The Funen telemedicine initiative
2004-2006

Telemedicine in practical application
Telemedicine can be defined as a remote healthcare service using information and communication technology.

Two parties, for example a patient and one or more healthcare professionals, are brought into close contact despite a greater or lesser physical distance separating them.

Funen telemedicine initiative

The Telemedicine Project – Digital Funen – comprises both Funen telemedicine at the Danish Centre for Health Telematics and project preparation for international projects. The practical content of the initiative is shown by the many project descriptions in this brochure.
A successful initiative!

It is not an aim in itself for it to be possible for healthcare services to be provided over long distances. This is an option and a way of responding to a number of the challenges and tasks which the healthcare system faces.

Knowledge is being centralised, while there continues to be a great need for the decentralised functions of the health services, such as general practitioners and smaller hospitals, to be able to accomplish as many healthcare tasks as possible. Part of the answer is to make specialised knowledge available across distances, and that is precisely what telemedicine can do. The capability exists, as technology makes it possible to communicate image, sound and text over long distances at high quality and consequently at relatively low cost.

In relation to needs and opportunities telemedicine is a simple and elegant answer, but technical standard solutions do not do it by themselves. Each individual situation demands careful adaptation of the technical solution. At the same time, it is just as important that the human factor is taken into account. What consequences does telemedicine have for the distribution of tasks and the organisation as a whole? Is there a need for continuing professional development? How do patients respond to this new form of contact with the healthcare system? In other words there is a need for development work with a view to creating practical solutions, putting them to use and extending them.

With this aim in mind, the County of Funen and the Danish Centre for Health Telematics in 2004 launched a three-year initiative in cooperation with a large number of parties in the healthcare sector, primarily on Funen and in the rest of the Region of Southern Denmark, alongside a set of international projects focused on telemedicine. Three years on, the knowledge and experience gained through the project work have been analysed, and the results are described in this brochure.

An underlying principle in the practical solution has been to take existing technological solutions as a basis, including videoconferencing equipment, healthcare data networks, image communication and the MedCom communication standards. But there are exceptions to every rule. Two projects have resulted in the development of new prototypes through cooperation with Funen IT companies: a smart exercise mat and an on-line communication solution for patients in their own homes.

Some of the projects are still under way, while other telemedicine solutions have already become a part of everyday life. Here and now, however, there is no doubt about the main conclusion: The initiative was a success, the capabilities and potential of telemedicine have been proven. There is a solid basis on which to continue working on development and dissemination.

Lars Hulbæk
Chief consultant
Danish Centre for Health Telematics
Telemedicine – that’s why!

It is possible. There is a need for it

It is not a coincidence that a great deal of attention has been focused on telemedicine in recent years. There are two fundamental reasons: technology can be used to convey healthcare services over long distances, and there is a need for it.

It is possible, because information technology is making advances, gradually extending the capability to pass on text, images and sound in a flexible way. At the same time there is a distinct trend towards the technology becoming cheaper.

There is a need for telemedicine, partly because development in the healthcare sector is clearly pointing in the direction of specialisation and therefore also centralisation. Specialist functions are being combined into fewer units, and this is happening at the same time as there is a need to maintain a high level of service and efficiency in the decentralised parts of the healthcare sector.

As large a proportion of the services as possible are to be provided close to the patient’s own home, in some cases in the home, in others at the patient’s GP practice, at the small local hospital or at a similar location. If it can be done, the healthcare service, the necessary expertise, must and can be decentralised in a virtual form in the local area.

In some cases it means that the patient’s problem can be solved there and then. If this is not possible, telemedicine can raise the quality of the effort, before the patient physically comes face to face with healthcare expertise, for example in the shape of the specialist or the specialised hospital function.

Telemedicine and the patient

For the patient, the advantages of telemedicine lie primarily in easy access to the best expertise. Typically this may involve the patient going to see his or her own doctor and the latter obtaining a second opinion from a specialist. In some situations patients would like to stay in their own homes and also deal with some of the check-ups and treatment themselves.

Telemedicine means that in many cases patients will be able to receive treatment without needing to travel far. A group of patients who will benefit particularly are those who live on islands or in other places far away from specialist functions. Other groups of patients are people for whom the journey would cause strain for health-related reasons and chronically sick patients who have to travel frequently to obtain the necessary expert assistance.

Telemedicine offers great potential – also by virtue of the fact that the number of chronically sick patients is rising sharply as the proportion of the elderly in the population increases.

Telemedicine and the healthcare sector

For healthcare professionals in decentralised functions, the benefits of telemedicine are primarily to be found in the fact that necessary information can be obtained at any time and anywhere. The potential for communication is literally boundless.

Decentralised functions in particular are under pressure, because under normal circumstances they will find it difficult to provide all the services the patients demand. They lack the expertise. Often there is a shortage of resources, either because the function has limited capacity or because it is not possible to fill vacancies in these functions. Here telemedicine can have a positive effect, firstly by making new resources available remotely and secondly by making the function more appealing to healthcare professionals. The decentralised functions quite simply become more attractive in purely professional terms due to close contact with specialist functions.
Telemedicine – that’s how!

