



Challenges and opportunities in the use of mobile communications in healthcare

Mobile Communications & Technology Platform

3rd Workshop: Shaping the Future of Mobile and Wireless Communications

Stockholm, Sweden 15th October 2008



Current drivers for mobile and wireless communications in healthcare (mobile health, m-health)

What do we mean by mobile health?

Where are the opportunities?

Some current applications

Barriers to adoption of m-health applications

Development priorities



Ageing demographics

Changing healthcare problems

- Chronic disease challenge
- Economics of centralised delivery

Technology changes

- Prevalence of low cost, connected computing power
- Accessibility of health information

Consumer attitudes

Developing countries



Ageing is a global phenomenon. The world's elderly population - people 60 years of age and older - is the fastest growing age group. By 2050 about 80% of the elderly will be living in developing countries. Population ageing is occurring in parallel with rapid urbanization: in 2007 more than half of the world's population live in cities. By 2030 that figure is expected to rise to more than 60%.

<http://www.who.int/features/factfiles/ageing/en/index.html>
[accessed 09.10.08](#) 10 facts about Ageing WHO

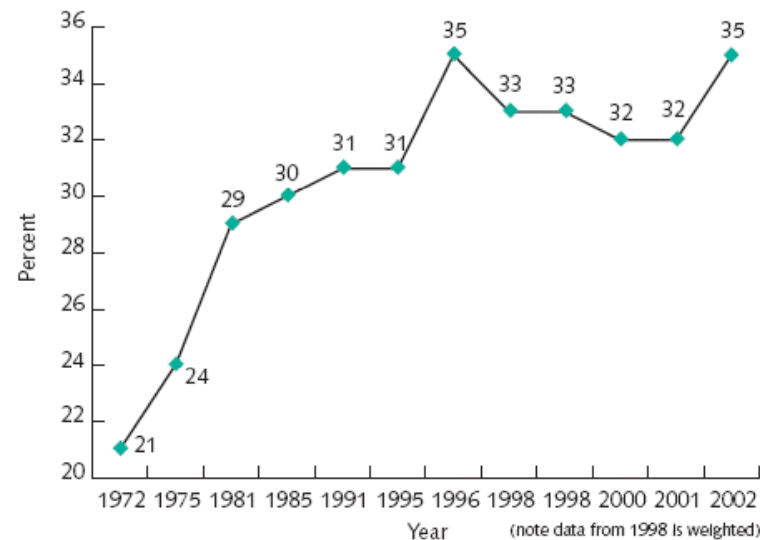
Growth of chronic disease



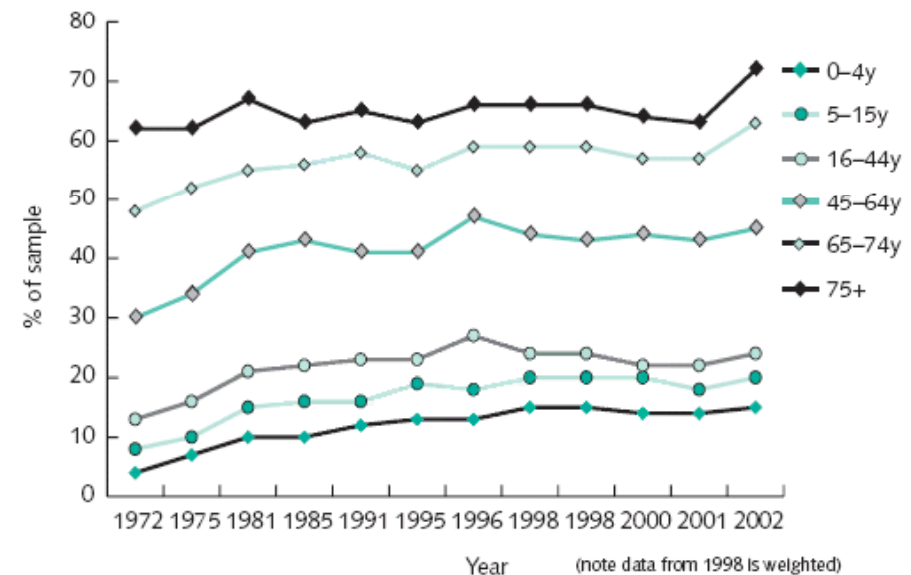
UNIVERSITY OF LEEDS

The number of people with chronic conditions is rising in the UK (Source: General Household Survey 2002)

All people reporting a chronic condition



People reporting a chronic condition (by age)

