Telemedicine:

Bootstrapping ICT networks and user communities

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Some definitions:

"medicine practised at a distance"

Telemedicine is the use of electronic information and communications technologies to support long-distance clinical health care, patient and professional health-related education, public health and health administration

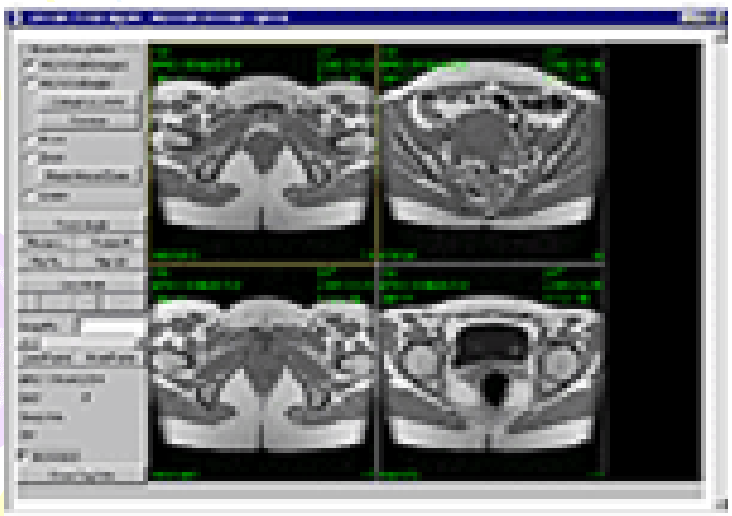
"Telemedisin er: Undersøkelse, overvåkning, behandling og administrasjon av pasienter og personale via systemer som gir umiddelbar tilgang til ekspertise og pasientinformasjon uavhengig av hvor pasienten eller relevant informasjon er geografisk plassert."

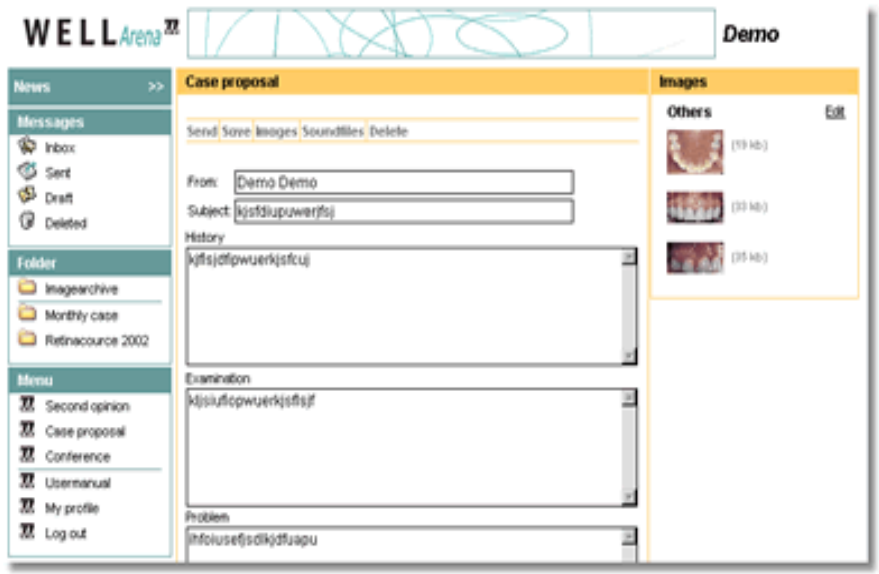
Telemedicine is the use of electronic information and communications technologies to provide and support health care when distance separates the participants

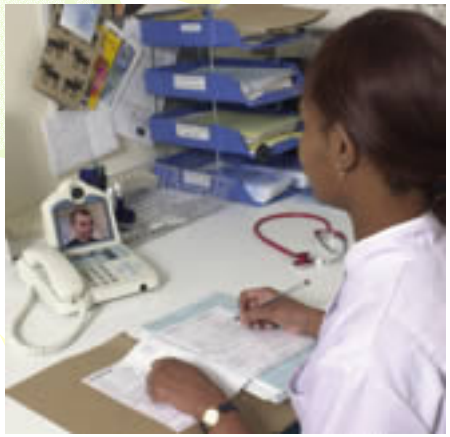
A wide variety of technologies and use areas

Communication between specialists (formal/informal)

(e.g. via ordinary email with attachments or custom-made email software)