**Planned online consultation**
The patient gains access to a consultation using telemedicine for example as outpatient checks during a course of treatment.

**Examples**
For example the Health Optimum project described on page 26, the County of Funen telealcohol abuse therapy project on page 10 and telepsychiatry on page 30.

**Planned offline consultation**
Enquiry, for example on assessment of a case on the basis of a picture or a similar item, is answered by specialist within an agreed period of time.

**Example**
For example teledermatology, described on page 8.

**Urgent consultation**
Online specialist assessment of an illness in connection with an urgent consultation.

**Example**
For example teleradiology cooperation between South West Jutland Hospital Esbjerg/Varde and Odense University Hospital, page 12.

**Remote function**
The clinical procedure is performed locally, while assessment is made by an expert remotely.

**Examples**
Examples of teleradiology cooperation are CAG cooperation between Haderslev Hospital and Odense University Hospital, page 14, Health Optimum, page 26 and Baltic eHealth, page 28.

**Preparation for surgery**
Preparation of surgical intervention by videoconferencing.

**Example**
For example Department of Orthopaedic Surgery, Odense University Hospital, page 22.

**Discharge/transfer**
Moving of patients between two organisational units in the healthcare system supported by visualised information on continued treatment.

**Example**
For example Videoconferencing in the Therapy Department of Funen Hospital, pages 18–19.

**Follow-up of admission**
The admission is followed up with treatment in the patient’s own home.

**Examples**
Examples of continued treatment of COPD patients, page 25, and IT in paediatric home care, page 16.

**Second opinion**
A healthcare specialist is asked for advice on an investigation or treatment.

**Examples**
For example tele-echocardiography, described on page 17, tele-wound assessment, page 15 and videoconferencing in medical practice on endocrinology patients, page 24.

**Conference**
Videoconferencing, for example in hospital department with geographically dispersed units.

**Examples**
For example Department of Orthopaedic Surgery, Odense University Hospital, described on page 22, and the Therapy Department of Funen Hospital, page 18.

**Training/exchange of experience**
Online lectures and taped recordings of procedures and/or lectures as an element of training and exchange of experience.

**Example**
For example Videoconferencing in the Therapy Department of Funen Hospital, page 18.
How did it go?

The principal conclusion after a three-year project period is that the initiative was successful. Objectives and results are as follows:

**Aim:** To ensure a leading position in telemedicine solutions for the County of Funen/the Region of Southern Denmark before 2007.

**Result:** Assessed on the basis of awareness of telemedicine activities in other parts of the country, it is evident that the County of Funen holds a leading position in practical application of telemedicine today.

**Aim:** To demonstrate the Danish Centre for Health Telematics as a national centre of excellence in telemedicine.

**Result:** There are several telemedicine centres of excellence in Denmark. The Danish Board of Technology report “Healthcare Services with IT”, May 2006, emphasises Aalborg University, the Centre for Pervasive Healthcare in Aarhus and the Danish Centre for Health Telematics. The latter in particular has marked itself out as a centre of excellence for the practical application of telemedicine. The Centre is widely acknowledged internationally as a national centre of excellence.

**Aim:** To implement practical use of telemedicine in the Funen healthcare system.

**Result:** Telemedicine solutions have been put to use in the Funen healthcare system and provide a good basis for a targeted dissemination effort in selected areas, both regionally and nationally.

**Aim:** To support telemedicine initiatives in the Region of Southern Denmark.

**Result:** The Danish Centre for Health Telematics has supported telemedicine activities in the Region of Southern Denmark by joining regional working groups in the area and extending telemedicine solutions to cover healthcare providers in all counties in the Region of Southern Denmark.

**Aim:** To make the County of Funen and the Region of Southern Denmark a known and key region in international contexts.

**Result:** Today the County of Funen is one of the leading players in European projects, both through existing international projects and with the approval of four new ones. The County of Funen has built up networks and practical cooperation both with other regions and with significant industrial parties in healthcare IT.
# The 17 telemedicine projects

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Teledermatology

In 2004 a pilot project was carried out with teledermatology between general practice and specialists in private practices and a hospital department. The trial was evaluated at the beginning of 2005.

The idea was to make it possible for patients to obtain a specialist assessment of their skin problem when they visited their own doctor. The doctor took pictures of the skin problem and sent them electronically to a dermatologist, who returned a case summary. The patient, thus, in most cases avoided being referred to a specialist.

Experiences

The general practitioners’ assessment is that the teledermatological service has helped them to make diagnoses and has contributed to better quality of treatment for the patient.

Finally, general practitioners evaluate that teledermatology has had a positive impact in the form of improved cooperation between general practice and dermatologists, and that they have gained from the project in terms of training.

For the patients, it meant fewer visits to the GP and a shorter period of illness. Most of the patients whose skin ailments were assessed by means of teledermatology have been able to continue with check-ups and treatment at their own doctors.