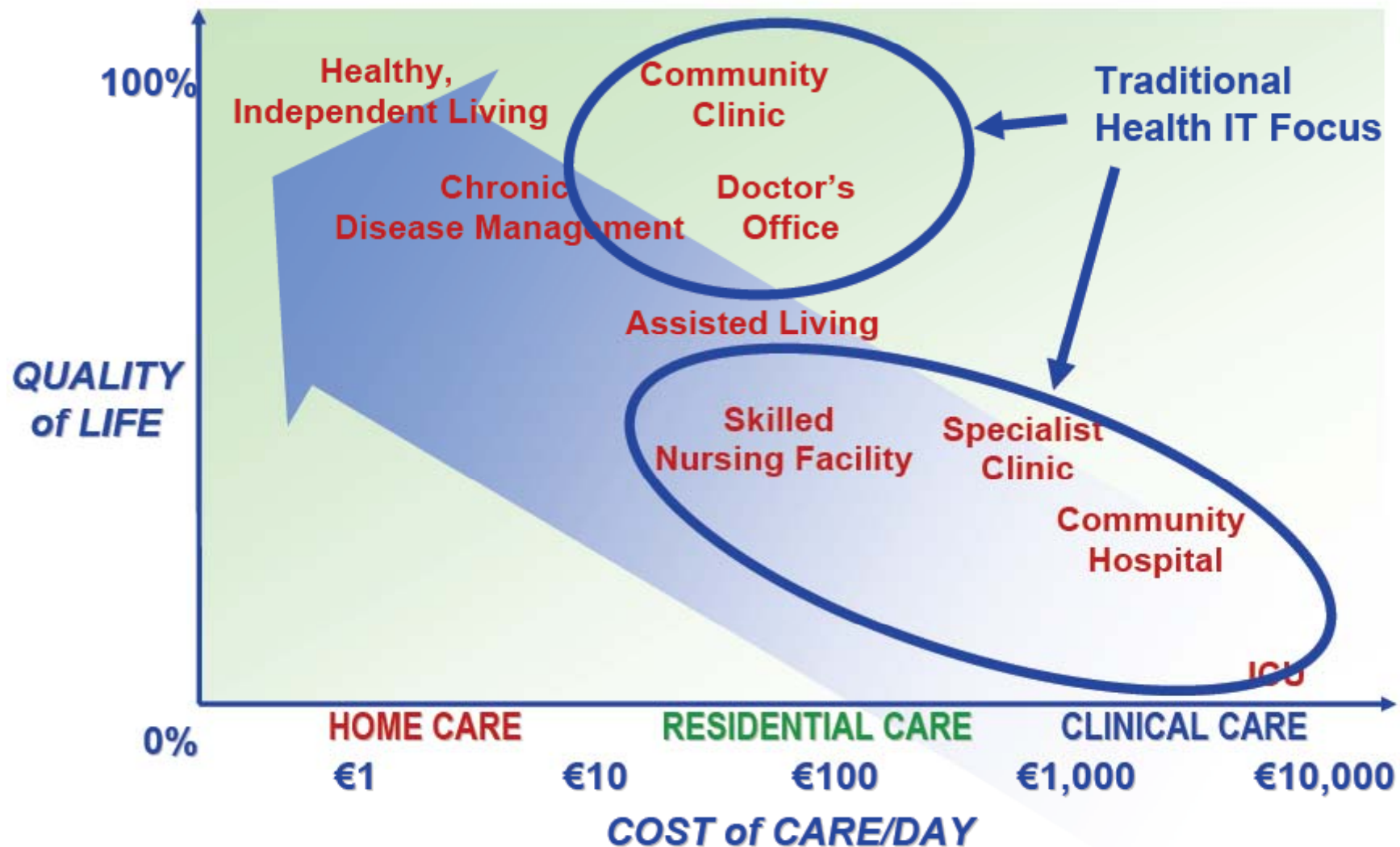


Raising the profile of long term condition care: a compendium of information, January 2008,
http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_082069
accessed 08.10.08

Health and Social Care Costs



Connecting for Health



Problems that m-health can/could solve



UNIVERSITY OF LEEDS

Mobility of doctors and allied health professionals

- Ward rounds link back to central information base
- Community nurses/physiotherapists/occupational therapists

Mobility of patients

- Personal health monitoring

Mobility of information

- Developing countries
- Telesurgery



The risk is in developing m-health applications which require changes to healthcare delivery

- Mobility of doctors – natural progression
- Mobility of patients – new concept
- Mobility of information – natural progression

Key features



UNIVERSITY OF LEEDS

Physiological sensors – blood pressure, blood glucose, temperature, movement, ECG etc.

Portability – pocket/hand bag, wearable.

‘Local’ hub (for PAN) – mobile device, home hub, PC/laptop

Connectivity to public and private networks – security, trust, prioritisation

Usability – user familiarity, open OS, intuitive interaction design

Efficient/economic power consumption

Call centre support – technical and clinical

Trusted – use consumer devices (mobile phone, TV, laptop), linked to recognised healthcare provider

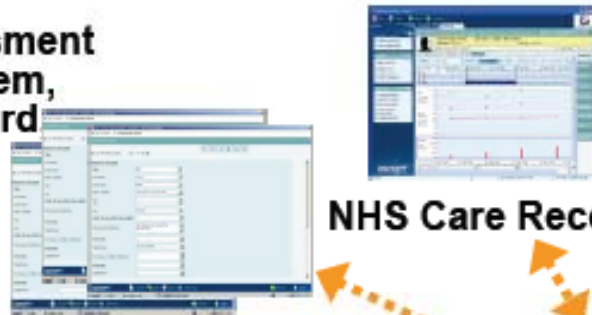
Fully integrated package provided to users – patients, clinical professionals, family/friends

Connected Care



Connecting for Health

Single Assessment Protocol System,
Housing Record
Social Care Record



NHS Care Record



NHS Direct



Care Professionals



Carer



Care Response Service
Warden etc

Elderly living independently



Cholesterol Monitor

Blood-pressure Cuff

Pedometer

Glucose Sensor

Sensor networks

Medication Tracking

Home Hub Appliance

Home Automation
Security Wireless Network

- Lights
- Doors windows
- Motion / Activity
- Bed
- Drawers
- Kitchen
- Bathroom



