Perspectives on Telemedicine

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Agenda

- History of telemedical applications
- Challenges of network architecture
- Examples for Teleneuroradiology
- Example for Telepathology
- Example for an integrated telemedical project
- Take Home
History of telemedical applications

- DICOM (Digital Imaging and Communications in Medicine) Standard.
- Upcoming network solutions (Satellite, ISDN (Integrated Services Digital Network)).
- HR Monitor displays.

Network architecture

Data Package

Server → Long distance transfer → Server
Process can take 250ms or more, so that 4 packages/sec can be transferred only.
Network architecture

Data package can contain several images (data packages) (f.e. 100)

Network architecture

Long distance transfer
Network architecture

Long distance transfer
Bandwidth is used to its maximal capacity
Therefore transfer process is much faster

Network architecture

For video data it is useful to use dedicated lines

Rerouting might be time consuming. It takes some weeks sometimes
Therefore if availability is mandatory at least one backup line is a must
Network architecture

Normal internet can be used for backup

Data package

Server \[\rightarrow\] Server

Capacity is less, but this is a backup only
Rerouting is done automatically in less then a second

Network architecture: Example
Key features of the establishment and operation Teleneuroradiology and Teleradiology concept

Examples for Teleneuroradiology

Stroke Unit Krankenhaus Hofheim located 30km to Frankfurt
Since 2007
500 acute strokes a year
24/7 service
Reaction time less than 30 minutes by contract, 17 min in real
Teleradiology including CT, CTA, MR
720 reports 2011
7% of patients in time window less than 1h
Highest intravenous lysis rate in Hessen
Examples for neuroradiological second opinion

Makhota Hospital
Located in Melakha, 700,000 inhabitants, 150km to KL and 200 km to Singapore
Alle specialties including Neuro, Neurosurgery, ENT, OMF, Oncology, Radiation therapy
25,000 patients a year
28 outpatient office in Indonesia, Malaysia, and Vietnam
Regency Hospital
Located in Joho, 1,000,000 inhabitants, near to Singapore
Alle specialties including Neurosurgery, OMF, Oncology

Both hospitals are depending to HMI listed at Singapore stock exchange

Make it simple:
Second opinion on demand

Easy to establish:
Case based link sent by email makes it possible to upload images and clinical data

Case based:
URL: https://chili.khnw.de/chili/uploadLink.cgi?
TICKET=52d8f8af.d2f00-42186433e2-60d5b527a157fc2-73011&uploadDestination=chili@localhost
Ticket : 605-372-325-2
Valid to: 22.04.2014 10:32

Encrypted connection → data security
Images Upload

Interactive Teleteaching
Telemedicine records

Telepathology

Determined line

High data volume, therefore dedicated line mandatory
Telepathology

Setup of a Neuroscience, Stroke & Rehabilitation Center of Excellence at Jerudong Park Medical Center, Brunei, Darussalam
Objectives of the partnership with Jerudong Park Medical Center (JPMC)

- Establish a basic **Neuroscience Center** at JPMC with the capability to receive and treat patients by July 2010.
- Establish a **Telemedicine process** in place in order to treat patients (and teach doctors) through a larger team in Frankfurt am Main, Germany.
- **Expand and grow** the facilities (infrastructure, staff) after July 2010 to accommodate increase in patients and to carry out more complex treatments.
- Establish a **Resident Exchange and Training Program** to facilitate the education and training of medical personnel from Brunei.
- Create a **Long Term Scientific Cooperation Program** together with JPMC and University of Brunei Darusalaam.

**Project Phases**

- **Soft-Launch** 01.07.2010
- 3 months
- 2-3 years

**End Objectives/Goals**

**Build**

1. 5 Neurology ICUs
2. Stroke Stroke Unit
3. 10-15 beds Normal wards
4. Tele-neuro-cardiology
5. Neurology & stroke unit (with CSF lab., Ultrasound, EEG & Electro physiology)
6. Telemedicine support
7. KHMW trained nurses at JPMC Other support units - neurophysiology & physiotherapy

**Operate**

1. Exchange program for third year students & PhD students
2. Neuro-virological cooperation
3. Train the trainer nursing programs to enable JPMC train its own nurses
4. Continued operation of the tele-radiology & telemedicine services
5. Nursing Exchange Program

**Transfer**

1. Create and share documentation
2. Future plan for training
3. Future plan for telemedicine
4. Certifications
5. Audit processes

**Ongoing Long Term Cooperation**

1. JPMC/KHMW/Heidelberg Agreement
2. Neuro Scientific Co-operation
3. University Exchange
Key features of the Neuroscience and Rehabilitation Centre

• Dedicated Comprehensive Stroke Unit
• Neurological Intensive Care Unit
• General Neurology in-patient ward
• Neurological Rehabilitation Centre
• Telemedicine (Neurology) 24/7 from Germany
• Electrophysiology and Neurosonology laboratories
• Training and exchange program for Residents and Nurses
• Audits & Certifications
• Scientific studies in Stroke Care (epidemiological, acute care, secondary prevention and more)
• Technical consulting & advice
• Implementation of SOPs, protocols and workflows

Key features of Neuroradiology (incl. teleneuroradiology)

• Physical presence in Brunei by certified neuroradiologists implementing protocols and workflow and training of radiological technicians.

• Provide a 24 hours service via Teleneuroradiology/or in Brunei with reaction time from emergency CT/MR examination to neuroradiological qualified English written report within 30 minutes.