In other cases teledermatology has led to a substantial improvement in referrals to specialists. The pilot project and its assessment have led to the formulation of permanent Section 2 and Section 3 agreements in connection with payments for the consultations of general practitioners and specialists in private practices in connection with teledermatology.

Outlook

Experience from the trial period shows that it will be advantageous if image management is integrated into the patient record using the MedBin standard. The doctors felt that it was time-consuming and laborious to send photographs via e-mail and make referrals via Edifact.

The project also showed that the participants needed training in photography. The Danish Centre for Health Telematics therefore arranged photographic courses, and in cooperation with the dermatology specialist Niels Veien from Ålborg issued the CD “How to take a good skin photograph in two minutes”.

The outlook for teledermatology is that this option may be extended to the entire Region of Southern Denmark and all the other regions.

A future option may be for patients to send images directly from home by e-mail or mobile phone.

Technical solution

An ordinary digital camera with 4 megapixel resolution and a PC with reasonable memory for image processing are used for photography. There is also a need for record systems at general practitioners and specialists that can handle the message formats MEDREF/MedBin and MEDDIS.

Finance

The basic costs for the general practice are around DKK 2,500 for a digital camera plus any costs associated with the addition of an image database and support for the MedBin standard in medical record systems. The costs of this vary and depend on the supplier.
Radiological examinations in the form of X-rays and CT and MRI scans are of great significance in diagnosis by specialists and for the safety in treatment and the subsequent check-up. The aim of the project has been to give healthcare professionals direct access to radiological examinations and descriptions using web consultation on the Health Data Network. This type of X-ray consultation is particularly useful in patient pathways that involve hospitals and private specialist clinics.

In practice the web consultations give specialists access to material from the Imaging Diagnostics Department of Odense University Hospital and X-rays from Funen Hospital Aeroe.

The general procedure is that examination data is requested by fax. Radiological images are supplied on film and descriptions are sent as Edifact. The manual procedure means that two to three weeks normally pass before the specialist receives the material.

The greatest advantage in web consultations is the time saving in private clinics, as specialists have access to the image material immediately after the examination. Diagnostics and treatment can therefore be initiated far quicker than in the past. The clinic also saves time by not having to gather examination results manually.

Another advantage is that the specialist can use the images directly in dialogue with the patient. At the same time there is a benefit in that the images are available when they are needed. In the manual procedure it may be difficult and time-consuming to get hold of the images again.

Web consultation additionally contributes to increased cooperation between specialist practice and the imaging diagnostics department, as practice occasionally provides feedback on examination data.

It is envisaged that in the future it will be possible to set up a national radiology index containing all radiological examinations. The index can be used by relevant healthcare professionals and by the healthcare system in other countries where Danish patients receive treatment.

Specialist private practice judges web consultation to be a substantial improvement in the service provided by the Imaging Diagnostics Department at Odense University Hospital (OUH). When the whole of Funen in the future is on PACS (Picture Archiving and Communication System), the time saving in hospitals and clinics will be even greater.

It is envisaged that in the future it will be possible to set up a national radiology index containing all radiological examinations. The index can be used by relevant healthcare professionals and by the healthcare system in other countries where Danish patients receive treatment.

The radiological examinations and descriptions are stored in RIS (Radiology Information System) or PACS (Picture Archiving and Communication System). Web consultation necessitates technical equipment in the form of a standard PC with an Internet browser and connection via the Health Data Network to a web-based server in the PACS/RIS system.

A specialist private practice usually has a PC with the software needed to take part. Initially there is a minor cost associated with establishing access to the Health Data Network.
Tele-alcohol abuse therapy

The aim of the project, which began in 2004, is to examine whether an alcohol abuse therapy facility using telemedicine might attract more patients who live far away from the treatment institution, and whether it will induce more people to complete their treatment.

The project is based at the Alcohol Rehabilitation Centre in the County of Funen, and tele-therapy is offered to patients on the islands of Aeroe and Langeland.

Alcohol abuse therapy in the County of Funen takes place in the form of individual therapy sessions, and in principle it is of little significance whether the therapist and the patient sit face to face or whether they see each other via a television screen and camera.

Experiences
30 patients have received or are receiving tele-therapy. This number is too small for it to be possible to draw any conclusions on whether the quality of the therapy is as good as in traditional therapy. Results to date suggest, however, that the patients remain in treatment longer, and that more patients commence therapy as this facility becomes known.

For patients, this option means that they save time and inconvenience when they can attend their local hospital instead of travelling to Svendborg. At the same time, therapy can be attended more discreetly.

At the rehabilitation centre, this facility has increased flexibility in the use of therapist and medical resources. The medical team spend less time travelling and more time with the patients. This facility has not had any organisational consequences, as it makes no difference whether the sessions take place remotely or face to face.

Outlook
It is planned that this provision will be extended, so that people who live in Faaborg can also obtain professional alcohol abuse therapy at their local hospital. Teleconferencing facilities are also to be set up in the Medical Department of Funen Hospital Svendborg, so that the patients can be offered alcohol abuse therapy while they are hospitalised.