e.g. Text alerts



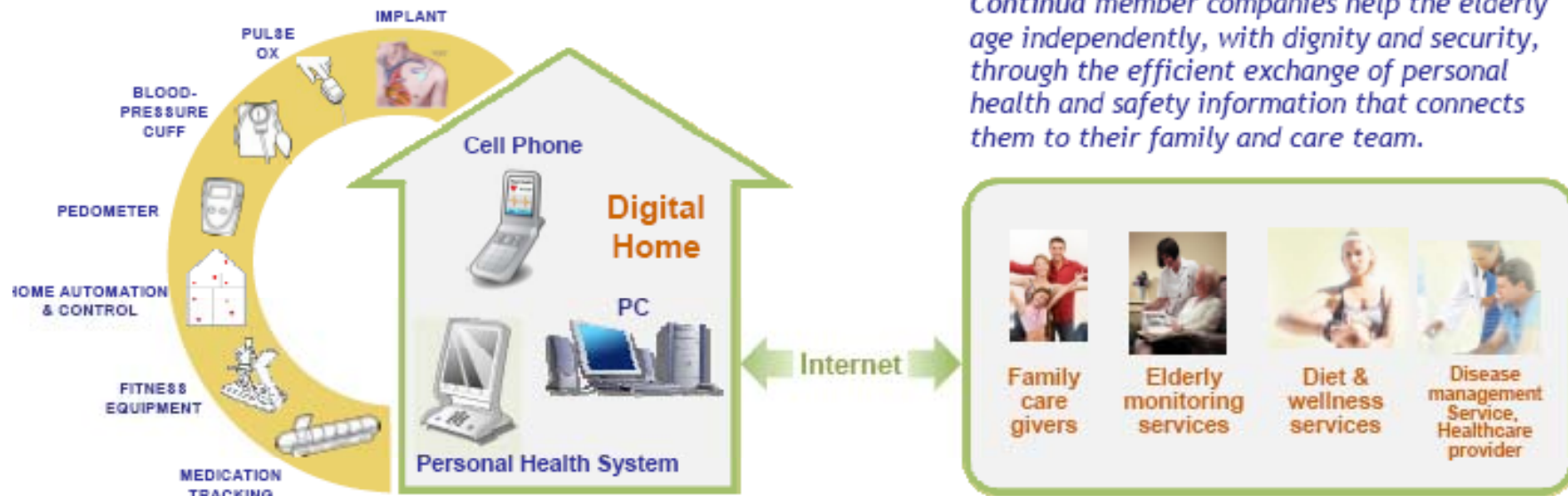
Family, friends and volunteers

Emergency Services

E-health system



UNIVERSITY OF LEEDS



Continua member companies help the elderly age independently, with dignity and security, through the efficient exchange of personal health and safety information that connects them to their family and care team.

Continua Alliance – Overview presentation

http://www.continuaalliance.org/about/Continua_Overview_Presentation_v9.0.pdf

Accessed 13.10.08

Overview of opportunities



UNIVERSITY OF LEEDS

Tomorrow's Wireless World – OFCOM (Office of Communications), UK. www.ofcom.org.uk

Research report on future developments, infrastructure, underpinning macroeconomic trends and demand for communications services.

- Healthcare one of two key sectors

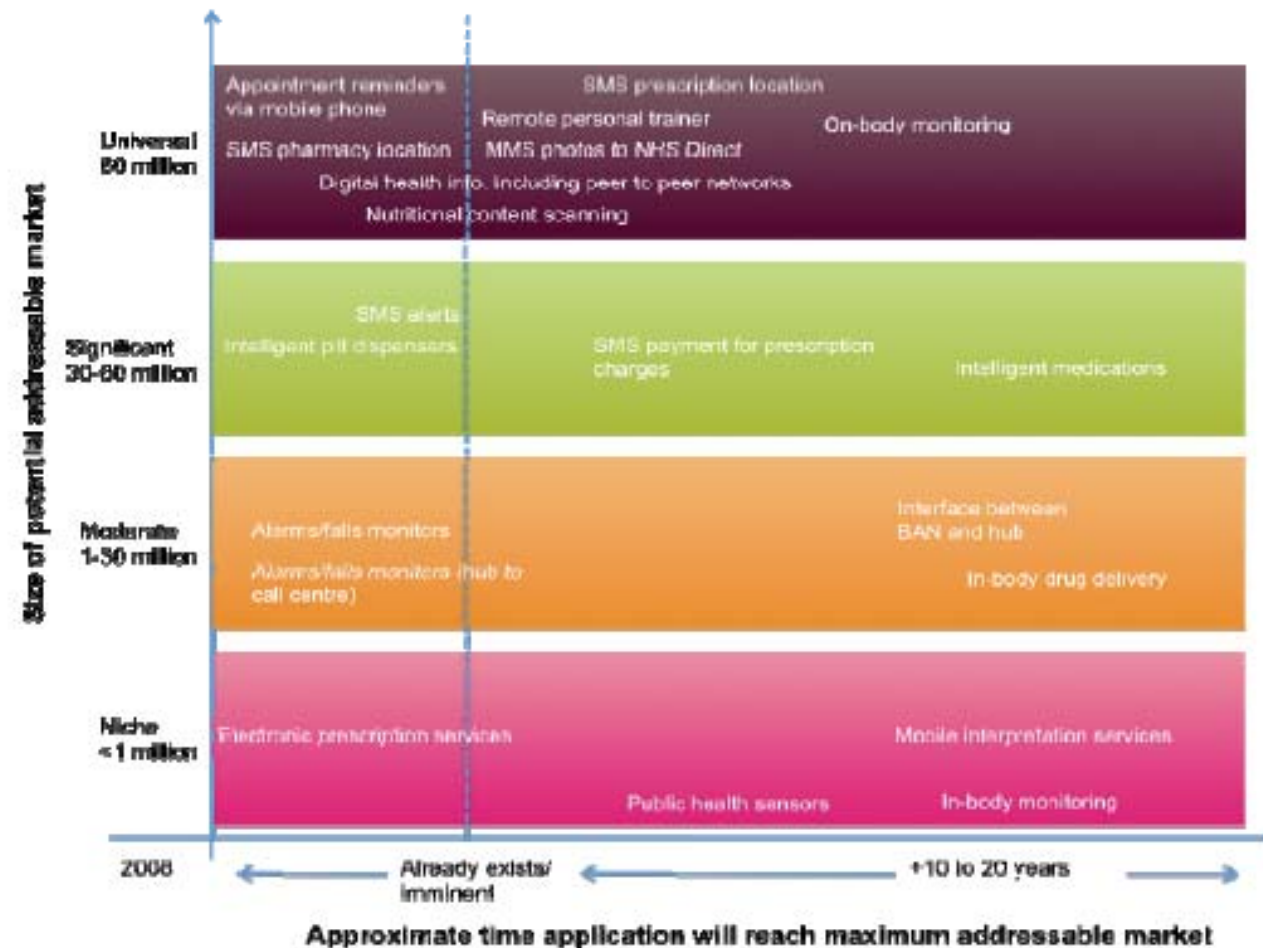
The following 4 slides are taken from this report.

