The Future of eHealth and Telemedicine: Global Health over Satellite - GHOS

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„Telemedicine via Satellite“, DLR Workshop, 17. of November 2004, Bonn, Germany
Why Global Health Care?

To move from
patient care and disease management


towards

prophylactic services for healthy citizens

from

„mens sana in corpore sano“
- in a healthy body healthy mind -

towards

„corpus sanum per mente sana“
- healthy body through a healthy mind -
eHealth and Telemedicine today

- **USER INTERFACE**
- **INFORMATION**
  - Internet / Interactive TV
  - mobile / stationary
- **SENSOR DATA**
  - Body Area Networks
  - Biochips, Nanotechnology

- **SERVICE**
  - Interconnectivity for Healthc. Services
  - Services for the Citizens
  - Healthcare at Home
  - Mobility
  - Management of Trauma, Emergency & Disaster
  - Health Early Warning for Env.Risk
  - e-Health Education

- **COMMUNICATION NETWORK**
  - Satcom
  - Wireless / Wired Local Access
# THE WORLD OF MEDICAL MONEY

## Total health expenditure/capita

<table>
<thead>
<tr>
<th>Country</th>
<th>Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>$3,724</td>
</tr>
<tr>
<td>Germany</td>
<td>$2,952</td>
</tr>
<tr>
<td>Japan</td>
<td>$1,759</td>
</tr>
<tr>
<td>Czech Rep.</td>
<td>$640</td>
</tr>
<tr>
<td>South Africa</td>
<td>$396</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>$130</td>
</tr>
<tr>
<td>Congo</td>
<td>$22</td>
</tr>
</tbody>
</table>

*Source: MedSMART 2003*
Real Time Telemedicine
Telementoring and Telemanipulation

⇒ Staging laparoscopy in cyber space OP 2000

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TECHNOLOGY FOR........? NOT QUITE...

⇒ Source: MedSMART 2003
Bridging the Digital Divide of the World

- Application centers for new treatments
- Remote treatment of patients
- Training centers and use of new medical devices from distance
- Centers of distributed medical intelligency
- Integration of medical competence
SICONET –
Stereoscopic Image Communication Network
(Satellite link with 34 Mbit/sec)
Deutsche Telekom-funded:

PANORAMA (1997 – 1999)
EU funded: Co-ordinator Siemens (D)
Terrestrial and Satellite based Network for
Telemedical Applications
(2 Mbit/sec)
EU-funded: Co-ordinator Eutelsat (F) (1999 – 2000)
MEDASHIP Satellite Network

*EU-funded: Co-ordinator D’Appolonia (I) (2002 – 2003)*
EMISPHER

Bridging the Digital Divide

Lessons from the applications

Different protocols

- Security
- Firewall
- Language
- Law
Realised by the year 2008 (EU)

• Electronic Health Records
• Electronic Health Insurance Cards
• Europe-wide patient identifiers
• Interoperability of the various cards, etc.
• Medical eLearning for health professionals
• Harmonisation of reimbursement and liability issues
• European Public Health Portal for citizens

⇒ Creation of an European eHealth Area
Why Global Health Care?

**Needs and Demands:**

- Dedicated 24/7 Telemedicine and eHealth services
- Reliable and high Quality of Service (QoS)
- Open source / open standards for interoperability & integration
- Gateways to other communication networks
- Enhanced Telediagnosis by remote control of medical devices
- Re-evaluation of medical workflow and decision-making tree
- New management tools & strategies for global virtual alliances
- Mental / intellectual / educational e-services for citizens
Why Global Health over Satellite?

- Communication platform with global coverage
- Interactive multimodal and multimedia communications
- Point-to-point and multipoint communications
- Meshed topology
- Tools and services for health professionals and authorities
- Personalised health systems for patients and citizens
GHOS: from Telemedicine towards Telepresence

Status quo of Telemedicine

- patient data transfer
- patient administration & management
- patient monitoring
- consultation

⇒ interaction with patient's data per se

Medical Telepresence

- live interaction - telemanipulation & telerobotics
- haptic telesensation
- telementoring & teleteaching

⇒ site-independent access to best medical expertise
GHOS: New elements to be developed

- Dedicated Network Control Centres for high and reliable QoS
- Intelligent data mining tools
- Health GRID computing infrastructure
- Modular personal Health monitoring systems with integrated micro-sensory and micro-acting elements
- Harmonisation of relevant legislation and regulations
- Personalised avatars for Assisted Cognition
- Multilingual support
- Virtual Euro-Mediterranean Hospital Infrastructure
Background of VEMH: Virtual Euro Mediterranean Hospital

- Telemedicine aims at equal access to medical resources for everyone at any time and anywhere

- Digital divide: ICT amplifies disparity in quality of life

⇒ Need for real integration of ICT platforms and telemedical services
Services of VEMH

• Euro-Mediterranean Medical University
  improved qualification by exchange and standardization
  of educational modules
• Real-time Telemedicine
  improved quality of patient care and qualification of staff
• Medical assistance
  improved continuity of care to stimulate tourism
• Implementation of Evidence-based medicine
  improved disease management and individual therapies
• Fellowship programmes for young professionals
  improved qualifications in multi-cultural and inter-disciplinary
  settings
VEMH - Real Time Telemedicine

Slide Scanner

Laboratory

Tissue probe

Diagnosis

Tumor patient in Casablanca

Expert in Paris

Expert in Berlin

Expert in Cairo
GRID for VEMH

• Medical Services need higher computing capabilities
• Grid is a suitable approach to realize Medical Services
• Existing Grid approaches are not sufficient for developing Medical Services
• The idea behind the Euro-Mediterranean Virtual Hospital is to provide citizens with sufficient Medical Services in every place
• Medical Services have to be useable via divert devices and networks, that means seamless
The Future

FORWARD LINK: 64 kbps -2 Mbps

RETURN LINK: 64 kbps -2 Mbps

⇒ Combination of different Networks

Costs

1 € per 1 minute via satellite for 2MBit/s

Security
Fire wall

Point to point

Point to multipoint

Multicasting

Broadcasting

UDP vs. TCP

Contributer network

Distributor network

DSL

Optical

Wireless

Home care

LAN

HOSPITAL C

Home care

LAN

HOSPITAL B

Home care

GHOS

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Challenges & Opportunities of GHOS

• Raising awareness and consolidation of the demand
• Development of economic models for sustainable services
• To move from curative to preservative tourism
• To account for ethical and privacy aspects:
  - Is health a human right or a social duty?
  - Freedom is the comprehension of necessity!

⇒ To prepare for Mars ............