The rehabilitation centres in Odense, Middelfart and Nyborg are now also purchasing videoconferencing equipment.

Provided tele-therapy is as effective as conventional outpatient therapy and other patient groups are brought into therapy, the outlook for the future is bright. It will be possible to combine discretion and proximity to citizens with professional alcohol abuse therapy, great capacity and a high degree of specialisation.

It is possible to imagine equipment set up at GPs’ surgeries, in social services, departments at large workplaces etc. The tele-therapy may even be offered in the patient’s own home.

To attract young people in particular, it must be possible to set up chat-rooms on the Internet, where young people can receive advice anonymously on alcohol rehabilitation.

Furthermore the rehabilitation centres have plans for the service to be extended to family members.

Technical solution
Standard videoconferencing equipment is used, and the sessions take place via the County of Funen network. The therapist can use a portable monitor. However, most tele-therapy sessions take place from a room set up for the purpose.

Finance
The purchase price for videoconferencing equipment is DKK 35,000–50,000, and operating expenses are low.
Alcohol abuse therapy for Funen and the islands

In 2004 the Alcohol Rehabilitation Centre of the County of Funen entered a new era. Patients from Aeroe and Langeland now choose for themselves whether they want to travel for a therapy session in Svendborg or prefer a videoconference session in the Prevention Centre in Rudkoebing or the Hospital in Aereskoebing. The patients will continue making appointments in Svendborg, and when they arrive in Rudkoebing or Aereskoebing they will be assisted by a secretary.

“It’s turned out that neither patients nor therapists feel that it makes a great difference when the therapy sessions are carried out using videoconferencing equipment,” says Anette Søgaard Nielsen, the head of the County of Funen Alcohol Rehabilitation Centre.

“In fact, this option helps to ensure that more patients actually get alcohol abuse therapy, and that they remain in therapy longer than they would if they had to travel to Svendborg every time.”

Greater anonymity

“Many patients find it difficult to walk into an alcohol rehabilitation centre, because they are ashamed and do not want other people to see that they have a problem with alcohol,” says Anne Marie Berntsen. She is head of department at the Alcohol Rehabilitation Centre in Svendborg and together with the five therapists at the centre she has already gained considerable experience with tele-alcohol abuse therapy.

“It’s more anonymous for patients to go to the Prevention Centre in Rudkoebing or the Hospital in Aereskoebing, and that makes it easier for them to turn up.

At the same time, the short travelling time means that this option can be utilised by a broader target group, including those who are in employment and are unable to get to Svendborg during the centre’s opening hours.”

Technology working well

After a running-in period during which technical problems were solved, there is little difference between face to face therapy and tele-therapy.

“The image quality is excellent, but you have to talk a little slower than normally,” says Anette Søgaard Nielsen.

“And you mustn’t talk at the same time, which is actually an advantage. In essence, it’s just an extension of telephone contact, and therefore the patients do not think that it’s complicated either.”

Tele-alcohol abuse therapy can be combined with sessions at the centre in Svendborg, depending on what the patient wants and how the therapist assesses the situation.

More facilities on the way

“Tele-alcohol abuse therapy can be used advantageously in other contexts in order to reach more target groups,” says Anne Marie Berntsen.

“For instance, we’ve initiated cooperation with the Medical Department at Funen Hospital Svendborg to offer a clarification session to patients who are admitted for detoxification. Patients are more receptive to the offer while they are hospitalised, so we can see quite clearly that more patients get started on a course of therapy.”

In the future the videoconferencing equipment can also be used for example to treat prison inmates or young people in their own homes, using a webcam.
The Department of Neurosurgery at Odense University experiences

The project was launched at the beginning of 2005, and since then teleradiology has become standard procedure.

Over a three-month period in the trial project in 1999, Esbjerg sent 44 examinations of acute patients to OUH. Of these, 18 patients either completely avoided being transferred to OUH or their transfer was deferred until the following day. In 2005 images were sent from Esbjerg to OUH almost daily.

The consequence is substantially better treatment. Above all, this scheme ensures that patients who need specialist treatment go to OUH and that they are only transferred as urgent cases if necessary. Other patients can stay at the South West Jutland Hospital Esberg/Varde and avoid stressful transport. At the same time both hospitals save money as well as resources.

Outlook

The cooperation on teleradiology will benefit from the fact that OUH will soon have a fully expanded PACS. With regards to systems, it will also be desirable to bring the patients into OUH’s RIS/PACS. This depends on a tendering process for RIS/PACS for Funen and South Jutland which is currently in progress.

In terms of development opportunities, it can be imagined that the same solution will be used by all hospitals in the Region of Southern Denmark and by the hospitals of other regions, particularly in those areas where OUH has national or regional specialties. When OUH acquires a fully expanded PACS, it will also be natural to transfer all images of elective patients and outpatients electronically.