Mobile health applications



UNIVERSITY OF LEEDS

Figure 2: Applications at the level of the individual (applications that could be used anywhere, e.g. at home, in the hospital, in an ambulance or “out of home”)

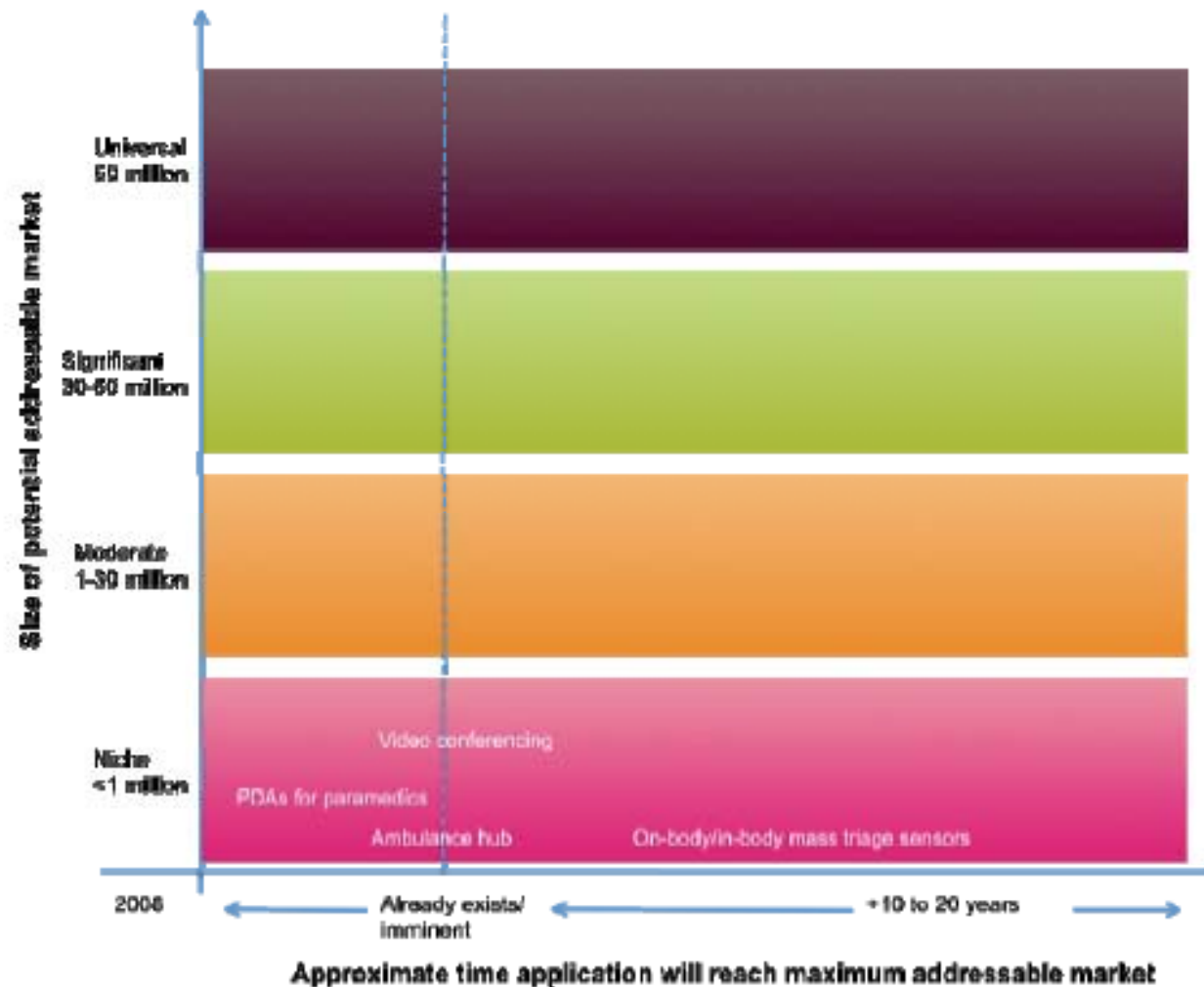


Emergency care applications



UNIVERSITY OF LEEDS

Figure 3: Applications in the ambulance

