Mobile Healthcare from Physician's Angle of View

Oleg Medvedev
Maxim Yatskovsky

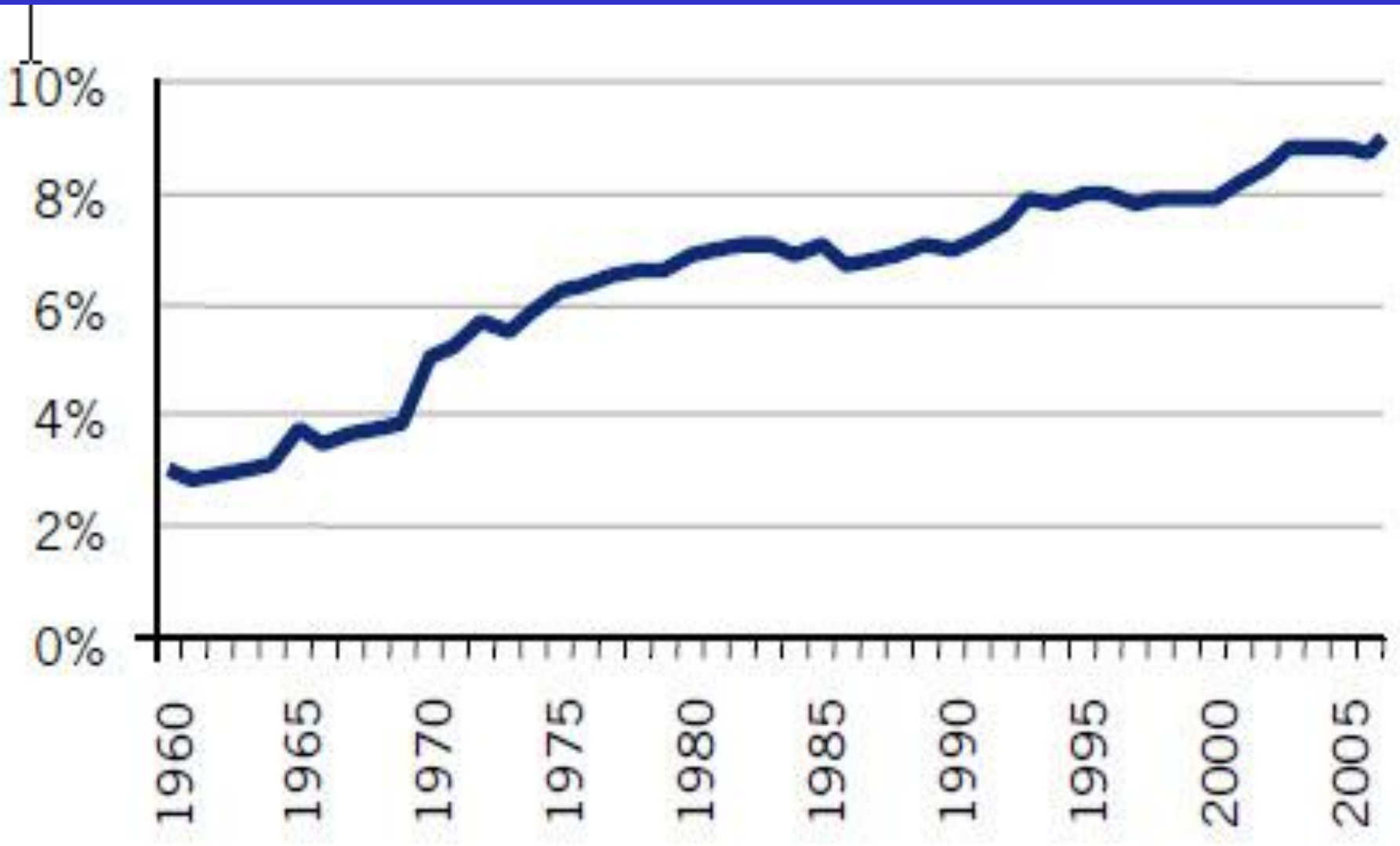
Moscow State University,
Moscow Baumann Technical University

Fruct 11, Saint Petersburg, 26.04.2012г.