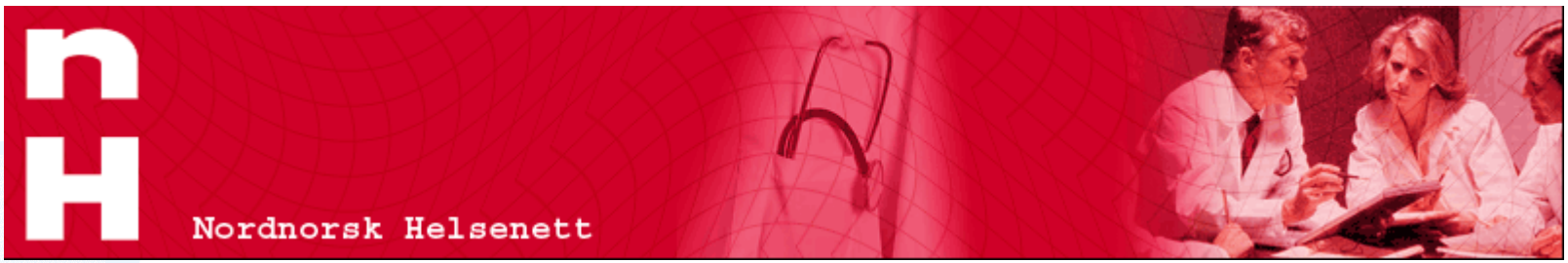


Videotelephones
IP-videoconferencing
ISDN-videoconferencing

Home care services:
Automatic transmission of measurements
Communication services

Equipment for use in examination rooms or operation theatres (video conferencing)

Dedicated health care networks



Velkommen til Nordnorsk Helsenett portalen!

Nordnorsk Helsenett er et lukket datanett for helsepersonell. Hensikten er å kunne kommunisere sensitiv pasientinformasjon slik at personvernet blir ivaretatt. NH portalen er tilgjengelig både utenfra og innenfra helsenettet, og er lansert for åpent å informere og diskutere helsenettets framtid - velkommen skal du være!

Why telemedicine?

- Equal access to high quality services
  - Improved quality of care through knowledge transfer
  - Saving lives in emergencies
  - Reduce burden of travel on patient or ambulating specialist
- Improved screening of patients prior to hospitalisation
  - Reduce number of unecessary referrals
  - Reduce waiting time and resource use

A few examples from NST

- Since 1992 the GP in Alta can have vc consultations with ear-nose-throat specialist in Tromsø
- Troms Military Hospital: No radiologist employed, all x-ray images transmitted to Tromsø
- Automatic transmission of blood sugar measurements of diabetic children as SMS to parents mobile phone and to hospital database (for long-term follow-up)

The development of telemedicine networks and services

- Telemedicine: ”The Land of The Thousand (Dead) Pilots”
- Some success stories, but not yet major dissemination into health care.
- How to go from projects to routine use?
  - ”We need more knowledge from rigorous evaluations on clinical outcome”
  - ”If only the security problem was solved”
  - ”First we need an extensive technical infrastructure”

How to build an information infrastructure?

- A joint infrastructure for many services will involve many technologies, groups of users and use areas:
  - E.g. homecare, emergency medicine, second opinion, routine cooperation
  - Images, sound (heart beats), graphical curves (ECG) etc. etc.
  - Hospital employees, local nursing homes, patients, GP's
- Building an information infrastructure from scratch? Installed base is not technical, rather organisational
  - Current communication: non-existent or non-digital
  - Rigid division of labour, responsibilities, routines

Some important non-technical elements:

- Routines of use (linking telemedicine work with existing work practices: where, when, who?)
- Rules and regulations (clinical responsibility, fear of malpractice suits, is sufficient information transmitted, debate on image quality etc.)
- Reimbursement schemes (asymmetry between costs and benefits)

Implementing telemedicine: An uphill battle

- Scarcity of resources (time, money, people)
- Telemedicine is costly
- Little management support
- (For some use areas): no perceived need
- Health care: little tolerance for disturbances, tests and faults

Today's focus: the dilemma

- Coordinated change from several actors is necessary in order to realise benefits of scale
- We don't manage to enroll the participants before we can prove that they will get benefits
- These benefits can't be realised before actual use by all (many)

- So: How do we reach the "critical mass"?
- 3 cases with varying strategies

(Mainly based on the 'Bootstrapping' paper)