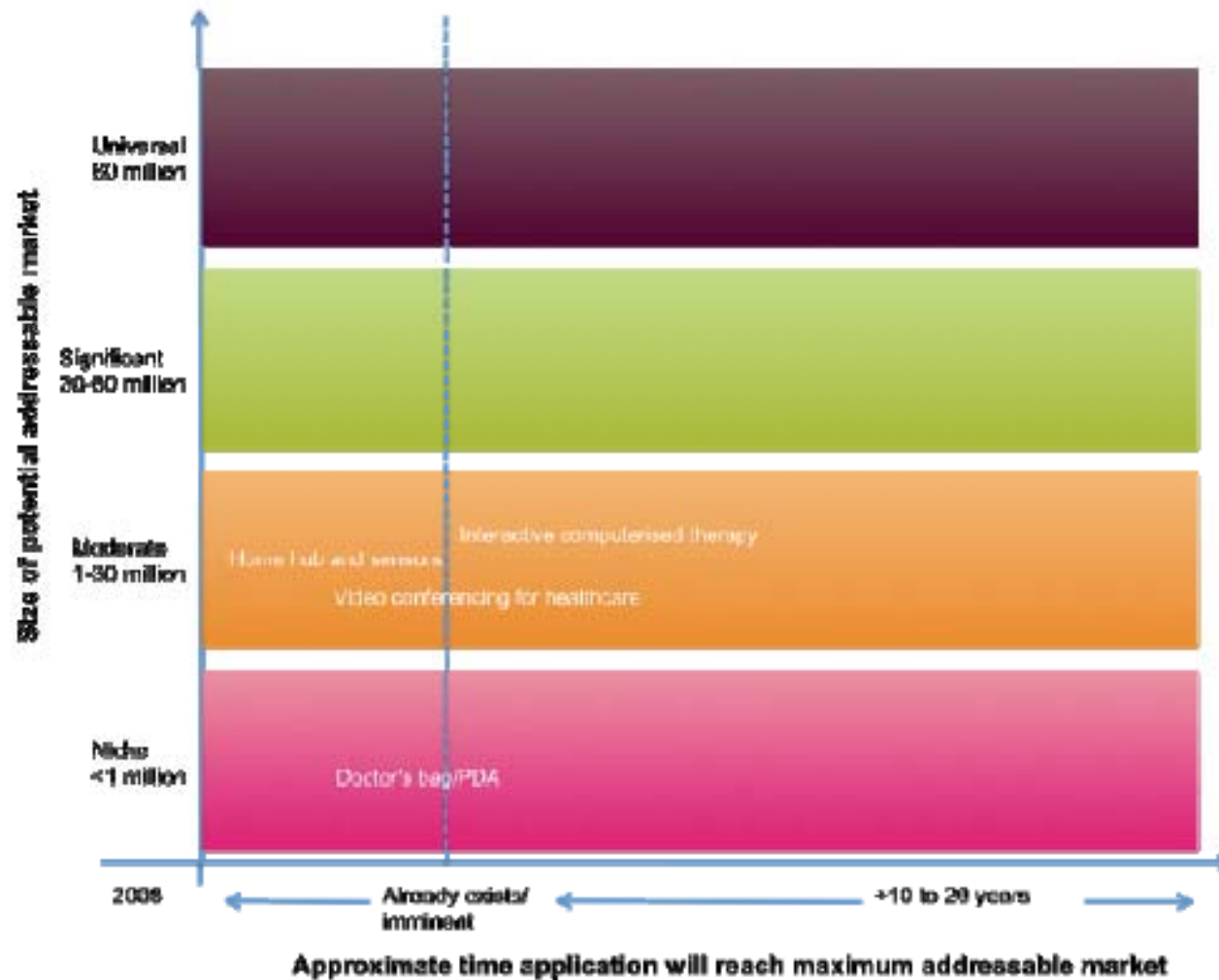


Home health applications



UNIVERSITY OF LEEDS

Figure 4: Applications in the home

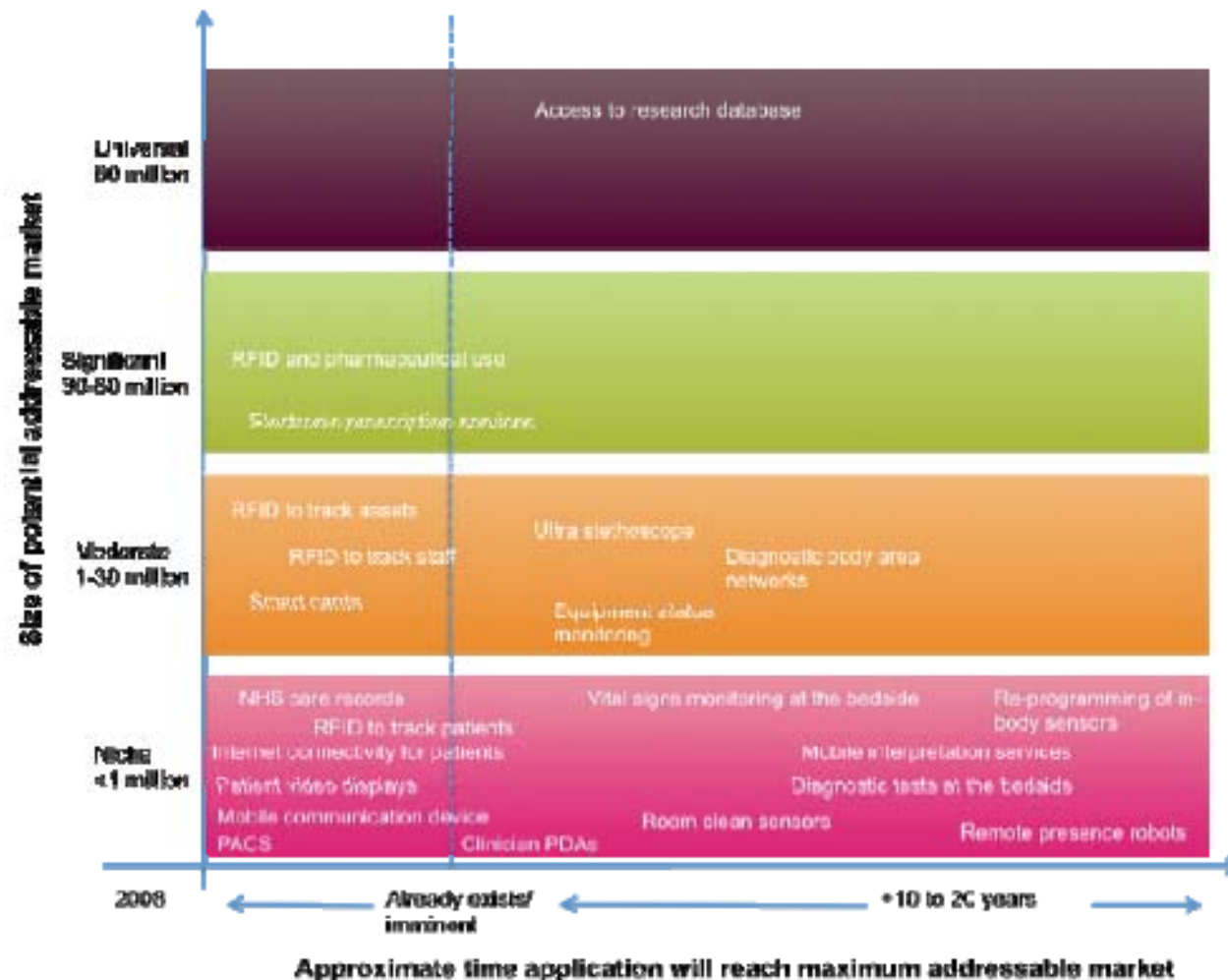


Healthcare provider applications



UNIVERSITY OF LEEDS

Figure 5: Applications within the hospital or GP surgery setting



Mobile health end-user scenarios



Daniel, 37 and Jane, 35.