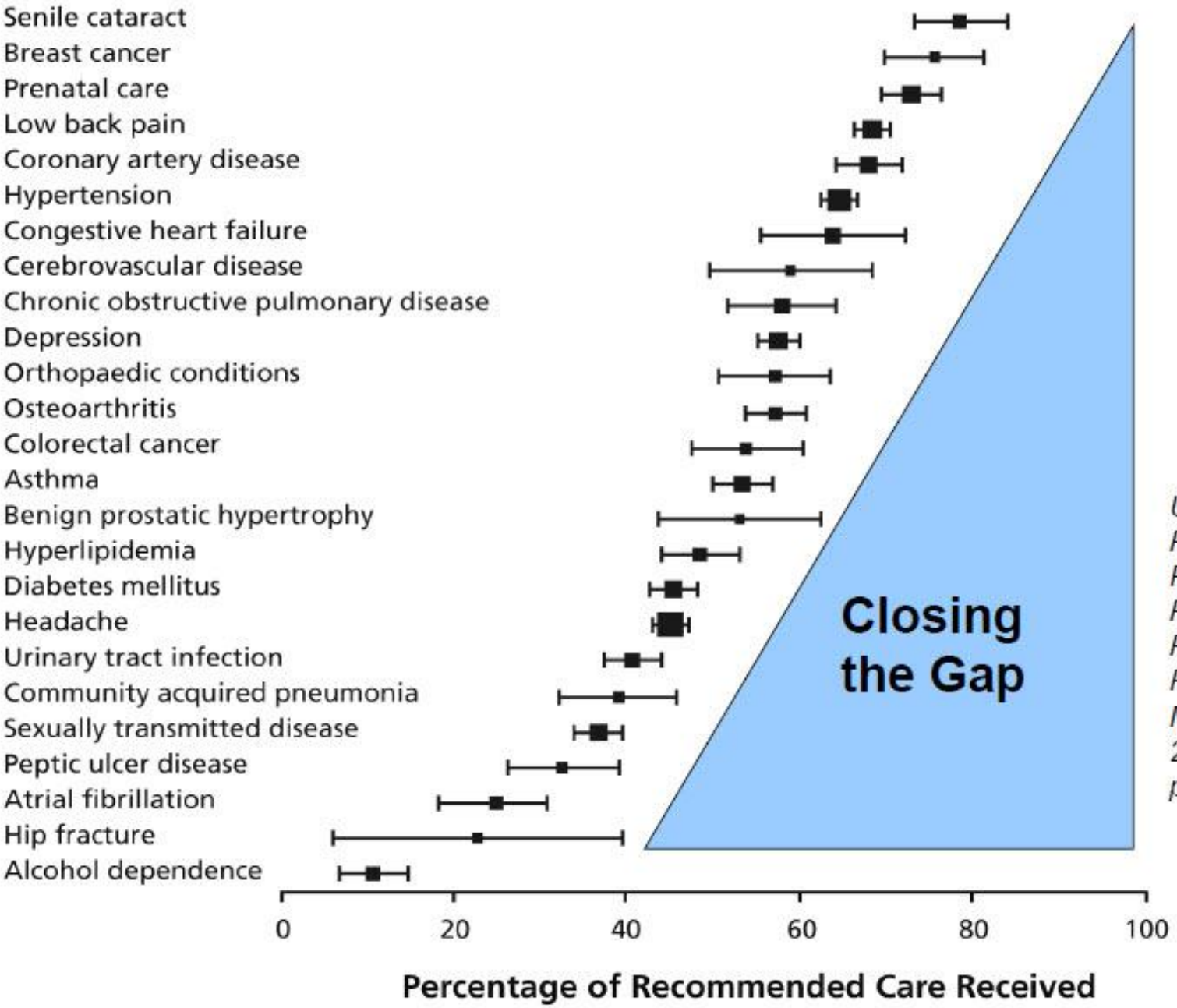
Problems to be solved in Medicine

- Raising the cost of healthcare

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

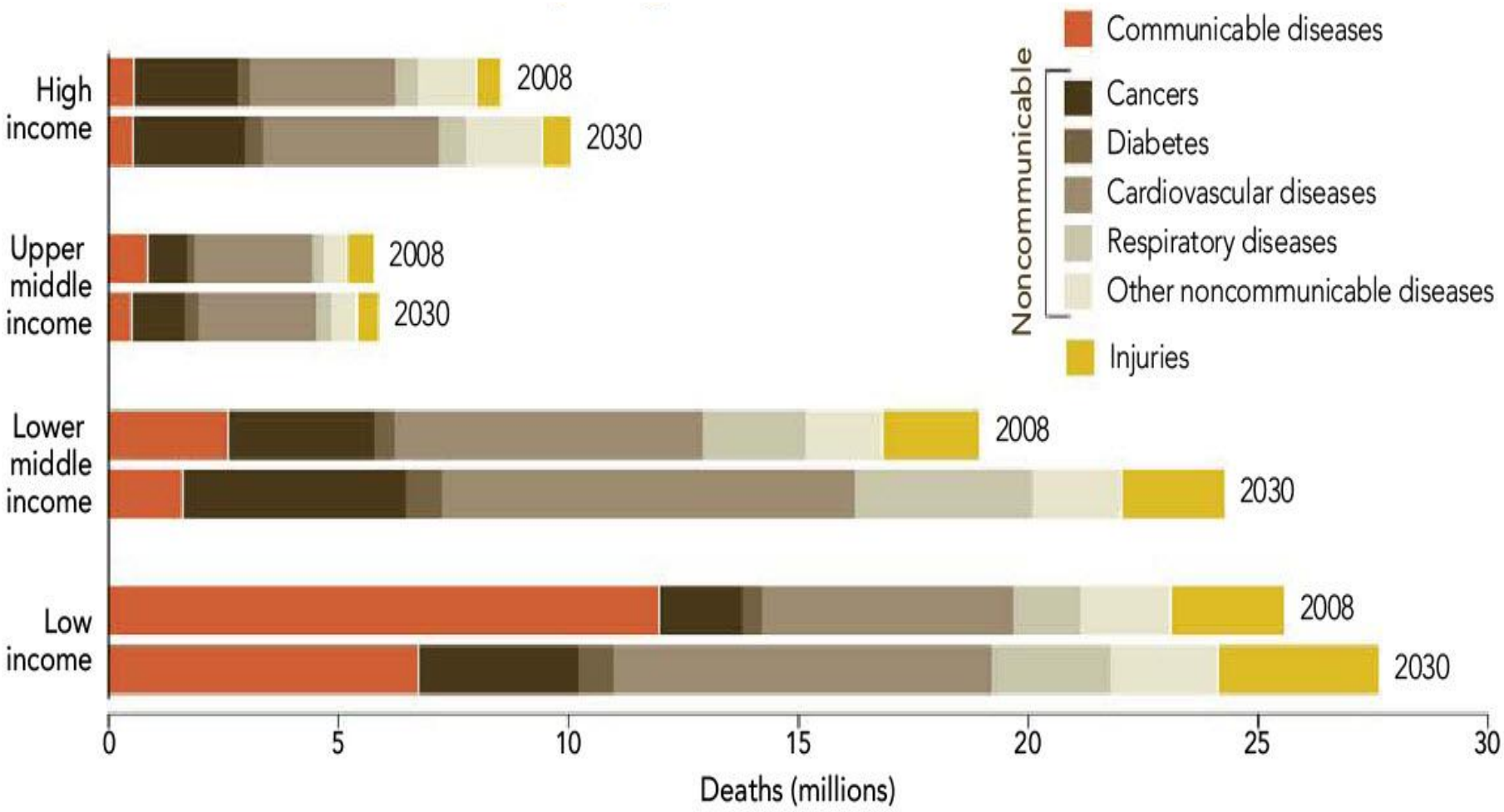


Gartner report, 2009



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

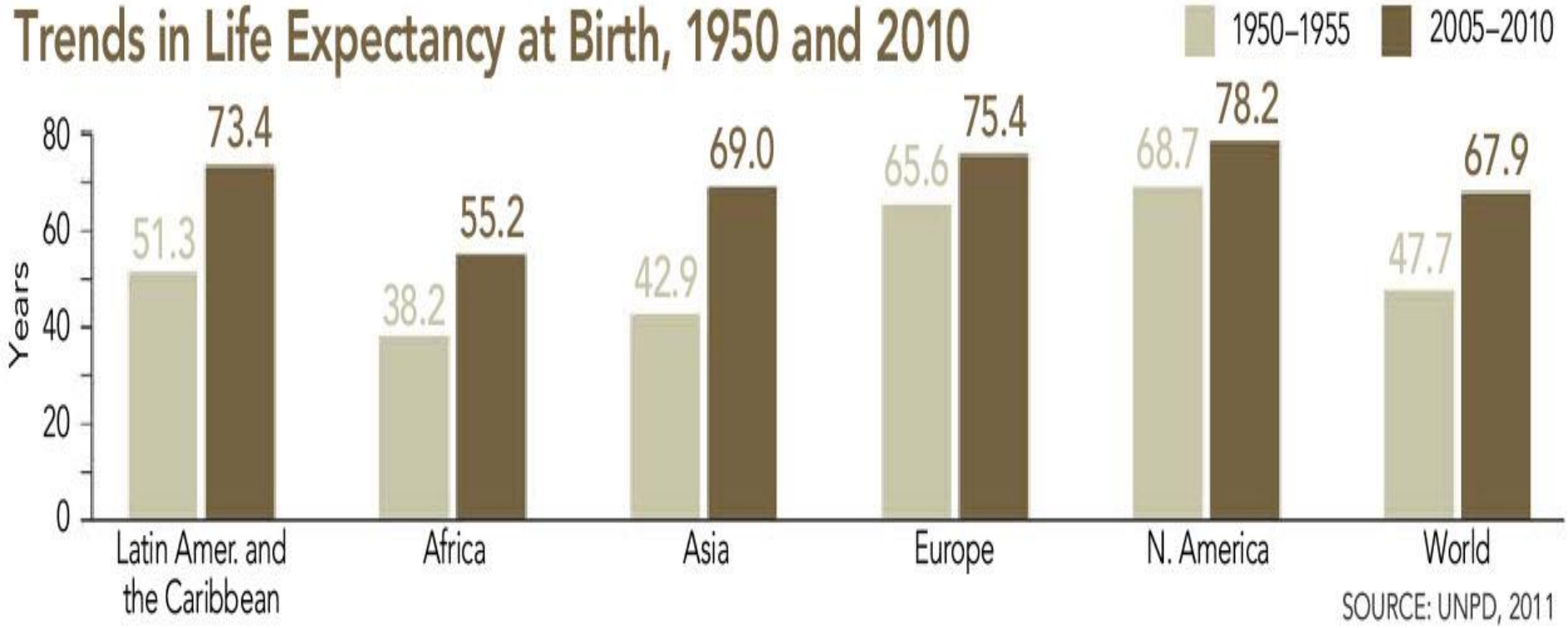
NHS
Connecting for Health

To treat patient at home – we need

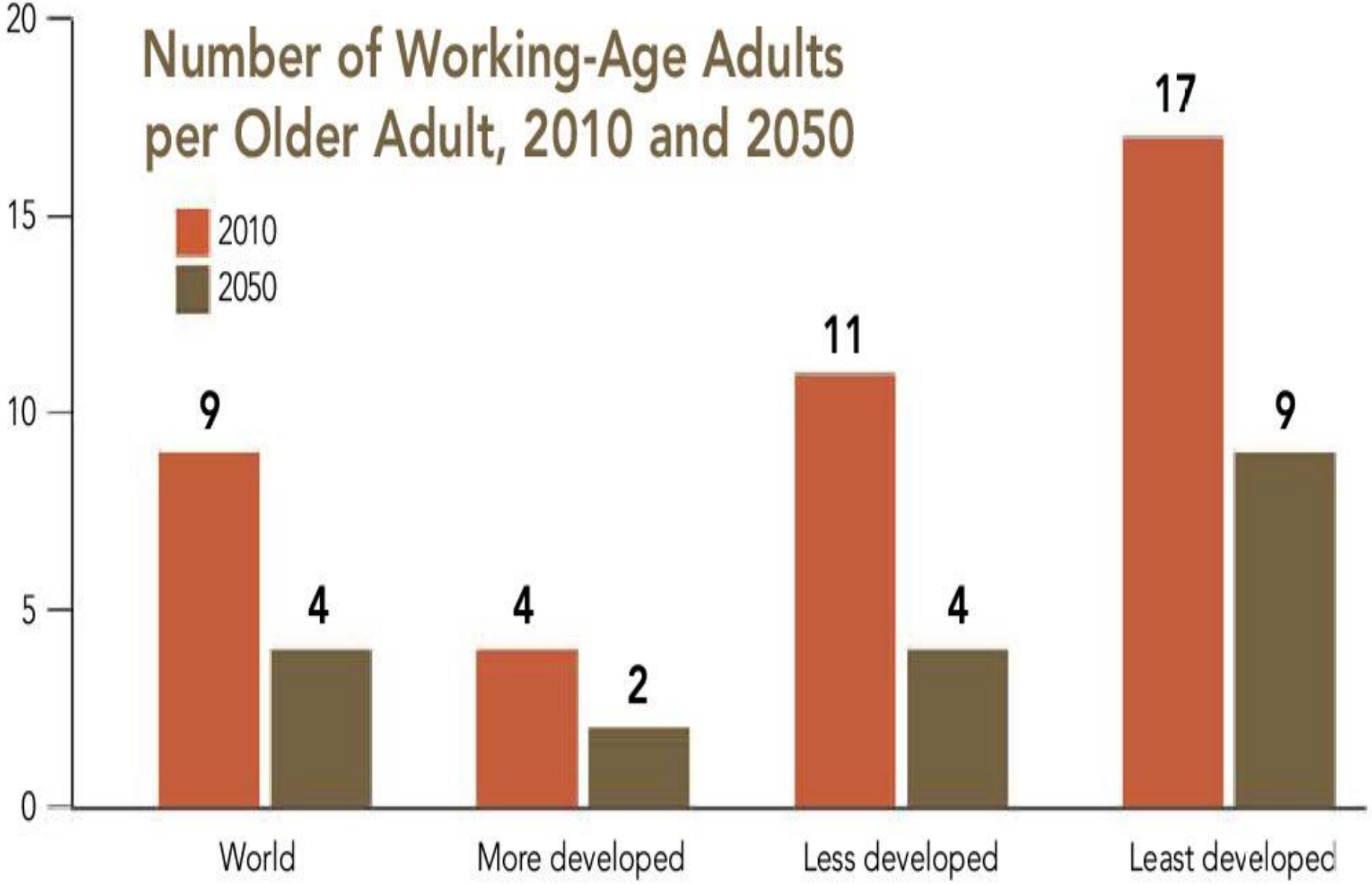
feedback from the patient

Problems to be solved in Medicine

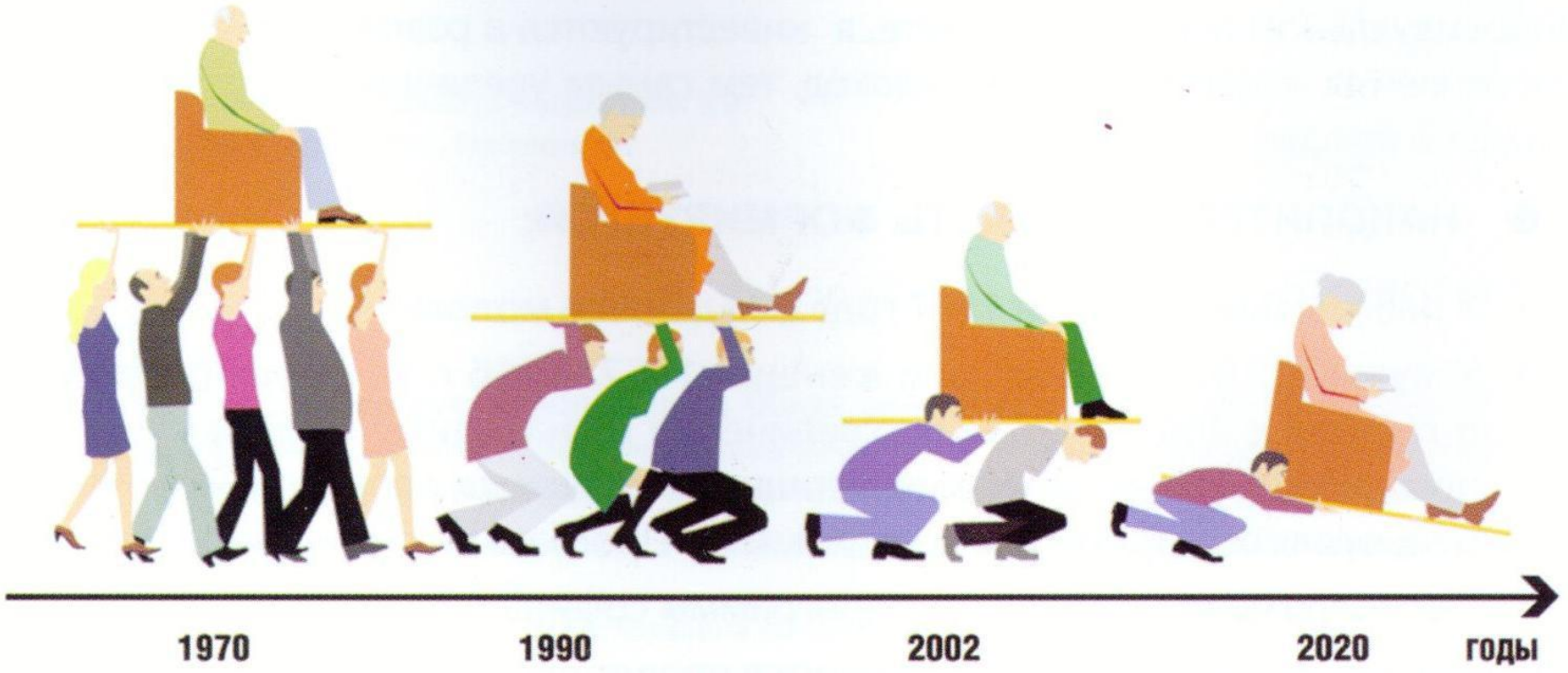
- Raising the cost of healthcare
- Ageing of population



29 JULY 2011 VOL 333 **SCIENCE** www.sciencemag.org


Number of Working-Age Adults per Older Adult, 2010 and 2050
2010
2050
20
15
10
5
0
9
4
4
2
11
4
17
9
World
More developed
Less developed
Least developed

Соотношение трудоспособного населения и пенсионеров



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?

