Mobile Healthcare from Physician’s Angle of View

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Problems to be solved in Medicine

- Raising the cost of healthcare
Average cost of healthcare in 6 European countries as % of their GDP

Gartner report, 2009
Condition
Senile cataract
Breast cancer
Prenatal care
Low back pain
Coronary artery disease
Hypertension
Congestive heart failure
Cerebrovascular disease
Chronic obstructive pulmonary disease
Depression
Orthopaedic conditions
Osteoarthritis
Colorectal cancer
Asthma
Benign prostatic hypertrophy
Hyperlipidemia
Diabetes mellitus
Headache
Urinary tract infection
Community acquired pneumonia
Sexually transmitted disease
Peptic ulcer disease
Atrial fibrillation
Hip fracture
Alcohol dependence

Percentage of Recommended Care Received

Closing the Gap

US data collated by Professor Bill Runciman, President, Australian Patient Safety Foundation from McGlynn et al; NEJM 2006 Vol 348; p2635-45

© 2008 Map of Medicine Ltd and Zynx Health Inc.
Rising toll. Between 2008 and 2030, the World Health Organization projects that the burden of non-communicable diseases will continue to rise, even in the poorest countries.
Health and Social Care Costs

Connecting for Health

Healthy, Independent Living
Community Clinic
Traditional Health IT Focus
Chronic Disease Management
Doctor’s Office
Assisted Living
Skilled Nursing Facility
Specialist Clinic
Community Hospital
ICU

QUALITY of LIFE

100%

COST of CARE/DAY

0%

HOME CARE
RESIDENTIAL CARE
CLINICAL CARE

€1
€10
€100
€1,000
€10,000
To treat patient at home – we need feedback from the patient
Problems to be solved in Medicine

• Raising the cost of healthcare
• Ageing of population
Trends in Life Expectancy at Birth, 1950 and 2010

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Latin Amer. and the Caribbean</td>
<td>51.3</td>
<td>73.4</td>
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<tr>
<td>Africa</td>
<td>38.2</td>
<td>55.2</td>
</tr>
<tr>
<td>Asia</td>
<td>42.9</td>
<td>69.0</td>
</tr>
<tr>
<td>Europe</td>
<td>65.6</td>
<td>75.4</td>
</tr>
<tr>
<td>N. America</td>
<td>68.7</td>
<td>78.2</td>
</tr>
<tr>
<td>World</td>
<td>47.7</td>
<td>67.9</td>
</tr>
</tbody>
</table>

Source: UNPD, 2011
Number of Working-Age Adults per Older Adult, 2010 and 2050

- **World**: 9 (2010), 4 (2050)
- **More developed**: 4 (2010), 2 (2050)
- **Less developed**: 11 (2010), 4 (2050)
- **Least developed**: 17 (2010), 9 (2050)
Именно поэтому в 2002 году в нашей стране стартовала пенсионная реформа.
Unprepared. Many developing countries lack the resources to effectively treat renal failure, diabetes, cancer, and other debilitating NCDs.
Can we get responsible old patient – no way!
What does healthcare need to encourage citizens and patients to follow healthy style of life, screening of their health status, and provide feedback to the healthcare provider?

Simple,

Miniature,

Devices for monitoring vital parameters with user friendly interfaces
Overweight children in England
Trends in the last three decades

Prevalence %


John Powel et al., Warwick Medical School, 2010
2007 Foresight Report: £15.8bn annual cost to UK
Figure 26.5 Identical twins with combined weight of 1,300 pounds. Note similarity in body shape.
Figure 26.9 Body mass index and the relative risk of death.
Exercise acts as a drug. Pharmacological benefits of exercise.
British Journal of Pharmacology © 2012
How can we push person to move more?

• To count the amount of movements

• To inform person about every day results

• To put goals (targets) for improvements
Использование mywellness key совместно с инвентарем Technogym

- Вы можете в меню Ваши тренировки создать новую тренировку, основанную на использовании доступного для вас спортивного инвентаря Technogym
- С вашего ПК вы можете получить доступ к результатам тренировок, созданных и заданных вашим клубом и выполненных в клубе
- Вы можете вручную вводить в Календарь информацию о тренировках, выполненных на тренажерах Technogym, но не зафиксированных вашим mywellness key
- Если вы продвинутый пользователь mywellness key, вы можете получить доступ к меню Расширенные функции и установить персонализированные цели на вашем mywellness key
Результаты

Занятия физическими упражнениями

Внешние занятия  Тренировка  Движение

очень активен
активен
средняя активность
низкая активность

Move

+440  -192  +127  -240  +371  -465  -146

13  14  15  16  17  18  19

Рекомендации

Вы можете поместить на эту страницу свои избранные графики.

Для этого выберите график в "отчет" и щелкните "добавить к избранным"
Sign on the elevator doors at TechnoGym

"Take the stairs to burn more calories"
Attention to the details (CDC Guidelines)

Other Safety Tips

- Keep emergency numbers in large print near each phone.
- Put a phone near the floor in case you fall and can’t get up.
- Think about wearing an alarm device that will bring help in case you fall and can’t get up.