Working couple: they work hard and play hard. They are keen to optimise their nutrition and physical activities to have a balanced diet, stay fit and control their weight. They are both members of a local gym and like to keep up to date with the latest technologies. They have limited time and each want to optimise their diet and fitness regime for their own personal physique. **M-health** produces a detailed nutrients and calories intake report from their manual input and generates their preferred internet grocery shopping list and optimal regime of exercise. At the end of each day, they can obtain an updated report and modified programme for the next day.

Rachel, 55

Rachel has been admitted to hospital three times this year with acute exacerbation of COPD. After a few days she is better, but once she gets home she does not know what to do to stop it happening again. Rachel was told to stay active but her breathlessness scares her and she does not want to do anything active for fear of becoming breathless. The pulmonary rehabilitation classes she went to were great, but she does not feel that she can carry on exercising on her own. With **M-health** she is given exercises by the physiotherapist to do at home every day. The **M-health** phone tells her if she is ok to continue or not, so Rachel feels safe exercising. The data are reviewed by her physiotherapist and consultant on a regular basis and they update her exercise programme accordingly. Rachel feels like she is well supported and safe without having to go to hospital.



Arthur, 72. Elderly diabetic patient: he has diabetes and uses **M-health** to monitor his glucose levels, record insulin doses and optimise his diet. Sensors automatically transfer information from his drug delivery injector and from the glucometer (wireless). The data is uploaded to his doctor at the end of each day. If recordings go outside a particular range, an alert is sent and the doctor will need to take action. Otherwise the doctor reviews the chart on a weekly basis and makes appropriate adjustments to Arthur's insulin treatment, diet and exercise programme regime. This information – and any emergency actions – is communicated to Arthur's health visitor, emergency call centre (if necessary) and also his son. The health visitor explains any changes to Arthur and advises of follow up / technical aspects.



Some current applications



UNIVERSITY OF LEEDS

Many technology led companies

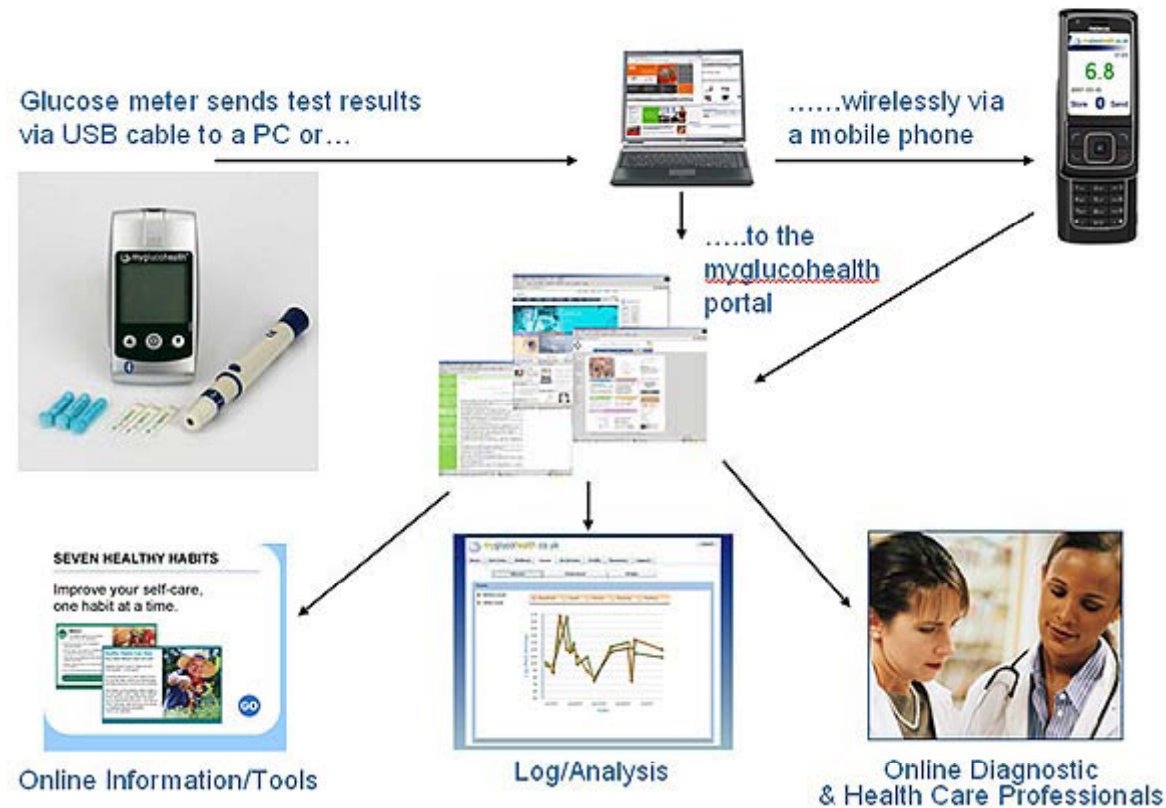
All offer some, but not all, of key features

Standardisation and adoption issues

Diabetes monitoring I



UNIVERSITY OF LEEDS



Myglucohealth <http://www.myglucohealth.net/index.asp>

T plus medical

<http://www.tplusmedical.co.uk>

System pack – data collection via user manual entry, graphical feedback, link to website, nurse information service, quarterly postal summary. £140/year

Self-diagnostic devices – bluetooth transfer available only for glucose meter £70. Other devices (peak flow meter, weighing scales, blood pressure meter, pulse oximeter) between £8 and £150.





Telcomed

<http://www.telcomed.ie/index.html>

WristClinic – wireless link to heart rate, heart rhythm, blood glucose, blood pressure, weight, temperature. Panic button

Stores 4 previous readings. Transmit to either landline hub or USB transceiver.

Monitoring web software and call centre.