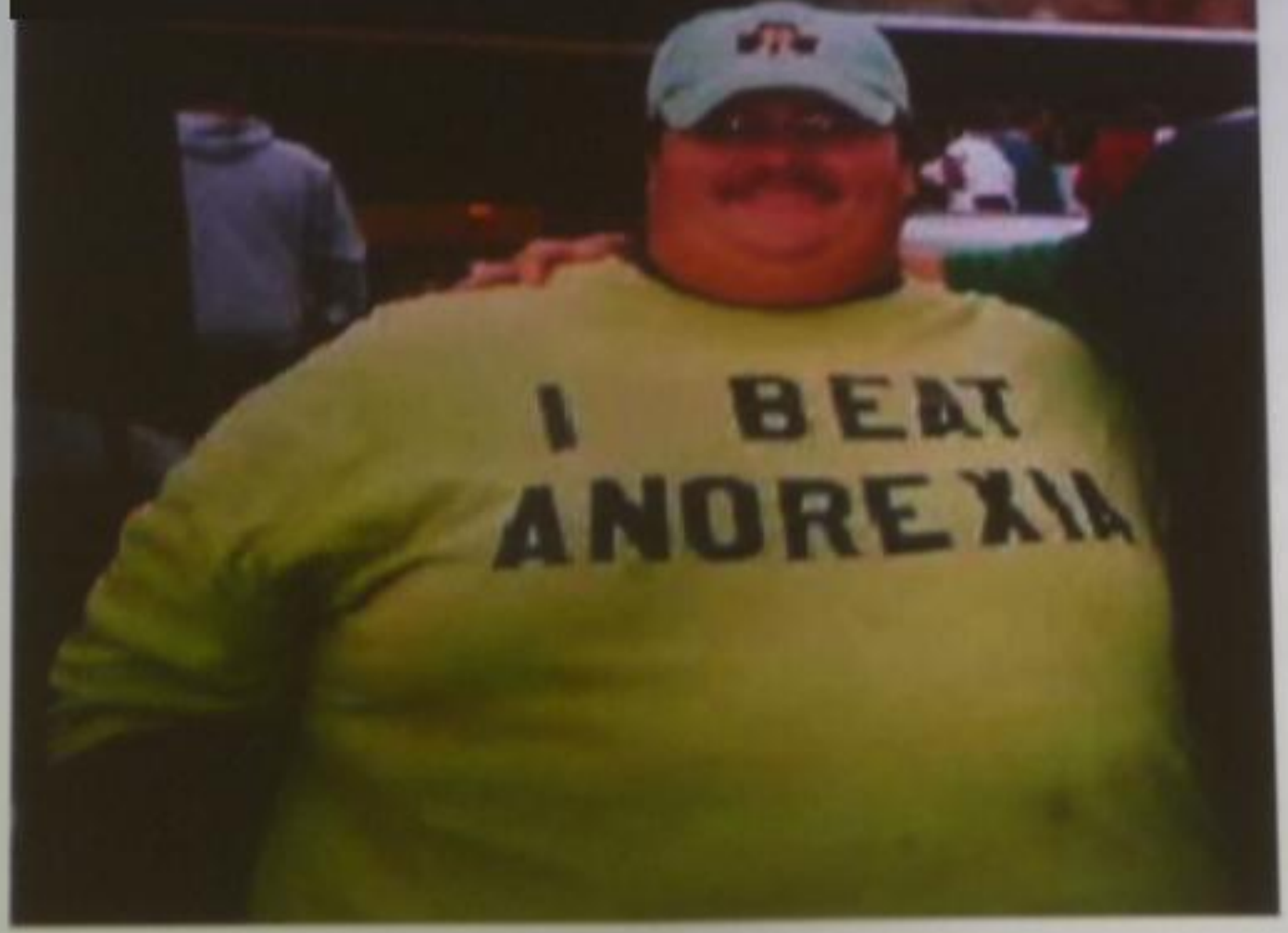
Simple,

Miniature,

Devices
for monitoring vital parameters
with user friendly interfaces

Overweight children in England
Trends in the last three decades

John Powel et al.,, Warwick Medical School, 2010



2007 Foresight Report:
£15.8bn annual cost to UK

John Powel et al.,, Warwick Medical School, 2010

Figure 26.5 Identical twins with combined weight of 1,300 pounds. Note similarity in body shape.

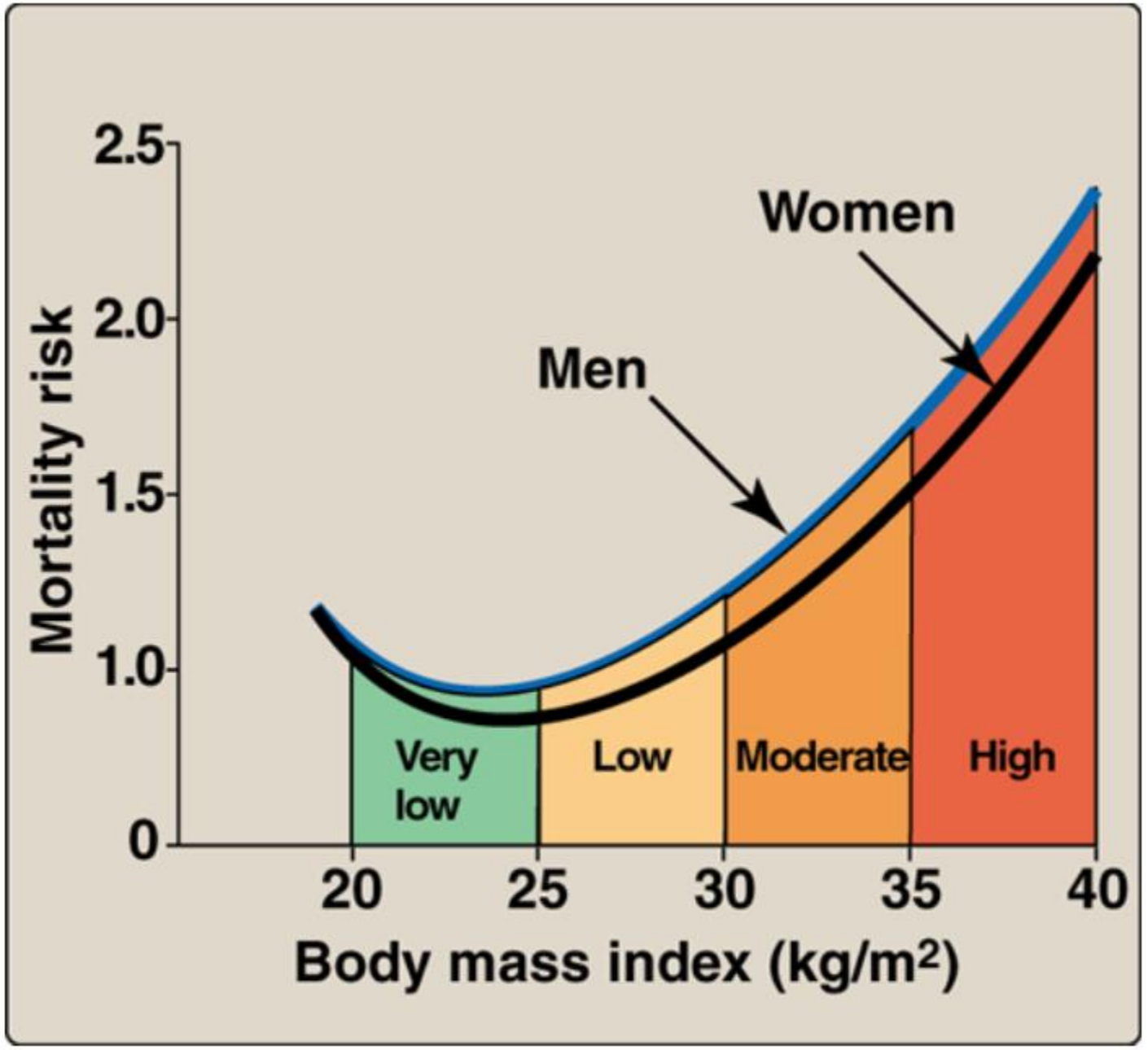
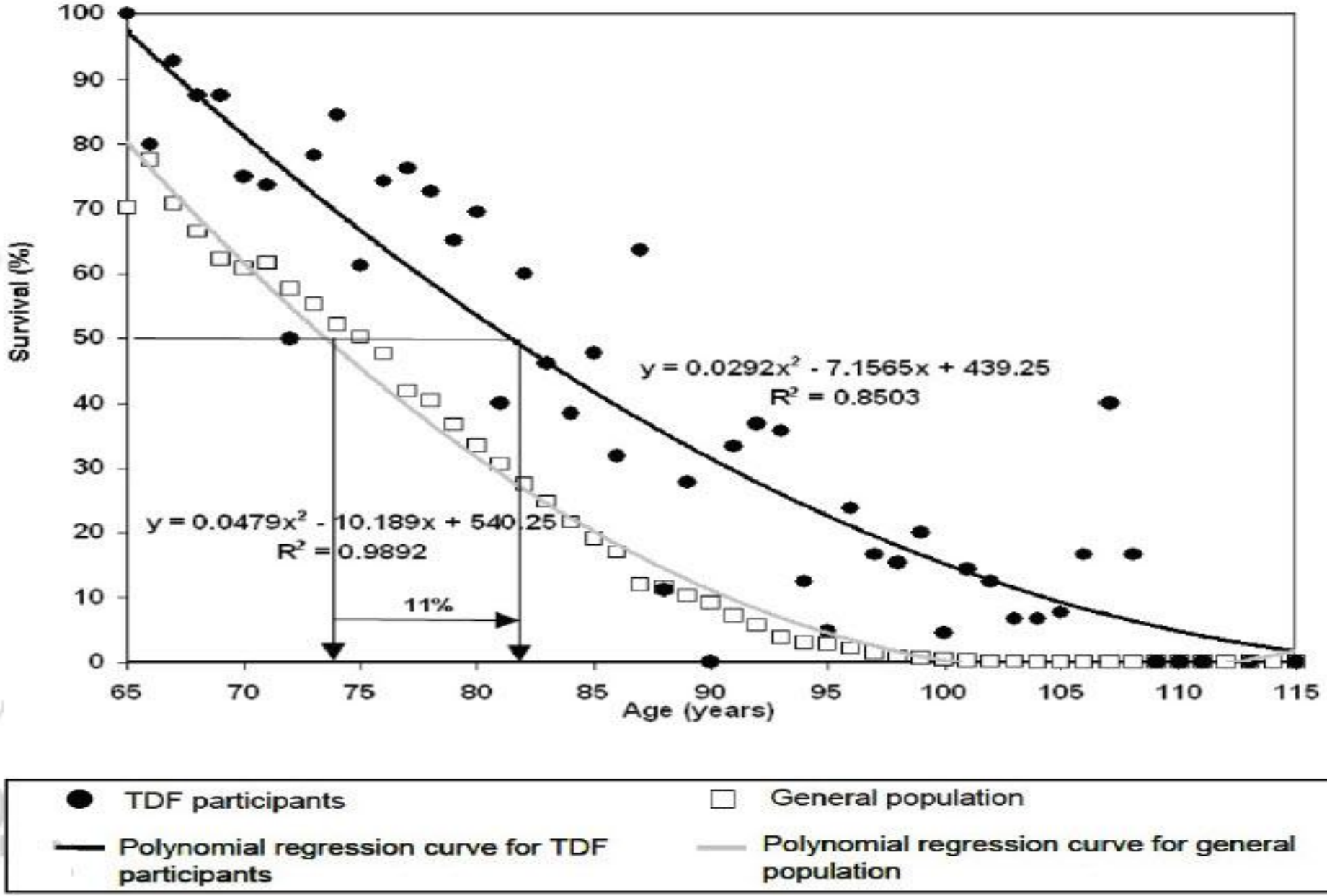


Figure 26.9 Body mass index and the relative risk of death.