Electronic message exchange

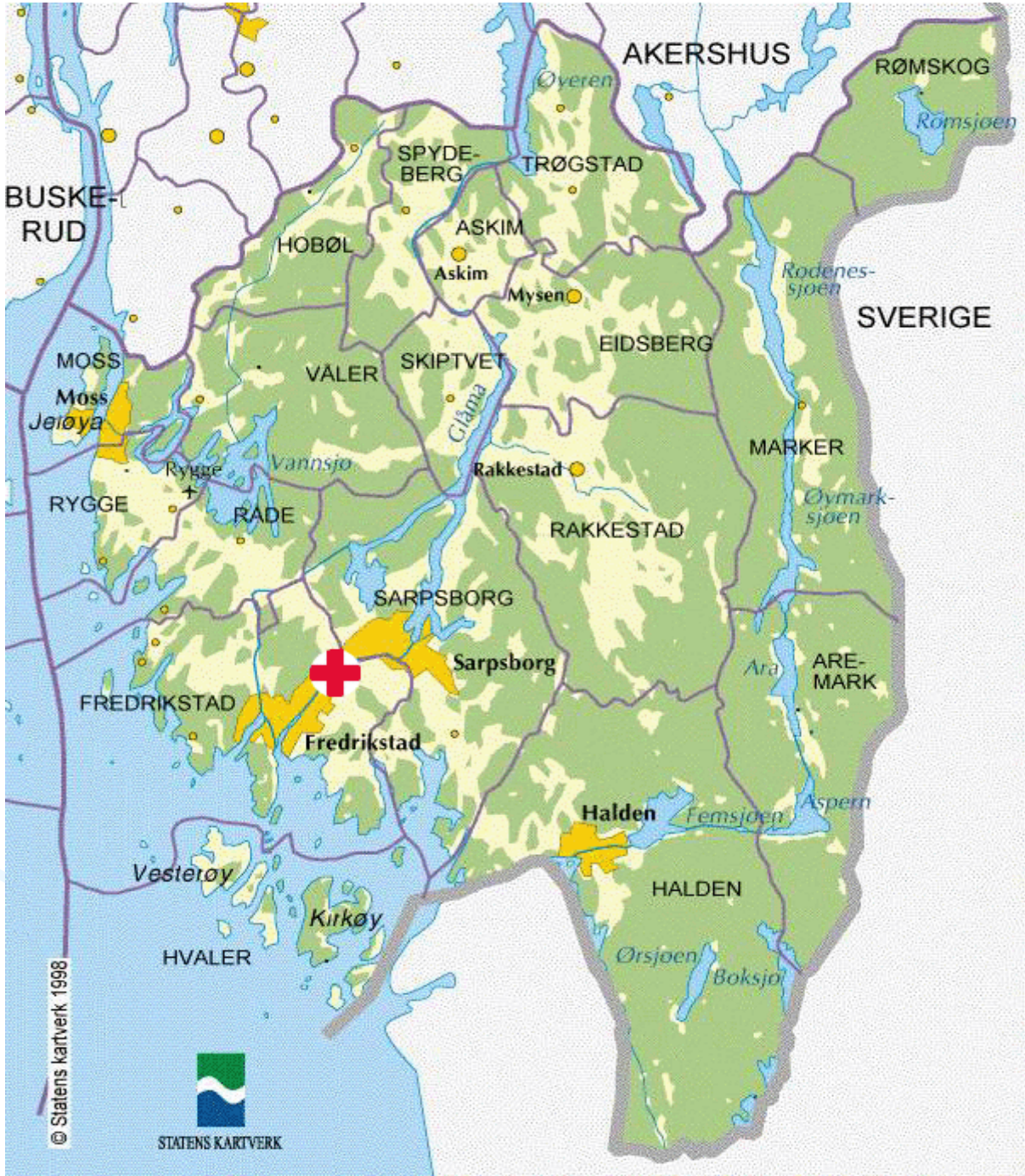
- Main types of messages: Lab orders + results, referrals and discharge letters
- 1987: Fürst Medisinske Laboratorier, Oslo offered a proprietary solution to GPs (lab test results were transmitted into the GP's patient record).
- CEN startet EDIFACT-based standardisation work. The solution required EDI-server and a X.400-connection. (Norway: Critical mass have not been reached, Denmark: the MedCom network)
- Still mainly paper-based message exchange, + proprietary solutions (from EPR vendors) + recent XML-based standards (the ELIN project). The PKI project.