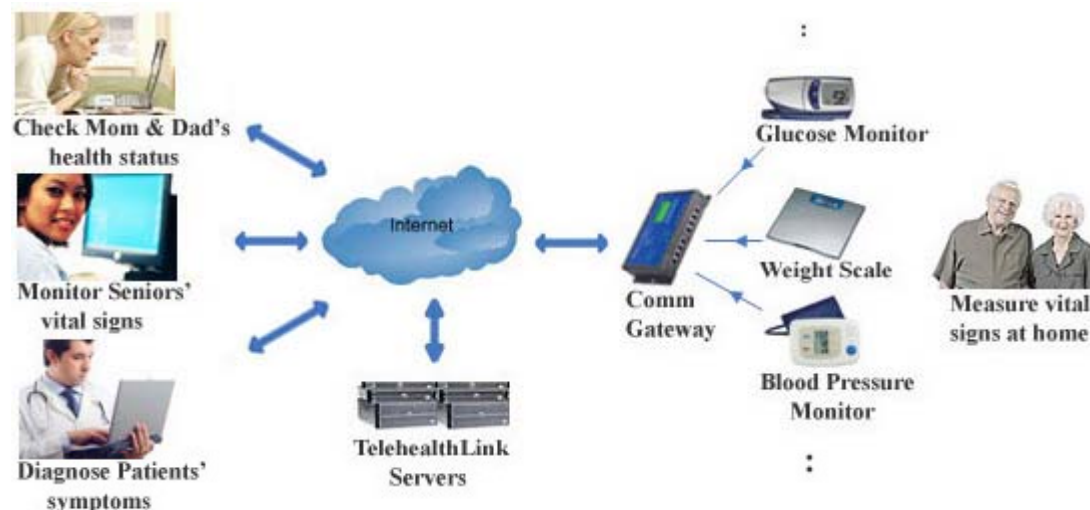
Vital signs II



UNIVERSITY OF LEEDS

TelehealthLink™ connects to personal health monitoring devices such as blood pressure monitors, weight scales, glucose monitors, pulse oximeter, or any monitoring devices with RS232/RS422/RS485/USB/Bluetooth protocols. The measurements are automatically transmitted to TelehealthLink servers via Internet by wire or wireless connections.

<http://www.telehealthlink.com/Telehealth/home.aspx>





Medic4All

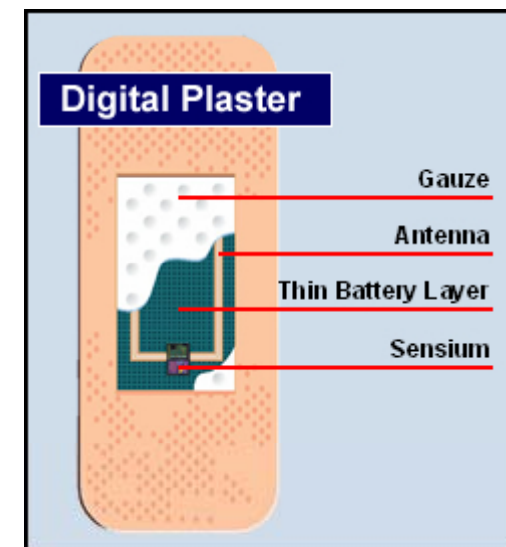
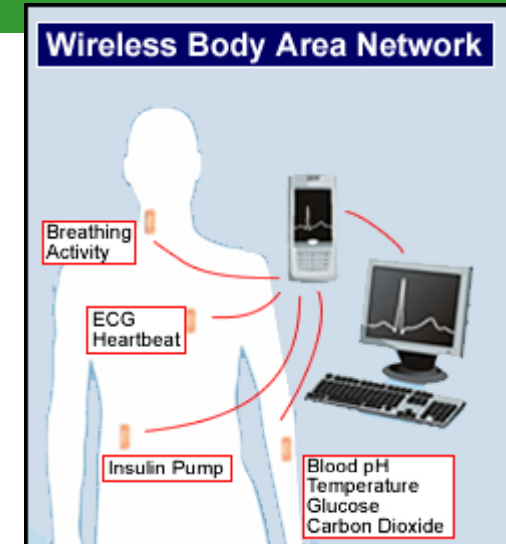
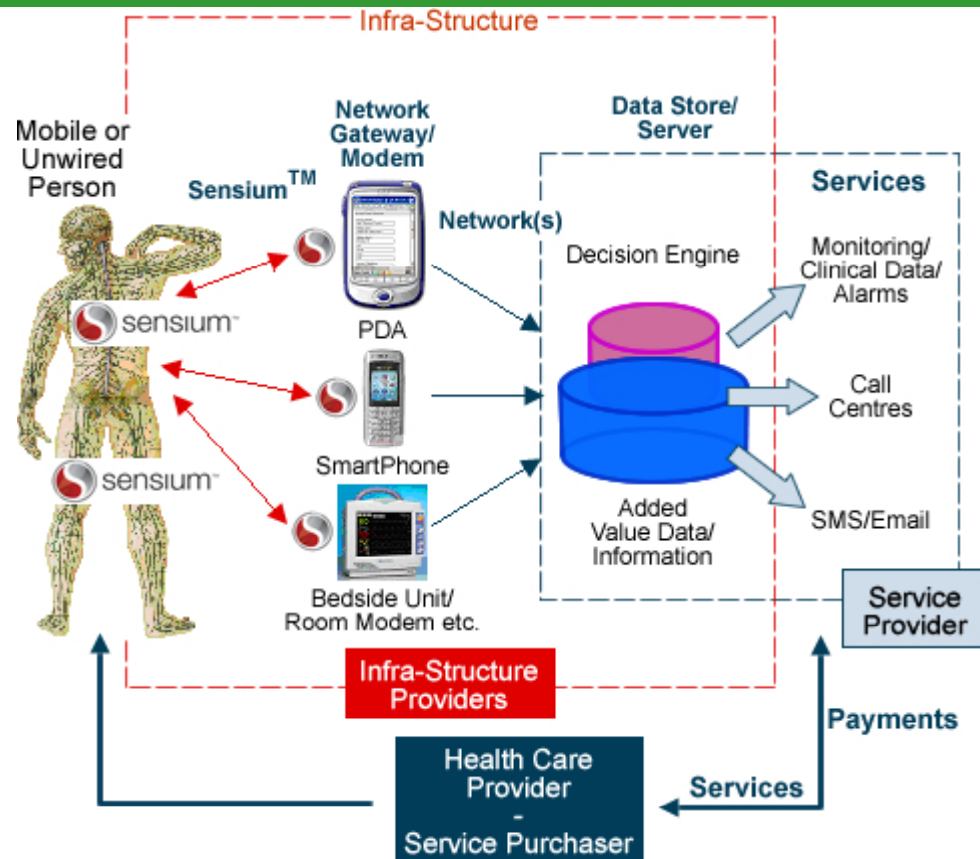
<http://www.medic4all-services.com/>

Aimed at travellers – range of service including personal health record, access to remote network of doctors, translation service between patient, local doctor and remote doctor speaking patient's own language.