John Powel et al.,, Warwick Medical School, 2010



TDF- участники Тур де Франсе

Review. Exercise acts as a drug. Pharmacological benefits of exercise. British Journal of Pharmacology © 2012

BENEFICIAL EFFECTS OF EXERCISE

↑ mitochondriogenesis
↑ oxidative fiber type
↑ fatty acid oxidation
↑ in aerobic capacity

↓ abdominal adiposity
improve weight control

↑ psychological well-being
↓ anxiety and depression
↑ expression of neurotrophic factors
↑ memory and cognitive function
↑ quality of sleep
↓ mental decline that comes with age
↑ neurogenesis

↑ coronary blood flow
↑ cardio respiratory function

↓ Triglyceride levels
↑ HDL
↓ LDL
↓ Blood pressure
↓ Blood coagulation
↑ Endothelial function
Improve glucose homeostasis
Improve insulin sensitivity

Review. 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

назад

mywellness - результаты - Mozilla Firefox

Файл Правка Вид Журнал Закладки Инструменты Справка

mywellness - результаты

www.mywellness.com/wellnessportal/CustomNavigation_Results/tabid/57/Default.aspx

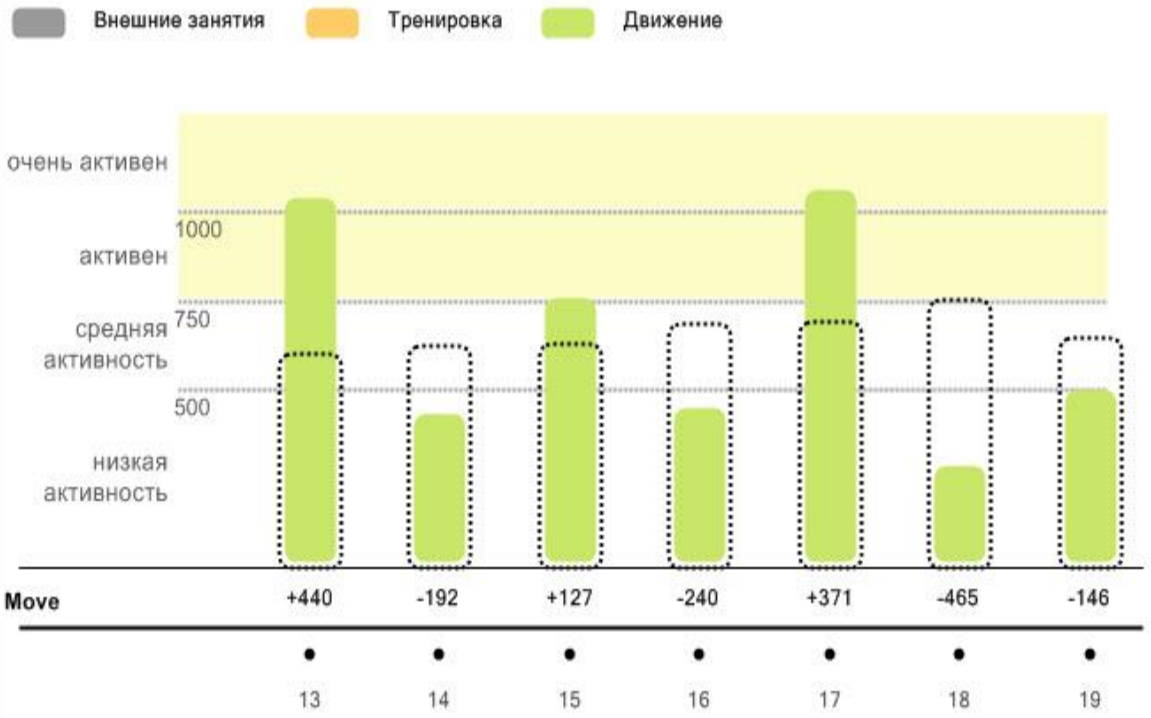
Самые популярные Начальная страница Лента новостей Windows Media Windows Бесплатная почта H... Настройка ссылок AND BP Monitor Server

Результаты

Занятия физическими упражнениями

вывести график

числа

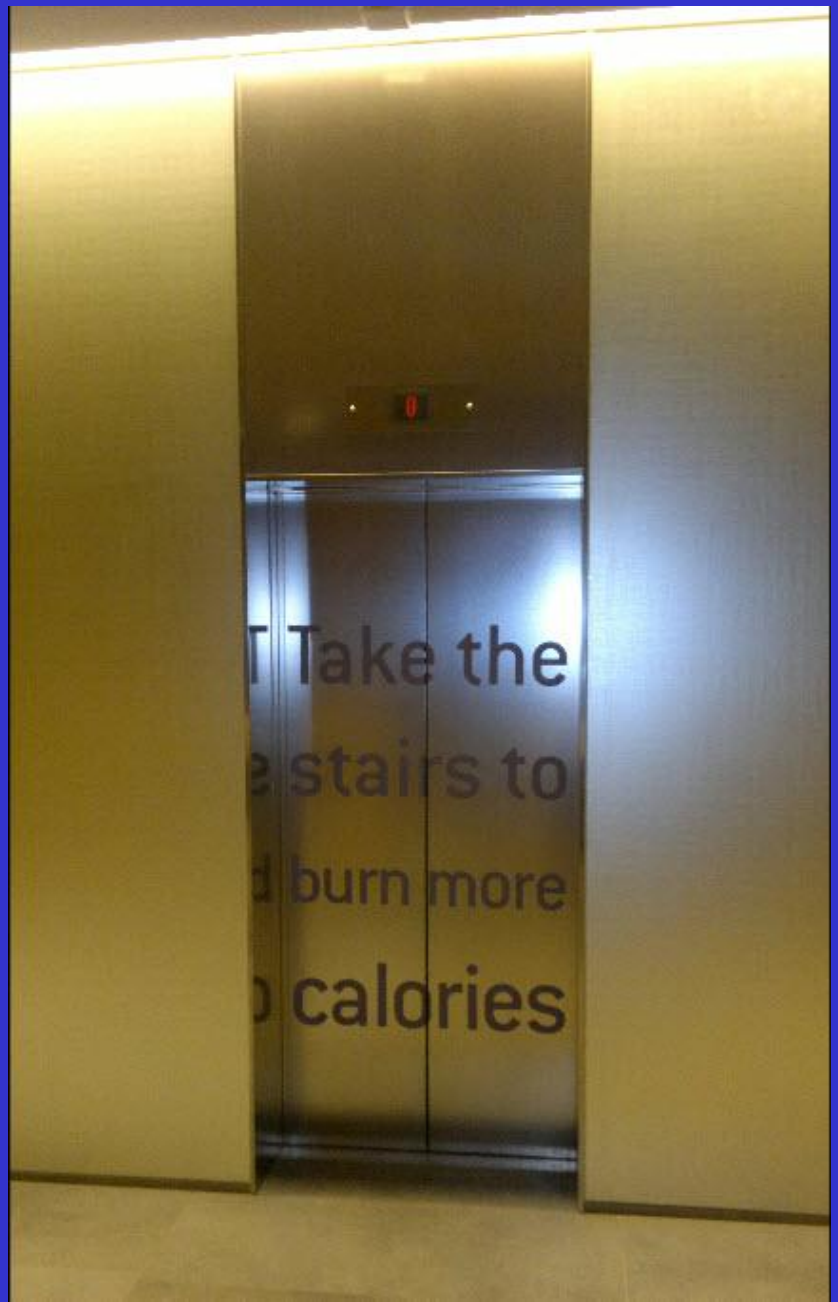


Рекомендации

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



Attention to the details (CDC Guidelines)

"I feel stronger and better about myself since I started walking every day."

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.

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 – age (in years)

Heart rate monitors

Blatand

*Join your Body - **Blatand Body Networking.***

Home | Company | Products & Services | Customers | Contact

Bluetooth Heart Rate Monitor.

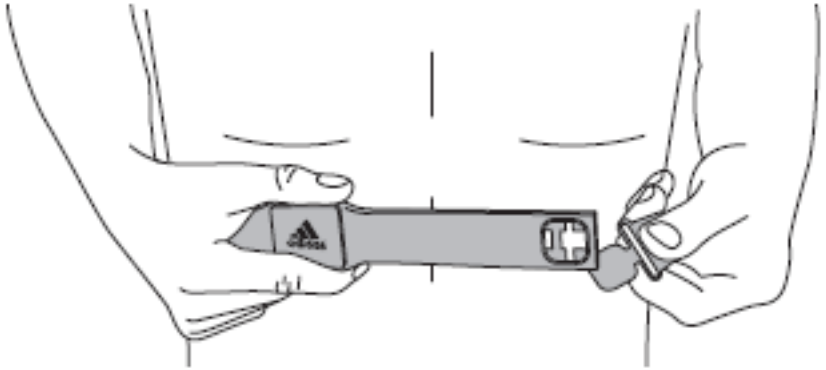
"People who are really serious about software should make their own hardware." - Steve Jobs quotes Alan Kay at the MacWorld 2007.

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)

Continua HEALTH ALLIANCE — 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

ISO IEEE

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

CERTIFIED USB — Personal Health Device Class Specification

Bluetooth™ — Medical Device Profile Specification

PC

Personal Health System

Cell Phone

Set Top Box

Aggregator

mHealthSummit

TECHNOLOGY • BUSINESS • RESEARCH • POLICY

December 5–7, 2011

The Gaylord National Resort
and Convention Center
National Harbor, Washington, DC Area

Shaping the Future of mHealth

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**

Bill Gates
2010 Keynote Luncheon

Healthcare without walls

A framework for delivering telehealth at scale

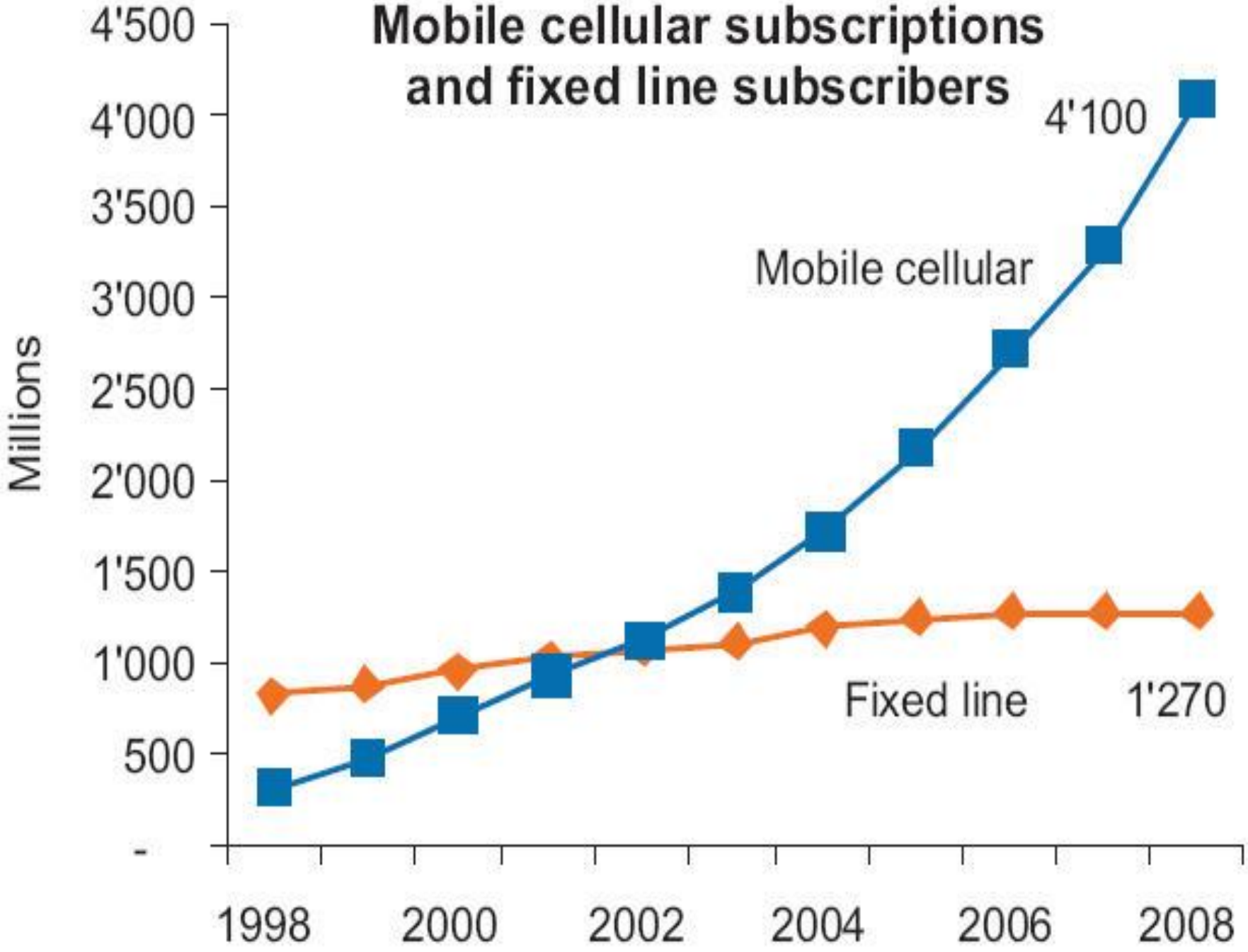
John Cruickshank

November 2010

Supporting authors

Gail Beer
Eleanor Winpenny
Julia Manning

2020health.org


Mobile cellular subscriptions
and fixed line subscribers
Millions
4'500
4'000
3'500
3'000
2'500
2'000
1'500
1'000
500
-
1998
2000
2002
2004
2006
2008
4'100
Mobile cellular
Fixed line
1'270