Østfold county

250 000 inh.
3600 sqkm.

Until 1998:
5 hospitals
5 ECUs
(Emergency care units)

After 1998
2 ECUs (Moss and Fr.stad)



The MobiMed technology

- Transmitters in ambulances (GSM as communication technology
- ECG can be transmitted to receiver at hospital
- Doctors interpreting the transmitted ECG
- Allows early detection of myocardial infarction, and then:
  - Thrombolytic treatment given before hospitalisatioin
  - And/or: Bypassing the ECU, go directly to heart ICU

The MobiMed history (1)

- 1997: Visit to Falun, Sweden to see MobiMed in use
- February 1998: Receiver at cardiology ward in Fredrikstad, transmitter in two Halden ambulances
- Equipment borrowed from vendor, no financial support, voluntary participation
- Was able to demonstrate time saved in bypassing the ECU for 16 patients in 1998.

Case from Nina Mikkelson's master thesis from february 2002

The MobiMed history (2)

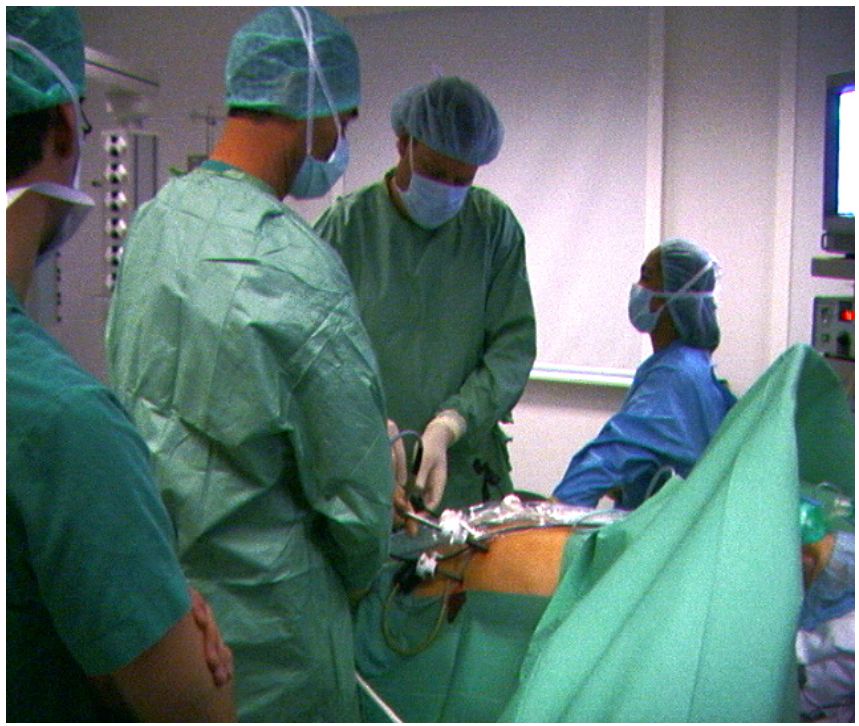
- Anaesthesia nurse followed the Halden ambulances. From january 1999 allowed to administer thrombolytic medication during transport on doctor’s order
- June 2000: More than 400 ECGs had been transmitted, the total ”call-to-needle-time” had been reduced by 50-60 minutes. End of voluntary use (cardiologist on duty was required to look at ECG in case of alarm)