• Clinical imaging demonstration sessions offered twice a week by video conference.
Between 2010 and 2012 3472 MR and 1118 CT examinations have been reported.

Transfer of CT examination needed 47sec and of MR examinations 252sec.

Access to images was always possible, while dedicated line was 22 times not available.
Key Features of Nursing and Therapists Program - „To care to teach, to teach to care“

- Creation of handbook “Specialized Neurological Nursing and Create E-Learning-Platform
- Provide facilities and lectures for 2-3 batches, with 8-10 qualified nurses each, in neurology, intensive care unit, the Stroke unit and normal ward station.
- Creation of a specific practical guidance program and supplementary seminars
- Provide certification together with the Association of Neurology of Germany.
- Resident and exchange program (Experiential learning - Small group learning opportunities - One-to-one teaching/ Tutor-System - Personal study - Audit and guidelines)
- Physio-, Logo and Ergo- therapists are trained in FFM, dispatched by KHNW to Brunei.
- Additional consultation in the specific nursing and therapy areas via the Telemedicine portal by qualified staff in nursing, Physio-, Logo and Ergo- therapy areas.

Achieved Milestones
Spreading Stroke Awareness

Importance of awareness and cross-linkage between the hospitals and local doctors in Brunei

Achievements in numbers (as of April 2012)

Patients treated so far at NSRC
13-year old patient
Admission with seizures and fever
On examination: mild leftsided hemiparesis
DD: Herpesencephalitis, media infarction, ADEM, MS

Examples for telemedicine

**JPMC Brunei**
- Residents/MO
- TA/nurses
- Neurophysiology
- CSF/cytology
- Doppler/Duplex

**KHNW Frankfurt**
- Consultants on call (24/7)
- Residents- on call (24/7)
- Teaching
- Result interpretation
  - EEG
  - cytology
  - Clinical practice
  - Neurophysiology
  - INT/Strokemed.
  - Doppler/Duplex
  - Doppler/Duplex
  - CSF/cytology
  - neurophysiology
  - EEG
Krankenhaus Nordwest (KHNW) is a leading German hospital based in Frankfurt am Main

- Treating 50,000 patients p.a.
- Approx. 1000 employees
- 10 medical specialties, 3 research institutes
- Renowned for its Neurology, Radiology, Oncology, and Laboratory Departments
- Academic teaching hospital of Goethe University, Frankfurt am Main.
- Medical and nursing care education in conjunction with Frankfurt University of Applied Sciences
- Leader in dispensing medical advice and opinion to remote locations via telemedicine wherein patients’ conditions can be analyzed and treated from Germany by German experts using the latest technologies
- International experience in using German technology to build, operate and transfer specialist hospitals and/or departments

Krankenhaus Nordwest (KHNW) is especially renowned for its...

**Clinic for Neurology**
- Nationally certified Stroke Unit with treatment of about 1,000 patients/year.
- Professor Meyding-Lamadé is one of the leading experts in neurology in Germany.
- Training center accredited by the German Society for Clinical Neurophysiology
- Certified as a multiple sclerosis center
- Involvement in national and international clinical trials (stroke, multiple sclerosis)

**Central Institute Radiology & Neuroradiology**
- Cross-sectional imaging for stroke diagnosis
- Diagnosis of inflammatory and malignant CNS diseases
- Intensive interdisciplinary cooperation with the Neurological Clinic and the Clinic for Vascular and Thoracic Surgery of the hospital
- MR spectroscopy
- MR perfusion
- CT angiography
- Stent implantation
- Thrombectomy
- Cross-sectional Imaging in Oncology
- Interventional Tumor Therapy e.g. TACE, Microwave Ablation
- All Interventional Recanalisation Procedures in General Radiology
- General Radiology is Key Member of all Tumor Boards and annually certified Tumor and Vascular Centres

**Clinic for Oncology and Hematology**
- Interdisciplinary tumor center, part of the UCT, an academic center of excellence in tumor therapy in the Rhein-Main area.
- Certified as a Leading Center for Oncology by German Cancer Aid.
- Professor Elke Jäger, head of the department, is one of only four German members of the Academy of Tumor Immunology, New York.
- Supported by the department of Radiation Oncology with state of the art treatment.
Offering integrated medical and technical services in one package...

- Krankenhaus Nordwest (KHNW) and MEYTEC, a leading manufacturer and service provider of telemedicine devices, have entered into a cooperation under the name of TELEHOSPITALPARTNER, offering a holistic service package of combined tele-medical and technical services. The rationale of such a cooperation is the attractiveness of delivering systemic and integrated medical and technical services in one package.

- The combined offering includes:

  **Medical Services**
  - Providing 24/7 Neurology, Teleneuroradiology and Teleradiology services from Germany (incl. CT/MRI examinations in emergency cases)
  - Specialist training, exchange programs for Residents, Nurses and Therapists in the field of Neurology

  **Technical Services**
  - Consultancy services in Hospital Management, such as implementing of SOPs, protocols and workflows, executing audits & certifications
  - Advisory, set-up, running and maintenance of the telemedical infrastructure
  - Providing inpatient telemedicine and mobile telemedicine systems, e.g. VIMED® TÉLEDÒC

Take home

- Telemedicine is feasible now, even over long distance
- Proper network architecture is mandatory including backups
- Teleneuroradiology causes no delay even in emergency cases and should include regular demonstration sessions.
- Telemedicine has an impact in neuroradiology, neurology, oncology, radiooncology and pathology
- Especially integrated services containing onsite and telemedicine can achieve highest quality
Thank You!

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