% of American MDs with smartphones

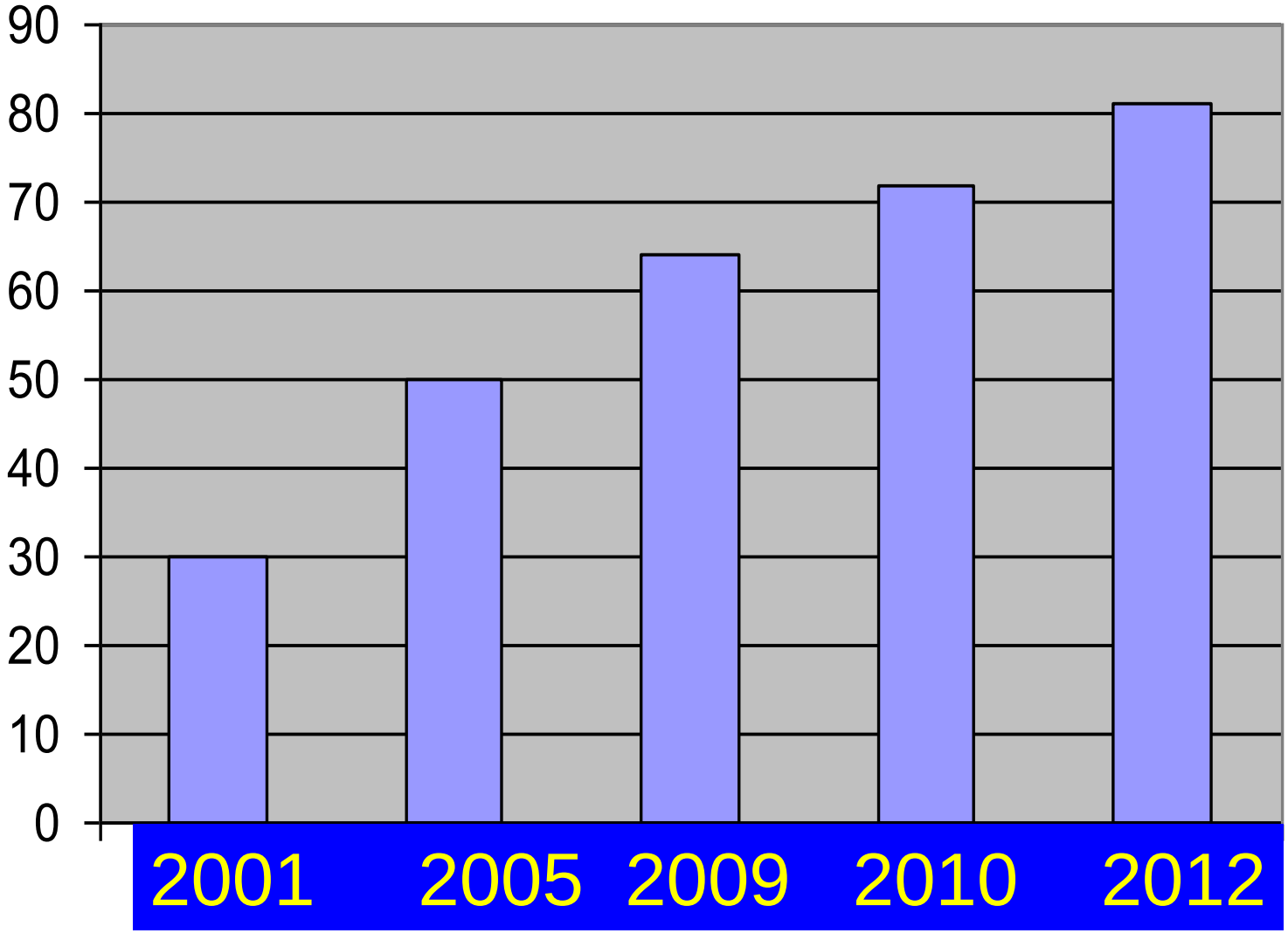
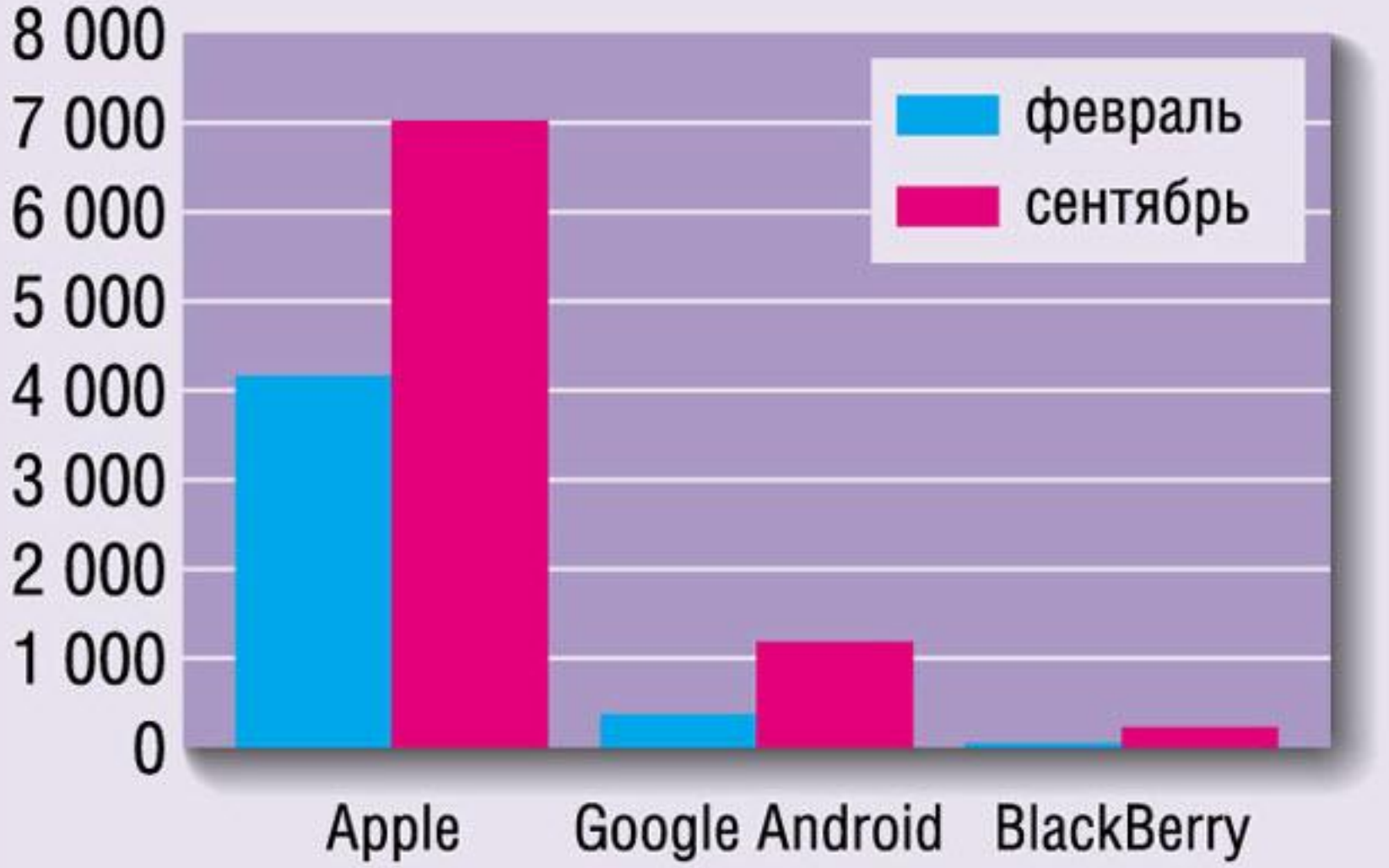
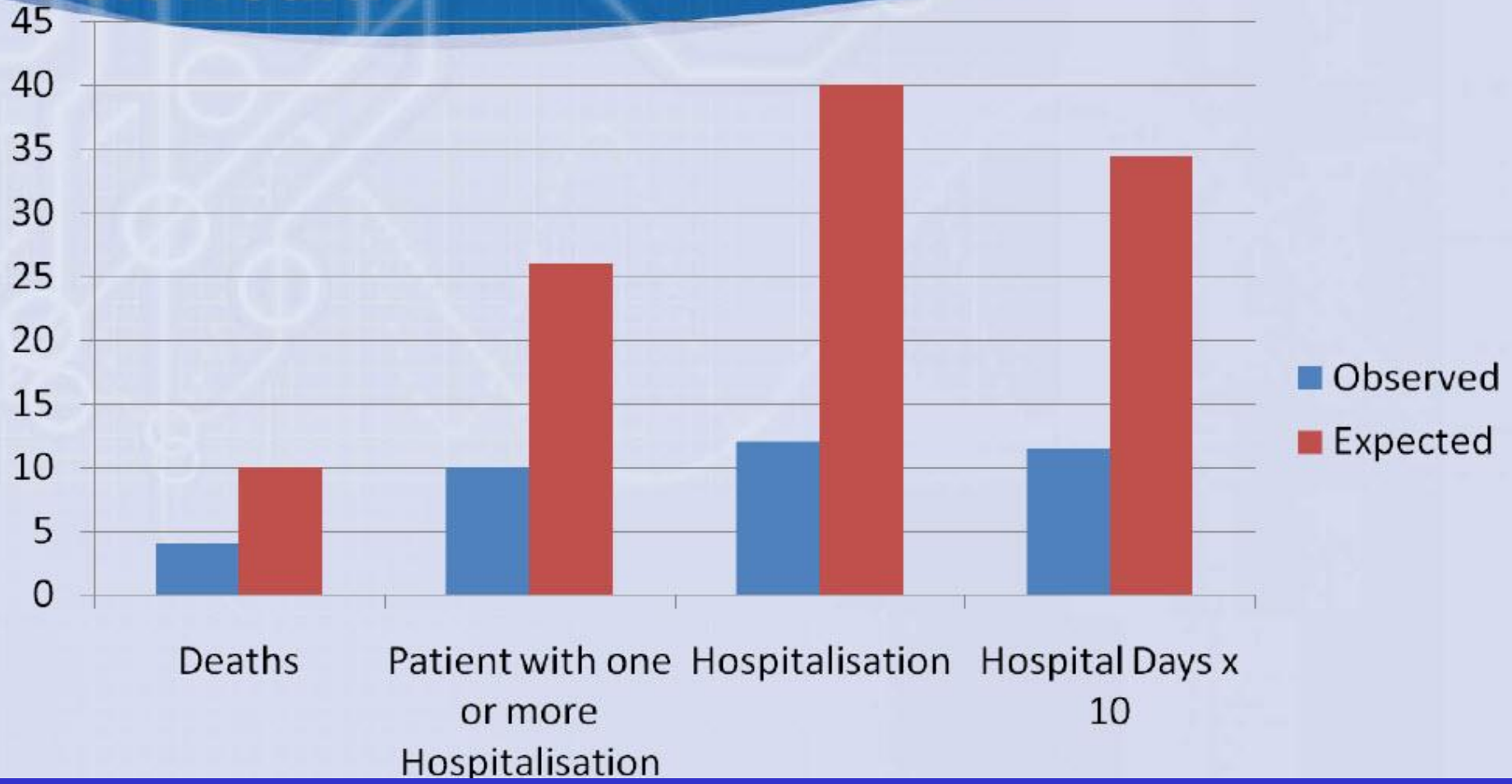


Рис. 1. Изменение числа мобильных медицинских приложений для различных платформ с февраля по сентябрь 2010 г.