“I feel stronger and better about myself since I started walking every day.”
How much should the person to exercise, what is the right dose of this remedy?

Heart rate correlates with the intensity of exercise.

Safe level of exercise intensity is determined by the maximal HR $220 - \text{age (in years)}$
Heart rate monitors

“People who are really serious about software should make their own hardware.” - Steve Jobs quotes Alan Kay at the MacWorld 2007.

Blatand offers a worldwide unique chest strap for heart rate monitoring. The chest strap communicates via Bluetooth short distance radio with your mobile phone or other end devices, e.g., the Bluetooth access point at a gym, a home computer or the rehab staff’s PDA.

It is convenient, persistent, interference-proof, tap-proof and less expensive than conventional products.
Numetrex Heart Rate Monitor Clothing
http://www.numetrex.com/
(см. Рис. 1)

(см. Рис. 2)
Version One Device Connectivity Standards

- Thermometer
- Pulse Oximeter
- Pulse / Blood Pressure
- Weight Scale
- Glucose Meter
- Cardiovascular and Strength Fitness Monitor
- Independent Living Activity
- Medication Adherence

Transport Independent

- 11073-10404 = Pulse Oximeter
- 11073-10406 = Pulse / Heart Rate
- 11073-10407 = Blood Pressure
- 11073-10408 = Thermometer
- 11073-10415 = Weighing Scale
- 11073-10417 = Glucose
- 11073-10441 = Cardiovascular Fitness Monitor
- 11073-10442 = Strength Fitness Equipment
- 11073-10471 = Independent Living Activity
- 11073-10472 = Medication Monitor

- 11073-20601 = Base Framework Protocol

Personal Health Device Class Specification
Medical Device Profile Specification

ISO
IEEE
USB
Bluetooth
PC
Personal Health System
Cell Phone
Set Top Box
Aggregator
Where Technology, Business, Research and Policy Connect.

The largest event of its kind, the 3rd annual mHealth Summit brings together leaders in government, the private sector, industry, academia, providers and not-for-profit organizations from across the mHealth ecosystem to advance collaboration in the use of wireless technology to improve health outcomes in the United States and abroad. More
% of American MDs with smartphones

- 2001
- 2005
- 2009
- 2010
- 2012

- 0
- 10
- 20
- 30
- 40
- 50
- 60
- 70
- 80
- 90
Рис. 1. Изменение числа мобильных медицинских приложений для различных платформ с февраля по сентябрь 2010 г.

Источник: онлайнное издание MobiHealthNews.
Outcome of Patients Enrolled in TeleHealth

- Deaths
- Patient with one or more hospitalisation
- Hospitalisation
- Hospital Days x 10

Observed
Expected

Доклад Д-ра Paul Atkin, UK, Барселона, 2010
Economical benefits of remote patient monitoring (RPM)

New England Healthcare Institute, 2009
Remote Physiological Monitoring

Heart Failure Care Comparison: RPM vs. Standard Care and Disease Management, Per Patient Per Year

<table>
<thead>
<tr>
<th></th>
<th>Management Cost</th>
<th>Average Readmissions</th>
<th>Cost of Readmissions (\dfrac{*}{\dfrac{$2,052}{\text{Technology}} ; \dfrac{$2,082}{\text{Technology &amp; DM}}})</th>
<th>Gross Savings v. RPM</th>
<th>Net Savings v. RPM</th>
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</thead>
<tbody>
<tr>
<td>RPM</td>
<td>$2,052 - Technology</td>
<td>0.552$\dagger$</td>
<td>$5,632$</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>$2,082 - Technology &amp; DM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disease Management</td>
<td>$750$\dagger$</td>
<td>1.116$**$</td>
<td>$11,387$</td>
<td>$5,755$</td>
<td>$3,703$</td>
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<tr>
<td>Standard Care</td>
<td>0</td>
<td>1.320$**$</td>
<td>$13,468$</td>
<td>$7,836$</td>
<td>$5,034$</td>
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</tbody>
</table>
Blood Pressure Monitoring
Audio and Visual Remindings
Remindings on Pills
Physician’s access to Patient data on Server
Mobile Cardiac Monitoring
Bluetooth® ECG and Activity Monitor

Applications
- Cardiac Rehab
- Cardiovascular Screening
- Home Monitoring
- Disease Management
- Atrial Fibrillation Screening
- Mobile Telemedicine
- Activity Monitoring
- Falls Monitoring
- Fitness Monitoring
- Sports Training
ECG analysis on the smartphone
AliveCor iPhone ECG
Futureemed kicked off this morning at NASA's Ames Research Park and all the attendees will be getting copies of Thinklabs Medical's iMurmur 2 and Heart Record apps for iPhone and iPad. iMurmur is a valuable application for learning heart murmurs and other cardiac sounds, while Heart Record is a non-clinical app that uses the iPhone as a basic electronic stethoscope.
With
50X &
200X
Lenses

Get best price Reviews ProScope Mobile Wi-Fi Wireless Handheld Digital HR Microscope for iPad, iPhone & iPod touch with 50X Lens & 200X Lenses - Design .... Check it out NOW!
Glucometer with BlueTooth (Germany)
Nonin Onyx II 9560 Bluetooth Wireless Finger Pulse Oximeter with FREE case!!