Technical solution

South West Jutland Hospital Esberg/Varde has SECTRA RIS (Radiology Information System) and PACS (Picture Archiving and Communicating System), while OUH has SECTRA RIS and a SECTRA MiniPACS system, which is primarily used for image storage. The PACS systems are linked via the Health Data Network.

Finance

The project has not required purchasing or investments, as existing equipment and networks are used. A setup of systems and networks, as well as testing, have meant limited use of resources.
The cooperation between South West Jutland Hospital Esbjerg/Varde and OUH on teleradiology means quicker assessment of CT and MRI scans, to the satisfaction of both patients and staff.

Interview

Quicker assessment of scans

Overall, no major difficulties were encountered in implementing the teleradiology solution, which is based on the link between the PACS systems in the Radiodiagnosits Department of OUH and in Esbjerg.

“It was an advantage, for example, that OUH and Esbjerg use PACS from the same supplier, so in everyday language the systems are able to talk to each other,” says Jørgen Nepper-Rasmussen, a consultant doctor in the Department of Radiodiagnosits, Neuroradiology Section, OUH.

“The link to the Health Data Network additionally offers the advantage that we receive scan images 24 hours a day. To make use of this improvement, some of the internal procedures of the Health Data Network were changed, so that the system is monitored around the clock.”

Expanded electronic cooperation between OUH and South West Jutland Hospital Esbjerg/Varde has been planned for many years. In 1998–99 the parties adopted a low-technology solution, in which the departments’ laser film printers were linked together. This made it possible for the radiology department at OUH to print films from CT and MTI scans performed in Esbjerg.

“That solution was already a step forward, because we were able to make a quicker assessment of patients. At the same time it was clear that there was a need for a more advanced solution,” says Nepper-Rasmussen.

Fewer journeys, better planning

When the radiology department at OUH receives CT and MRI scan images from Esbjerg, the images are automatically stored in the departments Mini-PACS system, where the neurosurgeons can view them and decide on diagnosis and treatment. The neurosurgeons involve the neuroradiologists in their assessments when necessary, and in some cases the images are also discussed at case conferences.

“The main purpose is to ensure that patients who are admitted in Esberg and Varde with a head injury or cerebral haemorrhage are quickly assessed by a specialist in order to plan the treatment. The advantage for the patients is that in some cases they avoid being transferred to Odense, because the treatment can take place at the local hospital,” Nepper-Rasmussen explains.

“On other occasions the journey can be postponed to the next day. This gives us a better opportunity to plan and coordinate internally in the department. At the same time it means that the patient is received as well as possible. Furthermore there are fewer costs associated with transporting patients during the day rather than in the evening or during the night.”

Earlier treatment of blood clots in the brain

“Our vision is to use teleradiology in connection with thrombolytic treatment of patients affected by a blood clot in the brain,” says Nepper-Rasmussen.

“Scans will enable the specialists at OUH to assess the prospects for thrombolytic treatment, without having the patient transferred to OUH. The time factor is crucial in thrombolytic treatment, and therefore the treatment has to be performed locally following guidance from OUH.

The idea is that the specialists should be able to follow the progress both from OUH and from home via a link to the Health Data Network, so that qualified staff monitor the patient permanently. In order to realise the project a common system in the whole of the Region of Southern Denmark for transmission of the images is needed. If everything goes according to the plan, this will be in place within six months to a year”.

Jørgen Nepper-Rasmussen, consultant doctor in the Department of Radiodiagnosits, Neuroradiology Section, OUH.
Tele-wound assessment

Project description

Treatment of wounds is characterised by an interdisciplinary approach and few national expert centres. It is essential to support clinical cooperation between specialist units and other functions in the healthcare system with telemedicine tools.

The aim is to make the initial assessment more informed and the diagnosis more reliable. This is achieved by supplementing referrals with image material. The treatment can in this way be initiated quicker. This results in quality improvements in the course of treatment and in some cases it is even possible to avoid amputations. Furthermore the solution can facilitate outpatient treatment of patients who require particular care and who are difficult to transport.

This specific project supports cooperation between the University Centre for Wound Healing at the Department of Plastic Surgery at Odense University Hospital and the Department of Orthopaedic Surgery and the Medical Department at Funen Hospital Svendborg, as well as selected GP practices.

The project cooperation is meant to contribute to the establishment of a telemedicine wound consultation in the County of Funen. At the same time the project will support and supplement already existing patterns of initial assessment and cooperation for wound patients in the county.

Experiences

To date the pilot project has only covered a few referrals. The project has nevertheless had several positive effects. Among other things, nurses who work in the homes of particularly debilitated patients can take images of pressure sores and obtain specialist assessments via telemedicine. In this way, some of these patients can avoid going to the hospital.

Outlook

Referrals are sent as edifact communication from general practice, and in this context getting the MedBin standard into use in the patient record systems of general practitioners poses a great challenge.

The University Centre for Wound Healing is working to develop a wound database as an addition to the department’s EPR. This means that tele-assessment of wounds can be handled with the same tools as the department’s other tasks.