Источник: *онлайновое издание MobiHealthNews.*

Outcome of Patients Enrolled in TeleHealth



Доклад Д-ра Paul Atkin, UK, Барселона, 2010

Economical benefits of remote patient monitoring (RPM)

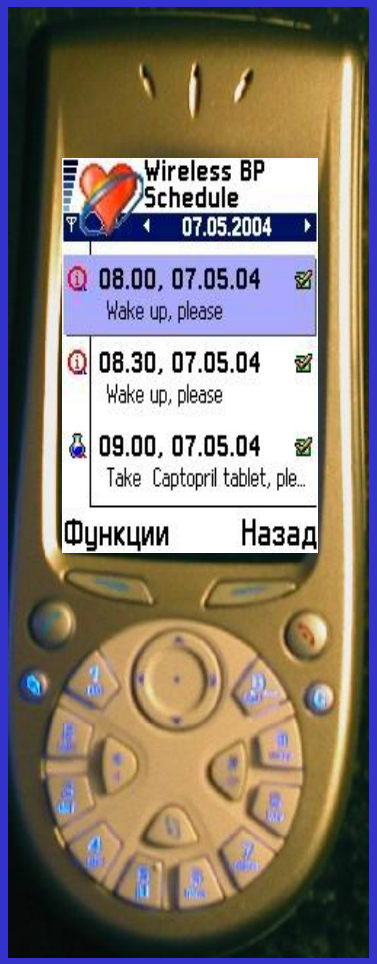
Heart Failure Care Comparison:
RPM vs. Standard Care and Disease Management, Per Patient Per Year

	Management Cost	Average Readmissions	Cost of Readmissions‡‡	Gross Savings v. RPM	Net Savings v. RPM
RPM	$2,052 - Technology* $2,082 - Technology & DM†	0.552§	$5,632		
Disease Management	$750‡	1.116**	$11,387	$5,755	$3,703
Standard Care	0	1.320††	$13,468	$7,836	$5,034

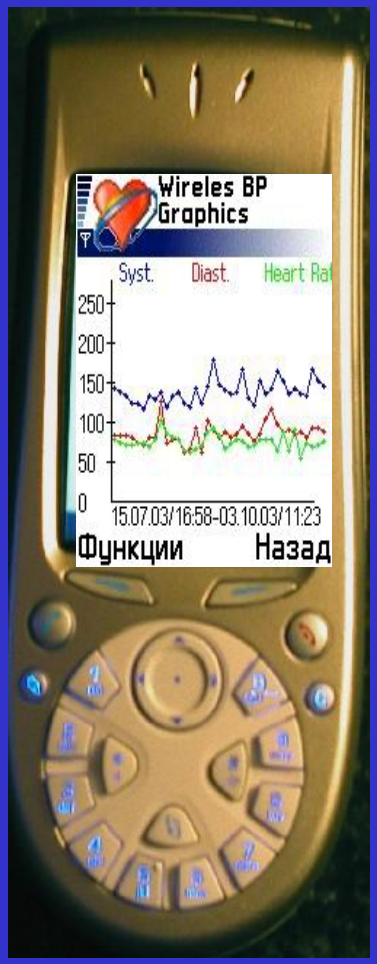
New England Healthcare Institute, 2009
Remote Physiological Monitoring

Blood Pressure Monitoring

Audio and Visual Remindings



Remindings on Pills



Physician's access to Patient data on Server

Alive Technologies

Mobile Cardiac Monitoring

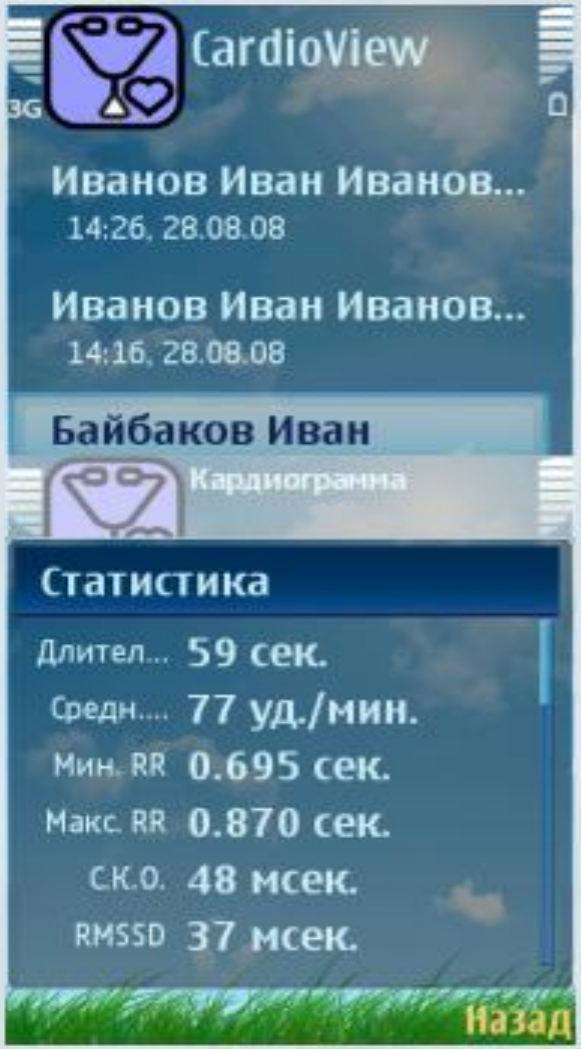
Bluetooth® ECG and Activity Monitor

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

Analysis of ECG on a Smartphone



AliveCor iPhone ECG

For Our Readers: Free Auscultation Apps from Thinklabs Medical

Filed under: Medicine , Net News , Pediatrics

Futuremed 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.

Please see more details below.

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 2 9560 Bluetooth Wireless Finger Pulse Oximeter with FREE case!!

WORKS WITH Microsoft® HealthVault™

NONIN

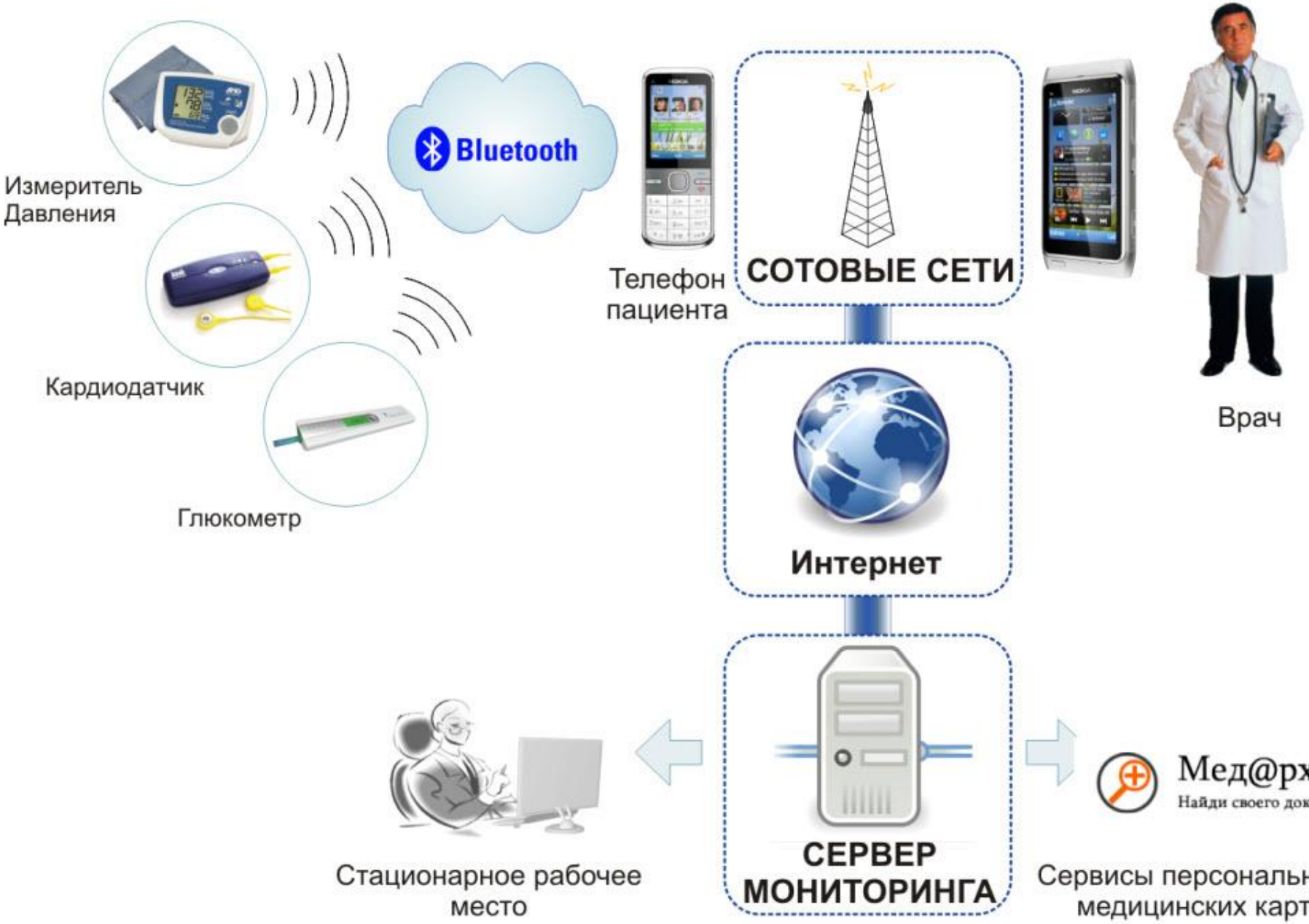
NONIN PureSAT™ | SpO2

9560 Onyx II

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



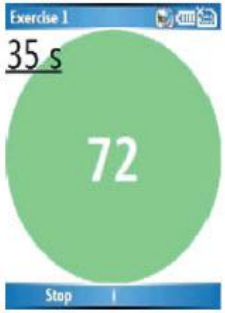
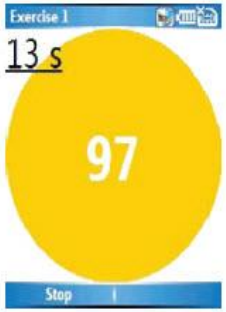
International Journal of Telemedicine and Applications
Volume 2008, Article ID 753064, 5 pages
doi:10.1155/2008/753064