Novel sensor technology



Toumaz – innovative sensors for personal area networks

<http://www.toumaz.com/index.htm>

AMD Telemedicine

<http://www.amdtelemedicine.com/index.cfm>

Range of mobile and networked medical instruments for use by doctors

Ultrasound laptop



Information sharing in developing countries



UNIVERSITY OF LEEDS

<http://web20.telecomtv.com/pages/?id=e9381817-0593-417a-8639-c4c53e2a2a10&vidid=3236&view=video&page=1>

Rwanda – Mobile Planet – use of mobile phones to combat HIV/AIDS

In 1994, the small African country of Rwanda was devastated by tribal genocide. Today, over 300,000 people live with HIV/AIDS in the country. But providing healthcare and education requires good communications. The government has recognised the ability of mobile phones to connect its network of hospitals and clinics, and has created TRACnet; an innovative scheme to help with the treatment and prevention of AIDS.



Technical barriers



UNIVERSITY OF LEEDS

Quality and availability of mobile devices

Non standard operating systems

Non standard user interaction

Cost and availability

Poor network coverage in rural areas

Design limitations – mobility means small size!



Continua Alliance

http://www.continuaalliance.org/about/vision_video/

A non-profit, open industry alliance of the finest healthcare and technology companies in the world joining together in collaboration to improve the quality of personal healthcare

“Our Mission is to establish an eco-system of interoperable personal health systems that empower people & organizations to better manage their health and wellness”

Standards for device connectivity (Bluetooth, USB), healthcare records, personal area networks.

Sharing of source code between members

Continua product certification



Complexities of healthcare customers

- Multiple stakeholder decision making process
- Opaque cost accounting methods
- Highly regulated (Medical Devices Directive for products, NICE (in UK) for clinical procedures)

Consumer health market immature

- Influenced/specified by mainstream market

Lengthy, expensive product development cycle.



Interoperability of devices – Continua

- Data transmission (Bluetooth, other)
- Open source code

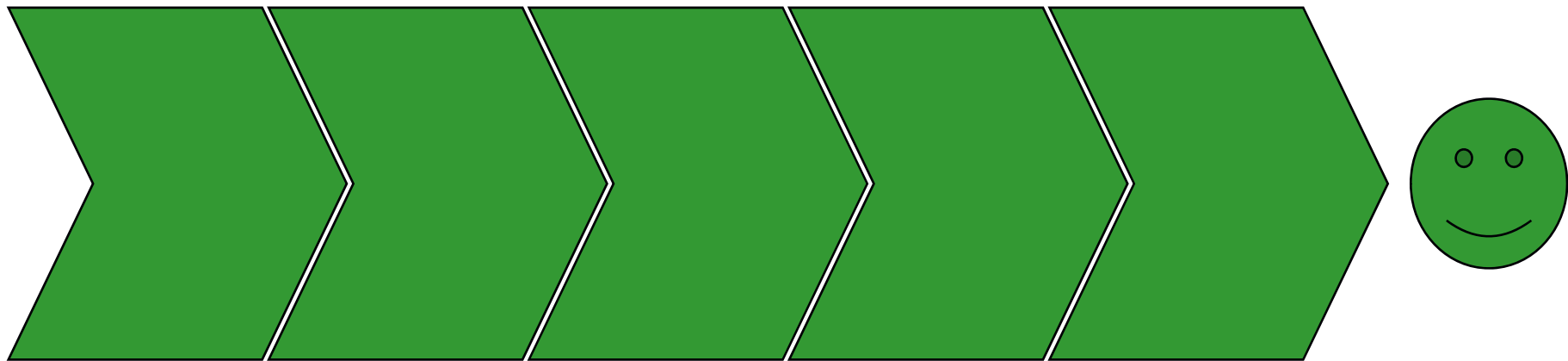
Need for dedicated spectrum (OFCOM)?

- CEPT allocation for medical implants (402-405MHz)
- CEPT allocation for social alarms
- Possible requirement for critical telemetry data.

Mobile and e-Health Value Chain



UNIVERSITY OF LEEDS



Monitoring device(s) manufacturer

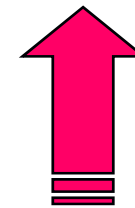
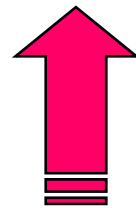
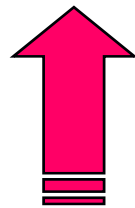
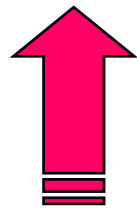
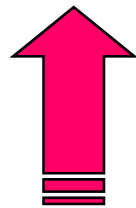
'Hub' hardware and software manufacturer

Application integrator

Network provider

Healthcare deliverer or support service

End user



Medical devices regulatory system

Network communications regulations

Healthcare delivery protocols



Existing products have business models across the value chain – sustainable?

Successful examples exist in related areas – eg. home care with fixed line and fixed equipment (and fixed people)

New alliances may be necessary for further progress

Conclusion



UNIVERSITY OF LEEDS

Many opportunities exist for mobile health applications

- Mobility of doctors/nurses
- Mobility of patients
- Mobility of information

The technology is largely available today.

Predictions are that mobile health will become mainstream within next 10 years.

This will require

- Standards development
- Favourable regulatory environment
- New business models.