In addition, work is under way on the idea of instructional videos, which can be used in relation to general practitioners, home care and patients.

An interesting perspective is to broaden the area to also cover the other hospitals in the Region of Southern Denmark. Cooperation has already been established with Ribe County on a number of patients. In addition, cooperation could advantageously be established with home-care nurses, who have great experience in assessing and treating wounds.

Technical solution

General practice sends referrals and image material as edifact communication.

The record systems at both general practitioners and specialists must be able to handle the MedBin standard.

The County of Funen receives the messages in the Cloverleaf system, which routes the referral to FPAS, the county’s patient administration system and EPR.

A standard digital camera with high resolution is used for photographic recordings. This solution additionally necessitates a PC with reasonable memory for image processing.

Finance

A digital camera typically costs around DKK 2,500. The costs of adding an image database and support for the MedBin standard in the medical record systems varies from DKK 0–25,000 depending on supplier.

At OUH there have been costs associated with development work to support requests in EPR and MedBin in the image database. In addition there is the development of interfaces between the systems.
CAG cooperation

Project description
The aim of this project is to assess whether videoconferencing is suitable for conducting consultations between cardiologists, in this case at Haderslev Hospital, and specialists – medical specialists and surgeons – at the Department of Cardiology at Odense University Hospital.

The vision is that all patients should have equal access to treatment by the same group of specialists.

The videoconferences will proceed in such a way that the cardiologists in Haderslev and the specialists in Odense look at the same coronary angiography images at the same time. Together they will decide whether it is possible to perform balloon dilatation or by-pass surgery or whether the patient will be treated with medication.

The project started at the end of 2006 and will lead to increased use of specialist resources and expanded cooperation between hospitals. It is anticipated that cooperation by videoconferencing will raise the quality of conferences and thus lead to better treatment of patients. Furthermore it is anticipated that time and travel expenses in connection with meetings can be saved.

Outlook
The primary challenge is to introduce and carry out the pilot project and reach so far that the project can become operational when the necessary confidence in the solution has been built up.

In the long term, it will also be relevant to involve South West Jutland Hospital Esbjerg/Varde in the solution. Cardiologists from OUH travel to Esbjerg for a conference every 14 days. This can possibly be avoided and cooperation otherwise expanded with more frequent conferences.

Technical solution
General videoconferencing equipment will be used at OUH and at Haderslev Hospital, together with the necessary hardware and software. The network connection will be made via the regional data network.

Finance
Costs of the order of DKK 335,000 are estimated for the project. Of this sum, around DKK 260,000 will be used for a clinical workstation, while the remaining DKK 75,000 is spent on acquiring videoconferencing equipment.

Per Thayssen, consultant in the Department of Cardiology of OUH, assesses electronic coronary angiography images.
The overall aim of the project has been to examine and try out various telemedicine solutions that can contribute to enhancing the efforts in Paediatric Home Care. Among other things it entails reducing the number of hospital admissions, generally improving the efficiency of the work in Paediatric Home Care and making it possible to involve the sick child and its parents to an even greater degree.

Paediatric Home Care is organisationally part of the Paediatric Clinic Department H, Odense University Hospital, and the tasks consist of nursing and instruction of children and their families in the home.

The use of GSM navigation has been a success. The digital video camera for the time being is used primarily for instruction purposes, because the mobile network does not yet provide an opportunity to use the technology for image documentation. The mobile connection to hospital systems has primarily been used for storage in the booking system and for access to records. Experience with the digital stethoscope is not good, as it is highly sensitive to noise. A spirometer for lung function analysis and colour printer have not yet been put to use.

Finance

Acquisition and initial costs have been approximately DKK 70,000.
Every year around 500 children are born with heart defects, around half of whom need surgical intervention or balloon dilatation. In Denmark around 300 heart operations are performed on children each year. Århus Hospital, Skejby and Copenhagen University Hospital are alone in performing heart surgery on children in Denmark.

The project, which is planned to begin at the end of 2006, is intended to improve the treatment of children with congenital heart defects by using telemedicine to support conferences and preparations for surgical procedures in cooperation between Odense University Hospital, Århus Hospital, Skejby and Copenhagen University Hospital.

The project is based in the Paediatric Heart Centre, Paediatric Cardiology Ward in the Paediatric Department of OUH. The Paediatric Heart Centre examines, treats and checks children with congenital heart diseases. The ward also takes urgent cases. There are 8–12 patient visits to the outpatient unit daily.

In outpatient visits, the unit carries out general medical examinations, and in most cases performs ultrasound scans of the heart. This examination may be supplemented by ECG and/or a fitness test on a treadmill. The unit also performs foetal echocardiography for pregnant women, where there is suspicion or increased risk that the child has congenital heart defects.

Today the procedure is that ultrasound scans are kept on CD-ROM, and about once a month a team travels to Århus Hospital, Skejby to hold a case conference and plan treatment. And up to twice a month a need arises for an urgent case conference, and immediate transfer to Århus is often chosen.