Research Article

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

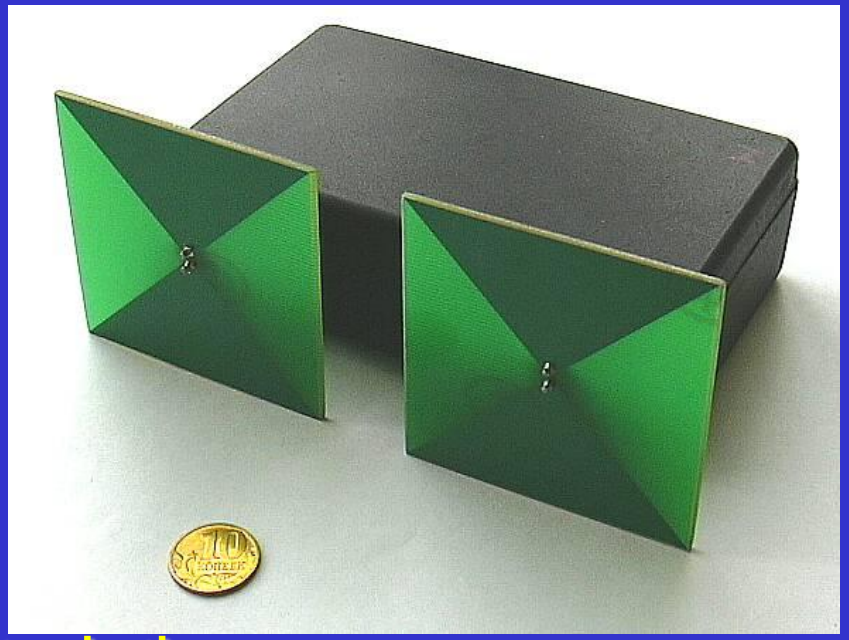
A. Marshall,[1] O. Medvedev,[2] and A. Antonov[2]

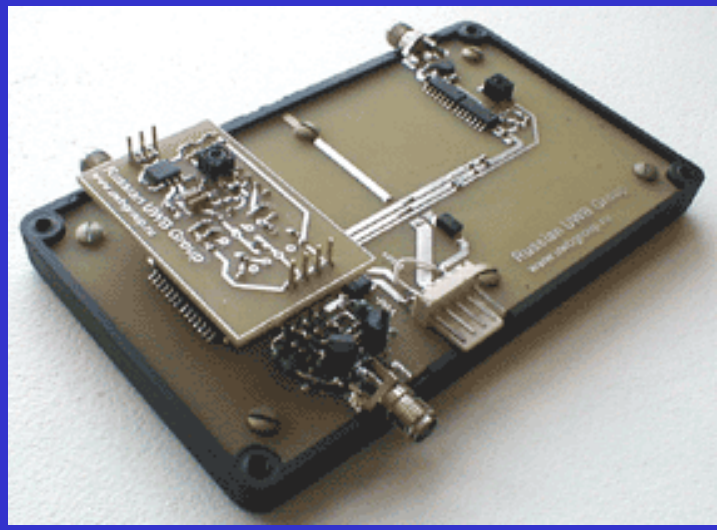
[1] *School of Computing, University of Leeds, Leeds LS2 9JT, UK*
[2] *Faculty of Basic Medicine, Lomonosov Moscow State University,*

Status	Screen shot	Other details
– Normal physiological conditions – Heart rate within acceptable range specified by clinical professional		– Heart rate shown – Time remaining in seconds shown – Green background
– 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
– 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

C124
C124
ICT
Industry
Billing
Messaging
EXHIBITOR

Radar for remote measurement of breath and a heart activity

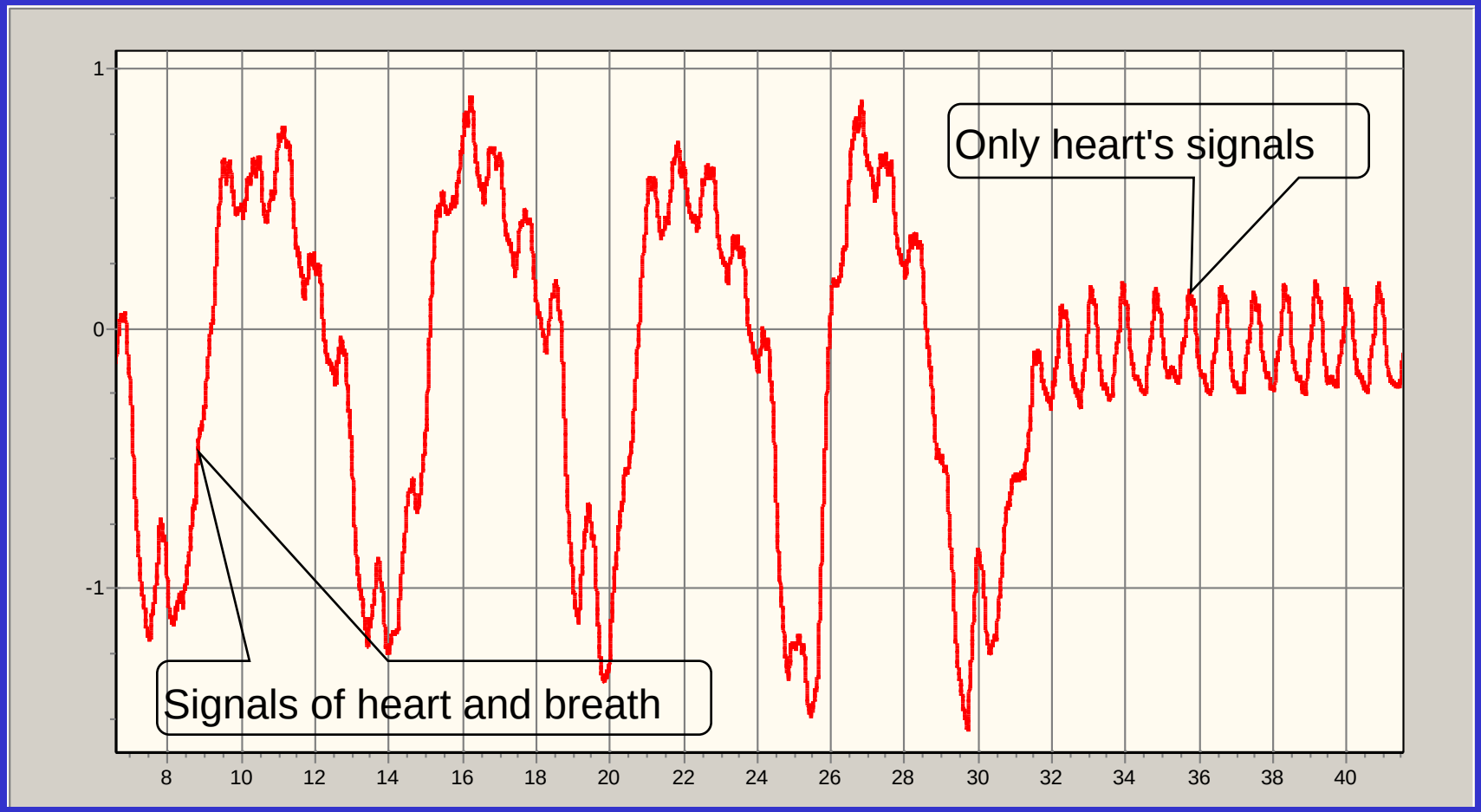




Characteristics

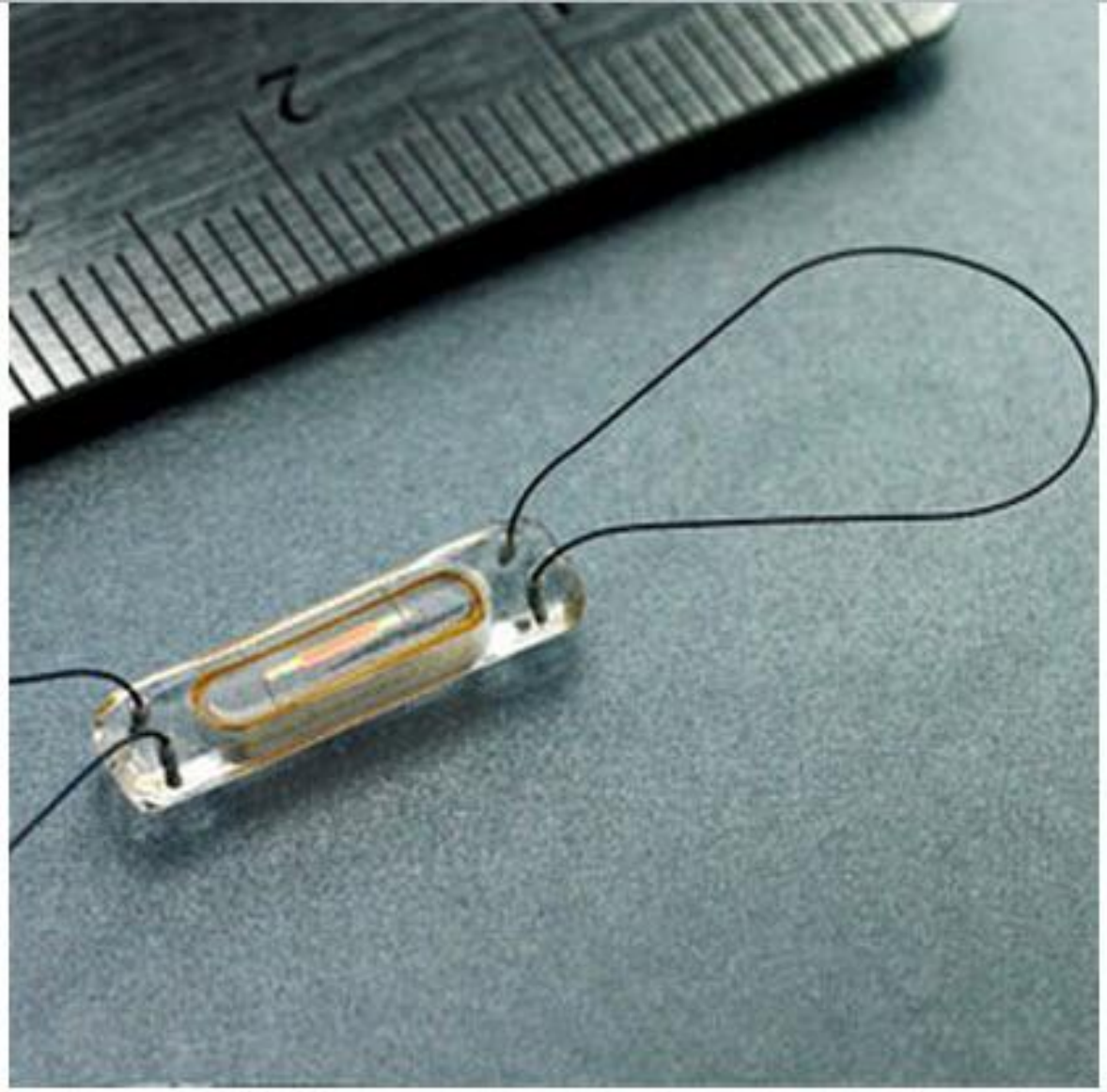
Duration of a pulse 200 ps;
Average power < 0.04 μW;
Range of action: 0.02- 5 m;
Density of a flow emission power
less than 0.1 mW/cm^2