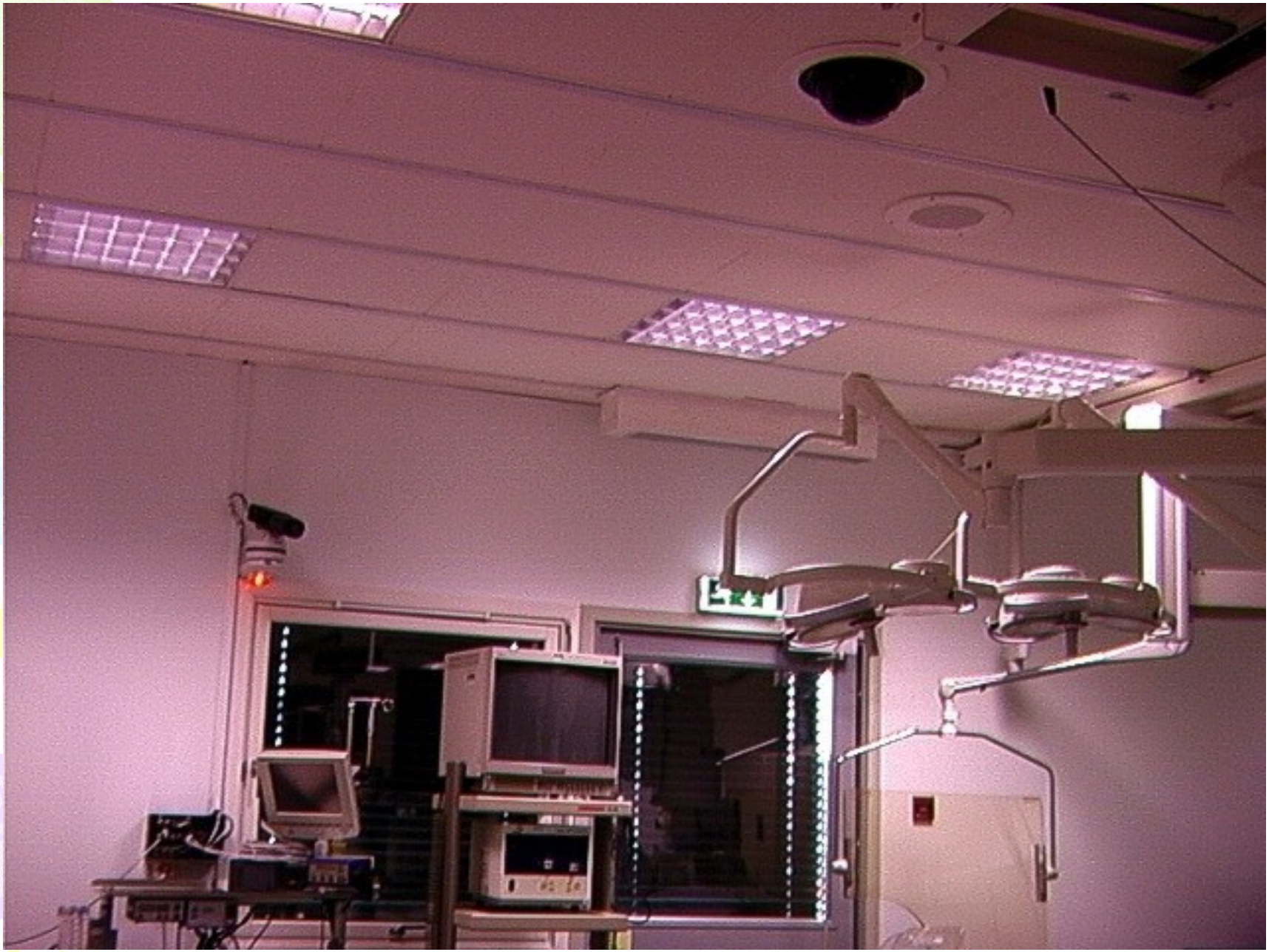
The MobiMed history (3)

- 1999: Askim looses its ECU
- April 2000: MobiMed in ambulances. (Financial support from county)
- October 2000: More than 200 ECGs transmitted, nurse administers medication
- Ambulance personnel reaches level 3 in their education (national initiative) and is allowed to administer medication
- 2001: MobiMed also in Sarpsborg, Moss and Fredrikstad ambulances