The telemedicine solution enables the Paediatric Department at OUH to hold case conferences with Århus Hospital, Skejby and Copenhagen University Hospital according to need and without long journey times for both patients and staff.

**Project description**

**Expectations**

It is anticipated that the project will lead to improved treatment for children, partly due to the possibility of quickly setting up urgent case conferences and partly due to improved communication options in general. In some situations it is desirable to avoid moving the sick child.

At the same time, it is anticipated that it will be possible to achieve savings in the form of a reduction in travel time and travel expenses to attend the case conferences.

**Challenges and plans**

The project is expected to become operational at the end of 2006, when the last organisational and technical solutions are in place.

**Technical solution**

The Paediatric Department of OUH has an ultrasound scanner, which is able to send images to cardiologists at Århus Hospital, Skejby or Copenhagen University Hospital while the scan is still in progress. The parties can use videoconferencing equipment to comment on, influence on and discuss the examination and take decisions on further treatment.

Communication takes place via the Health Data Network.

**Finance**

No investment has yet been made in new equipment under the project.
Telemedicine in the therapy department

The Therapy Department at Funen Hospital provides the setting for two telemedicine projects. The department has tried out videoconferencing across the hospital's sites and is taking part in the development of a smart exercise mat.

The need for videoconferencing arose as a consequence of the merger of different sites of the Funen Hospital into one therapy department. The project is intended to strengthen cooperation across geographical distances and support quality in the services provided. The project is an important tool in the department’s professional and organisational development.

The videoconferencing systems were implemented in April 2005 to support communication between the chief therapist/heads of specialties and the hospital units. The intention in practical terms was to use the equipment in morning conferences, development of quality and skills, professional discussions and instruction.

Later in 2005 the idea arose of cooperation with the Mærsk McKinney Møller Institute for Production Technology at the University of Southern Denmark and Entertainment Robotics to develop “smart physiotherapy training equipment”. The Mærsk McKinney Møller Institute and KOMPAN had jointly developed a smart playground mat, and the idea was to further develop the technology for the healthcare sector. The mat was successfully tested on knee patients and heart patients and was then brought into the department’s telemedicine project.

Videoconferencing

Experiences
The use of videoconferencing for meetings is working as intended and contributing to passing on knowledge and inspiration in the department. Staff save on travel time and resources.

Outlook
The idea is to extend the use of videoconferencing in the Region of Southern Denmark. Another clear prospect is to use the solution in closer cooperation between hospitals and municipalities in the transfer of patients for rehabilitation.

Technical solution
The equipment is standard equipment linked to the County of Funen Network.

Finance
The videoconferencing equipment in Svendborg, Nyborg and Faaborg has cost around DKK 200,000 to purchase, including installation and instruction. In Aeroskoebing existing equipment is used.

Smart exercise mats

Experiences
The effect of rehabilitation on the mats is highly positive. The patients are enthusiastic about the tool and often forget about their functional limitations. An incidental gain is many valuable contacts with other organisations at both national and international level.

Outlook
It is a challenge for the department to be involved in the development of the smart exercise mat. The project costs resources, but in turn provides energy and motivation. The development work is continuing, and the prototypes will be improved continually.

Technical solution
The task of the Therapy Department is to test the exercise mat and take part in its development. For the time being four exercise programmes have been developed for heart patients.

Finance
The County of Funen directly covers DKK 0.5m of the development expenses for the exercise mat, while Funen Hospital covers DKK 0.2m and the Danish Centre for Health Telematics DKK 0.2m. The parties have entered into a cooperation agreement which governs the development effort and rights. Funen Hospital is assured of royalties from future sales to customers.
Heart patients in rehabilitation play an important role when the Therapy Department of Funen Hospital takes part in the testing and development of a smart exercise mat. The patients move around following lights fitted into the mats. A computer program controls where and when lights are on.

“So far 20–25 patients have tried out the mats, and they are all enthusiastic about this form of rehabilitation. The patients work on their stamina and fitness, which we assess by intensity and pulse measurements. We record their coordination and balance on video,” says developmental physiotherapist and project leader Tonny Jæger.

“The mat is designed so that it can be fitted both on the floor and on a wall, enabling patients to exercise their whole body. It’s very exciting to take part in generating ideas for development of the prototype. One thing we would like to be able to do is to model the mat for different purposes, for example a long walkway. In the longer term we would also like to be able to program the light, so that patients can practise particular movements they previously used for example in playing golf or tennis.

In the test phase we naturally identify some things that do not work, but the opportunities for development are so great that it’s worth it. It’s also logical to use the mats for the rehabilitation of other groups of patients, for example hip patients.”

Jæger presented the mat at the Nordic Telemedicine Conference in Tromsø in June 2006 and there was keen interest in the smart exercise tool, leading to many international contacts. He anticipates that the mat will become a permanent feature in the department’s rehabilitation equipment during the course of 2007.

Meetings and instruction via camera and monitor
Videoconferencing is another telemedicine tool used by the Therapy Department. Staff were quickly able to see the benefit of communicating by monitor and camera rather than travelling between sites to meet face to face.