Output signal of radar during breath and when breath is stopped



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

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SMSI® Oxygen Sensor

See the light reveal the data

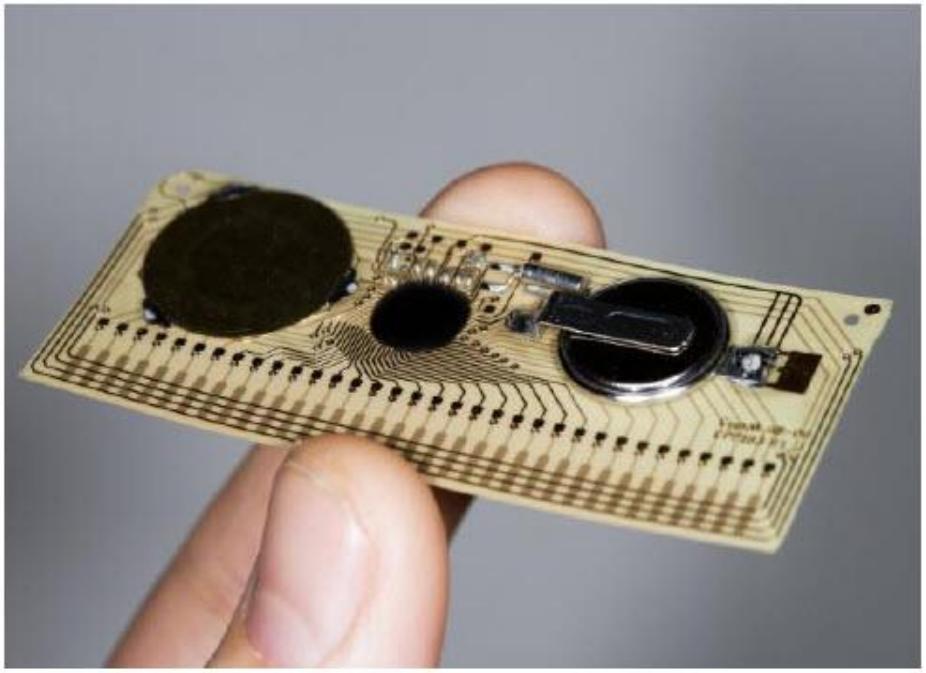
SMSI® Glucose Sensor
Personal Glucose Monitoring

MedSignals®
The Right Pill. The Right Time. Taken Properly.
SNOOZE
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 chart displays
• Helps remote caregivers assist you when needed
Quantity 1 MedSignals Solid Medication Dispenser
Next pill at
18:58
pico

CYPAK

smart, secure and connected

Standard solution for medication monitoring



The CEM083 is a designed as a single component for inclusion in pharmaceutical

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

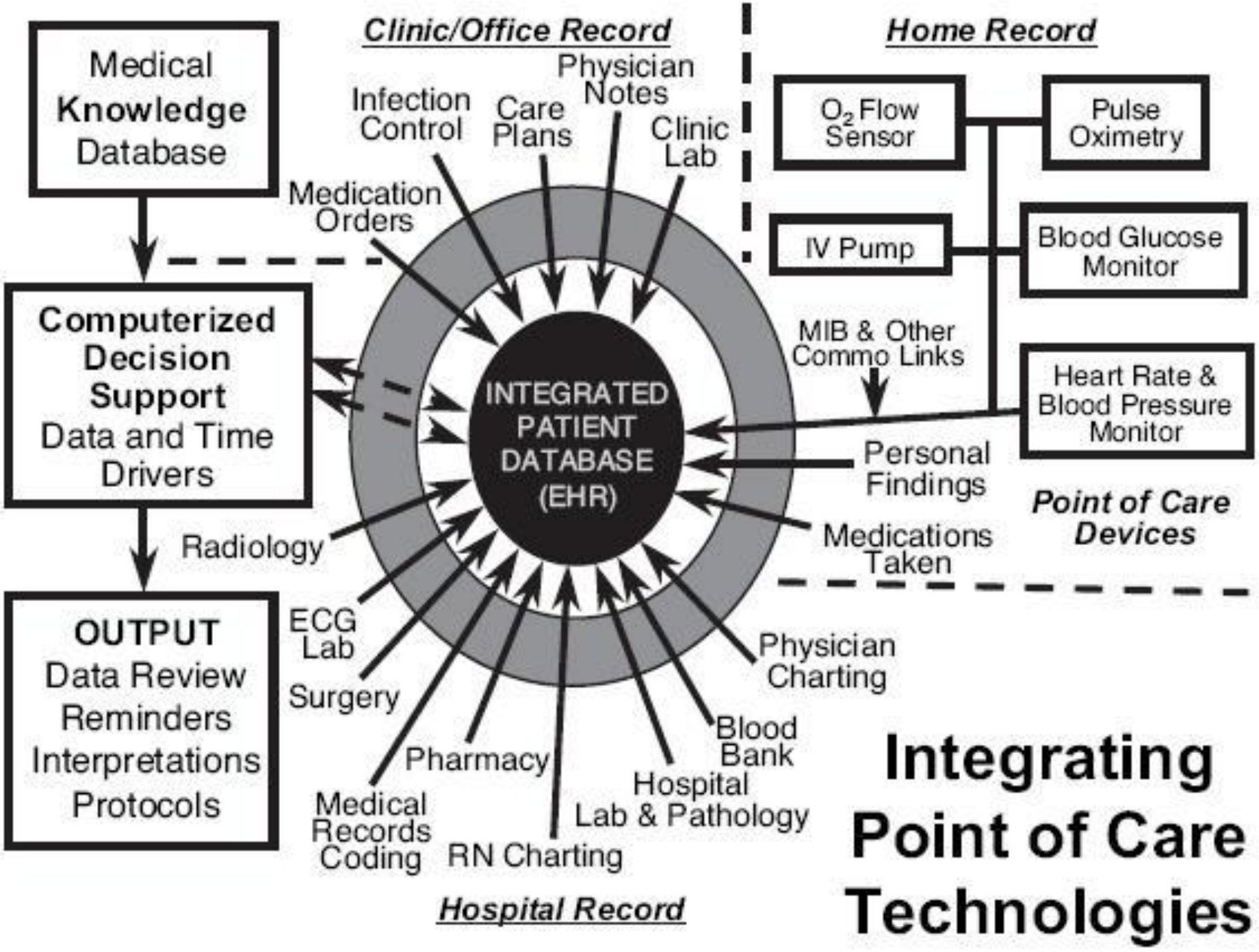
The CEM083 is RoHs compliant.

Applications

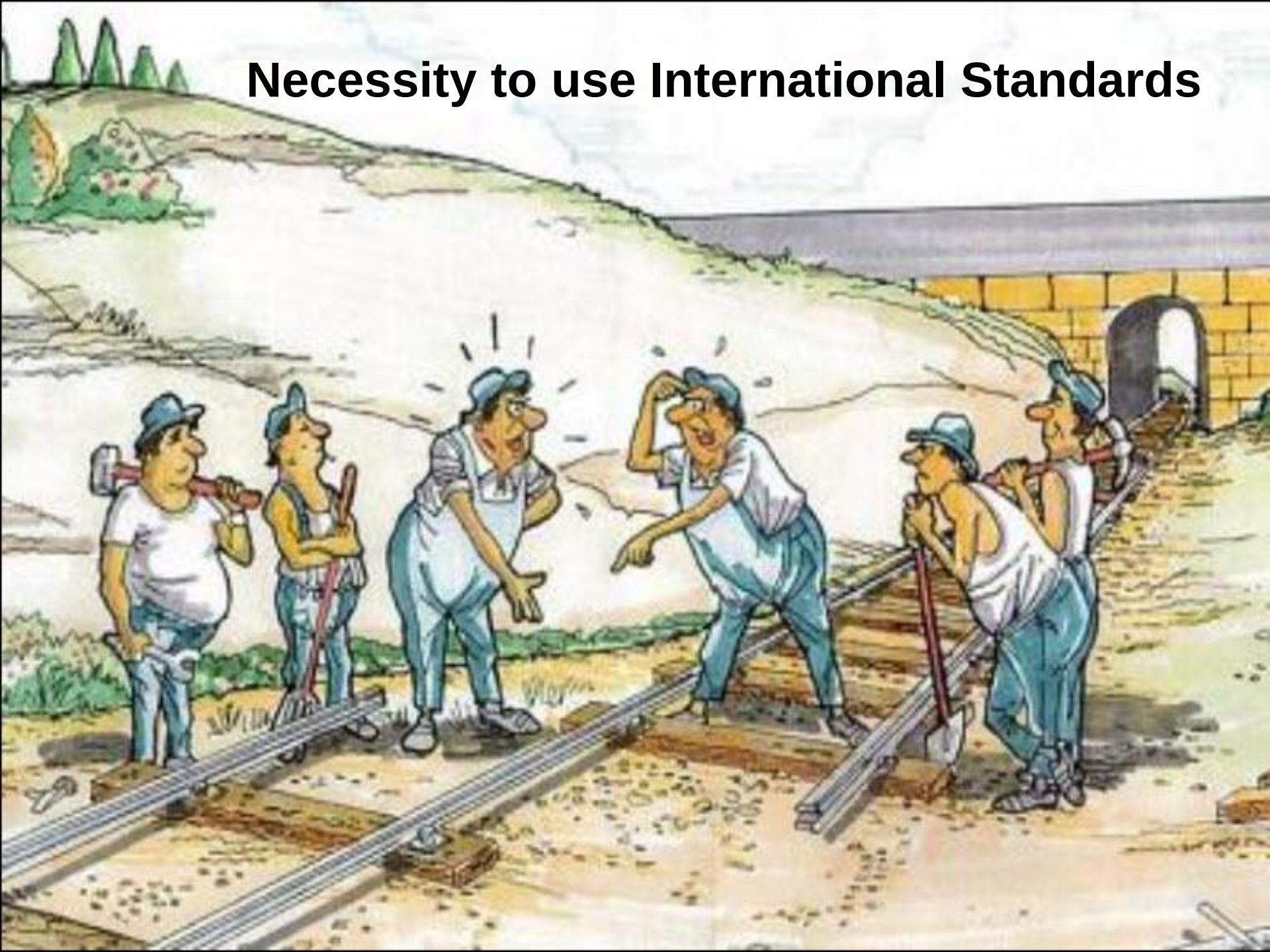
Published	Medication errors according to the drug dispensing system	
	Traditional*	Unit Dose
Barker, 1969	31.2%	13.4%
Crawley, 1971	26.0%	2%
Barker, 1984	1 error/patient/day	1 error/patient/week

* Collective, Individualized

MEDICATION ERRORS AND DRUG-DISPENSING


Medical Knowledge Database
Computerized Decision Support Data and Time Drivers
OUTPUT Data Review Reminders Interpretations Protocols
Clinic/Office Record
Infection Control
Care Plans
Physician Notes
Clinic Lab
Medication Orders
Home Record
O2 Flow Sensor
Pulse Oximetry
IV Pump
Blood Glucose Monitor
MIB & Other Commo Links
Heart Rate & Blood Pressure Monitor
Personal Findings
Medications Taken
Point of Care Devices
INTEGRATED PATIENT DATABASE (EHR)
Radiology
ECG Lab
Surgery
Physician Charting
Blood Bank
Pharmacy
Hospital Lab & Pathology
Medical Records Coding
RN Charting
Hospital Record
Integrating Point of Care Technologies

Necessity to use International Standards



Continua HEALTH ALLIANCE — 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

ISO IEEE

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

CERTIFIED USB — Personal Health Device Class Specification

Bluetooth™ — Medical Device Profile Specification

PC

Personal Health System

Cell Phone

Set Top Box

Aggregator

Message 1:

We need Green Light for remote monitoring of our health conditions

Message 2:

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?