Disaster Emergency Medicine - Experience from DELTASS Project

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What is Charité?

• Largest university hospital in Europe:
  – 3,500 beds in 115 clinics and institutes
  – ~125,000 inpatients, ~390,000 outpatients yearly

• 12,400 employees, including 3,232 scientists

• 8,900 students

• State-of-the-art business enterprise:
  – 810 million € annual budget, including
  – 253 million € for research and education

http://www.op2000.eu
eHealth and Telemedicine today

**USER INTERFACE**
- Interconnectivity for Healthcare Services

**INFORMATION**
- Internet / Interactive TV mobile / stationary

**SENSOR DATA**
- Body Area Networks
- Biochips, Nanotechnology

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

**COMMUNICATION NETWORK**
- Wireless / Wired Local Access
- Satcom

[Images and logos: ESA, OP 2000, SRU OP 2000, RRK am MDC, Charité, Berlin]
**THE WORLD OF MEDICAL MONEY**

**Total health expenditure/capita**

<table>
<thead>
<tr>
<th>Country</th>
<th>Amount (USD)</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>
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<tr>
<td>Zimbabwe</td>
<td>$130</td>
</tr>
<tr>
<td>Congo</td>
<td>$22</td>
</tr>
</tbody>
</table>

*Source: MedSMART, USA*
Networks for interactive medical Teleapplications
VH for Bridging the Digital Divide

格尔诺斯
通用高级低成本跨欧洲卫星网络
项目在欧盟的支持下进行

DELTASS
灾难紧急后勤远程医疗先进卫星系统

SRU OP 2000, RRK am MDC, Charité, Berlin
WinVicos

Wavelet-based interactive Video communication system

• Sophisticated medical telecommunication software
• Advantages of intelligent wavelet transform compression
• For archiving and transmission of medical images
• Meets the heterogeneous requirements
  (scalable resolution and transmission rate)
Satellite Communication in OP 2000, Charité
**DELTASS**

Disaster Emergency Logistic Telemedicine

Advanced Satellites Systems

*ESA-funded; National Centre for Space Studies, CNES (F); Institute for space-medicine, MEDES (F); European Aeronautic Defence and Space Company, EADS: EADS-MS&I (F); Alcatel Space Industries (F); SPACEBEL (B); EADS – Dornier Mobile Systems (MOSYS) (D);*

- Breakdown of terrestrial telecom infrastructure
- Satellite communication: easy, at all spots, cost-effective
- WoTeSa / WinVicos for telemedical communication
- Mobile Field Hospital MFH (at the disaster area)
- Reference Hospital RH (outside disaster area)
Note:

- Disaster emergencies: ~40% more amputations (!!!)
- Live second opinioning: Reduction of unneeded interventions (???), e.g. costs reduction (?)

Interactive Services provided:

- Teleconsultation and Telesonography during triage
- Teleconsultation in the Operating Room (OR)
- Interactive Virtual Reality Simulations in the OR
- Interactive Telemicrobiology
- Internet Access & Consultation of External Data Bases
The Situation?

Disaster emergencies, (fires, earthquakes, floodings, explosions, war, etc.) occur mostly unexpectedly and the disaster site is hard to predict. Most of the times a large number of persons get injured and need medical treatment. At the disaster site the terrestrial communication infrastructure is often severely damaged, cellular phone networks risk to suffer capacity overload and satellite-based phones allow only for a limited bandwidth.
In case of disaster emergencies various (international) organisations (e.g. Red Cross, other humanitarian organisations, etc.) start rescue and support measures, not only for rescue and medical treatment of victims/patients, but also to support and guide panicked victims and to provide subsistence support.
The Situation?

Problems occurring in the first phase of this process are the lack of information on size and kind of the disaster, number of victims, kind of injuries, status of the functionality of the infrastructure, etc. The major factor, however, that limits efficacy and efficiency of these measures is the lack of coordination between the various teams involved in Search and Rescue (SAR), First Aid Medical teams (FAM), ambulances, Triage, etc.. However, as complete deployment of the MFH can take as long as 6-24 hours, the critical first hours of the rescue measures suffer from a severe lack of coordination and information flow.
DELTASS — Interactive Telemedical Services

Disaster Emergency Logistic Telemedicine Advanced Satellites System

Inmarsat
Globalstar
GPS
Mobile Field Hospital
Eutelsat
Mobile Teams
Reference Hospital
Gateway
Permanent Center

DELTASS

SRU OP 2000, RRK am MDC, Charité, Berlin
DELTA\textsc{S}

WoTeSa-WinVicos and Joystick for VR-simulations

Tele-Ultrasound medical device
Central Control Unit OP 2000 (CCU)

Remote-controlled microscope for microbiological and pathological examinations

SRU OP 2000, RRK am MDC, Charité, Berlin
Teleconsultation in the Operating Room

Inguinal Hernia

Fracture talocalcanean joint
Teleconsultation and Telesonography during triage
Interactive Virtual Reality Simulations in the OR

SRU OP 2000, RRK am MDC, Charité, Berlin
Remote-controlled camera integrated in the OR-light
Interactive Telemicrobiology
Technology of Interacting

Project FAME

FRANCE

6,500 km

USA
Integration of Means

Simulators

Displays

Virtual Reality

Advanced Telecomms

Medical Command Centres
The Future

FORWARD LINK: 64 kbps - 2 Mbps

RETURN LINK: 64 kbps - 2 Mbps

Combination of different Networks