Surgical Telemedicine

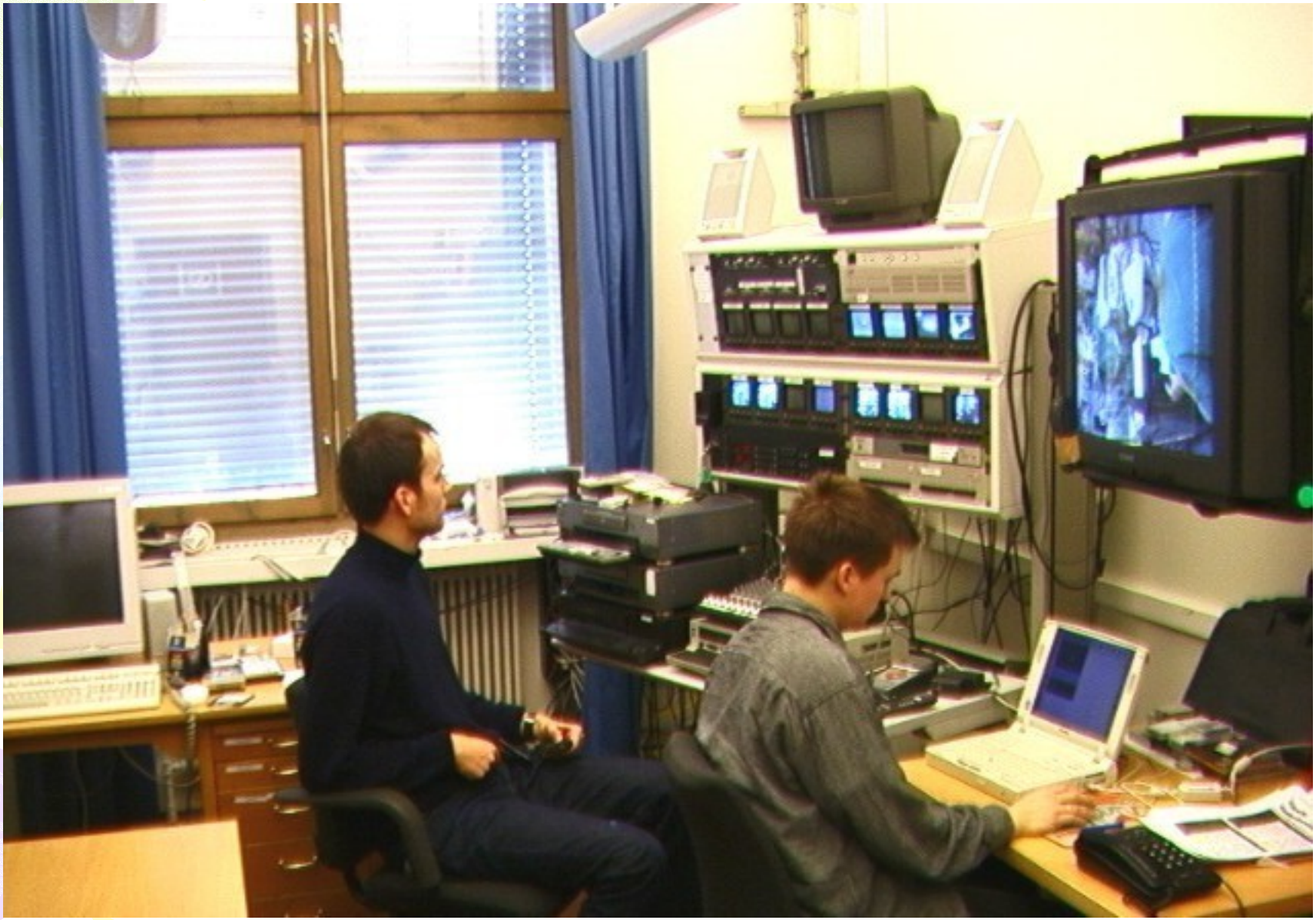
- Laparoscopic surgery (keyhole surgery in the abdomen) is based on video images.
- The idea: transmit high quality audio and video to/from operation theatres in real time. (ATM network, 34 Mbit/s)
- Rikshospitalet, Ullevål, Telia, Ericsson, IFI (1997-1999)
- Use: demonstration of operations for surgeons under training + ad hoc discussions between experts on specific cases.





Project history

- A lot of testing (of image quality)
- A few operations transmitted
- Some high-profile sessions
- A lot of different sessions transmitted
  - Lunch lectures for radiologist
  - Lectures for medical students
  - Regional meetings for ENT specialists
- Main learning situation



Towards A Bootstrapping Strategy

- Important points from the examples:
  - All use areas are not equal
  - All technical solutions are not equal
  - Some users are more motivated than other
  - The power of the example, ’it really works’
- Exploit these differences:
  - ”Multidimensional critical mass”: it’s not just about number of users, but also about who, for what etc.

A Bootstrapping Strategy

- Start with the simplest and cheapest solution
- Select motivated and knoweldgeable users
- Select use areas that are simple and not critical
- Augment rather than replace
- Select use areas where benfits are immediate and easily visible
- Select use/technology with a large potential (for enrolling many users)

... and:

- Use this as far as possible, enroll more users
- Use the same solution on more innovative and beneficial ways
- Use the solution for more critical tasks
- Use the solution for more complex tasks
- Redesign the solution so that new tasks can be carried out
- (Repeat from start).