The first wireless fingertip pulse oximeter

Oximetry Unplugged – Revolutionizing Disease Management. With the increased need for remote disease management, there is an opportunity to provide oximetry monitoring solutions to simplify the exchange of secure information.
Общая схема решения

Измеритель давления
Кардиодатчик
Глюкометр

Bluetooth

Сотовые сети
Телефон пациента

Интернет

Сервер мониторинга

Стационарное рабочее место

Сервисы персональных медицинских карт

Врач
Research Article

Use of a Smartphone for Improved Self-Management of Pulmonary Rehabilitation

A. Marshall,¹ O. Medvedev,² and A. Antonov²

¹ School of Computing, University of Leeds, Leeds LS2 9JT, UK
² Faculty of Basic Medicine, Lomonosov Moscow State University,

<table>
<thead>
<tr>
<th>Status</th>
<th>Screen shot</th>
<th>Other details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise 1</td>
<td>35 s</td>
<td>Normal physiological conditions, Heart rate within acceptable range specified by clinical professional, Heart rate shown, Time remaining in seconds shown, Green background</td>
</tr>
<tr>
<td>Exercise 1</td>
<td>13 s</td>
<td>Normal physiological conditions, but near acceptable limits, Heart rate higher or lower than normal, but still within acceptable range, Heart rate shown, Time remaining in seconds shown, Amber background</td>
</tr>
<tr>
<td>Exercise 1</td>
<td>10 s</td>
<td>Dangerous physiological conditions, Heart rate excessively high or low, Exercise should cease now, LOUD AUDIBLE WARNING SIGNAL, Heart rate shown, Red background, STOP displayed, Display freezes and remains in this state until the Stop button is pressed</td>
</tr>
</tbody>
</table>

STOP 106
Radar for remote measurement of breath and a heart activity

**Characteristics**
- Duration of a pulse: 200 ps;
- Average power: < 0.04 $\mu$W;
- Range of action: 0.02 - 5 m;
- Density of a flow emission power: less than 0.1 mW/cm$^2$
Output signal of radar during breath and when breath is stopped

- Only heart's signals
- Signals of heart and breath
Implantable RFID-based sensors

The CardioMEMS Interrogator cart contains a 15” touchscreen monitor and lightweight, ergonomically designed Antenna. During the EVAR procedure, the cart’s Antenna transmits RF energy to the sensor. The circuit inside the sensor is charged by the RF energy. The sensor returns a resonant frequency signal back to the Antenna, which is translated by the electronics to a pressure measurement.
TELLTALE HEART MONITORING: This small sealed sensor keeps tabs on artery pressure in heart failure patients, transmitting information wirelessly to doctors.

*Image: OSU MEDICAL CENTER/CARDIOMEMS*
SMSI® Glucose Sensor
Personal Glucose Monitoring
MedSignals
The Right Pill. The Right Time. Taken Properly.

A Smart Pillbox that:
- Reminds you at pill times for 4 key drugs
- Fits in a pocket or purse — you can take it anywhere
- Communicates pill-taking patterns to your doctor
- Helps remote caregivers assist you when needed

pico
Standard solution for medication monitoring

Configuration and self-test
Configuration is done by software which is programmed into the chip using the RFID capabilities of the CPK082. Customization may be done either during manufacture and/or prior to use by a pharmacist or care provider.

The module provides a self-test capability that may be used in manufacturing and in the market to ensure that it is functioning correctly.

RoHs
The CEM083 is RoHs compliant.

Applications
<table>
<thead>
<tr>
<th>Published</th>
<th>Medication errors according to the drug dispensing system</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Traditional*</td>
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<tr>
<td>Barker, 1969</td>
<td>31.2%</td>
</tr>
<tr>
<td>Crawley, 1971</td>
<td>26.0%</td>
</tr>
<tr>
<td>Barker, 1984</td>
<td>1 error/patient/day</td>
</tr>
</tbody>
</table>

* Collective, Individualized

MEDICATION ERRORS AND DRUG-DISPENSING
Necessity to use International Standards
Version One Device Connectivity Standards

ISO
IEEE

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Personal Health Device Class Specification
Medical Device Profile Specification
Message 1:

We need Green Light for remote monitoring of our health conditions.
Healthcare is interested not in results of single measurement (flirt),
but in results of ‘sustainable relationships” with the monitoring system.

Healthcare is interested in changes in your conditions.

We are searching for change…..
Questions?