“Today we typically hold three or four organisational meetings a week by videoconferencing. As a result we cope with planning and coordination quickly and effectively,” says Jæger.

“We also use the equipment for instruction across sites and even across national borders. On the other hand, we are not yet so good at using the equipment for professional development. To some extent it’s a matter of getting used to the medium. Some people find communicating through a monitor cold. At the same time, many therapists would rather be in direct contact with patients themselves than assess a rehabilitation situation by videoconferencing,” Jæger feels.

Another reason for limited use is that the geographical spread of the therapists is not as great as expected.

“I can see some clear opportunities in broadening the use of videoconferencing when the municipalities take over a number of rehabilitation tasks. For example, home care staff can film the patient’s home, so that the hospital therapist can offer advice on rehabilitation and furnishing. We could also monitor rehabilitation situations in municipal healthcare centres through videoconferencing equipment. That makes it possible for the therapist who has trained the patient at the hospital to contribute his or her experience. Finally I see a number of opportunities to use videoconferencing in connection with cooperation in the region.”
Cooperation between residential institution and hospital

**Project description**

The aim of the “Social IT” project is to support cooperation between the Lindebjerg residential home and relevant parts of the healthcare system. The home has around 70 adult residents.

Half of them suffer from epilepsy, while the others need psychiatric treatment. The home therefore often cooperates with specialists. In this connection there is a need for an effective exchange of information.

In practical terms the project is concerned with electronic exchange of correspondence messages between the home and the residents’ general practitioner, an epilepsy specialist from Neurology Department U of OUH and a psychiatrist from Psychiatry Department P of OUH.

In addition, epilepsy specialists at OUH have an opportunity to devise web consultation in the Home system, so that they can view the residents’ records, including video recordings of epileptic seizures, with a view to assessment and advice to the staff of the home.

Other than simplifications and time savings, the introduction of IT solutions does not have any impact on the organisation, as it involves automation of relatively simple functions.

**Experiences**

The exchange of correspondence messages and outpatient notes with OUH has worked smoothly since May 2006. The same applies to access from OUH to the Home system. The video recording solution has been tested and entered service.

Waiting time for specialist assessments is reduced to one day rather than the previous one to two weeks. The information reaches the right person quickly and reliably, so that optimum treatment can be commenced immediately.

One result of the shorter waiting time is that it is easier and quicker to change medication. Relevant social educational activities can be started at short notice.

**Outlook**

Lindebjerg wishes to follow up the project by developing an electronic form, which the instructors will use to describe seizures suffered by residents with epilepsy. The form will give the neurologist at OUH a uniform and relevant description of the seizures. In addition, Lindbjerg would like to install a videoconferencing system for training purposes, for example in cooperation with the Odense Social Education Seminar.

**Technical solution**

Facilities have been set up for digital video recording and editing in the Lindebjerg Home system and functions have been developed to handle electronic correspondence messages between Lindebjerg and OUH and the residents’ general practitioners. In addition, access has been provided from OUH to the Home system via the Health Data Network.

**Finance**

The project expenses have been shared so that the Danish Centre for Health Telematics has paid the costs of the Health Data Network in the project period totalling DKK 30,000. The other development expenses are paid by the other suppliers.

*Deputy manager Michael Henrikse and assistant Ellen Foss, Lindebjerg Home, assessing video recordings from the home. On the left is one of the Lindebjerg residents.*
Cooperation between general practice and hospital

**Project description**

The aim of this project has been to try out new technical options in cooperation between general practice and the hospital sector. In practice it entails creating electronic access to patient data across the sectors as a supplement to the sending of patient data, which already takes place.

The project is based on Aeroe in support of the National Health Insurance effort to preserve and strengthen primary healthcare services on the island, on which the proportion of people over the age of 70 is twice as high as in the entire County of Funen. The National Health Insurance and the four medical practices on the island are cooperating in the project.

The telemedicine solution means that general practitioners on Aeroe have access to X-ray images from Funen Hospital Aeroskoebing via the Health Data Network and to patient data from the Funen hospital service via the Health Data Network and Sundhed.dk (The Danish eHealth Portal). The general practitioners can also consult their colleagues’ recordings using P-EPJ, which extracts record data at personal identity number level from the medical record systems. This is useful when the GP is on duty and is consulted by a colleague’s patient. The GPs additionally take part in the County of Funen teledermatology service.

**Experiences**

The project has led to increased electronic communication across the sector boundary between general practice and hospital. It is a great benefit that the on-call GP can consult the record systems of other general practices and view notes, medication and laboratory data for patients who are not his/her own. This provides greater certainty of correct treatment for the patient.

For the time being the GPs will only be using X-ray consultations to a limited extent, as the system is too time-consuming in short consultations. Furthermore they only use access to SUP data from Funen Hospital in a few cases, because the solution at present does not contain admission data from Funen Hospital. This need is met in practice by phone calls to the hospital.

**Outlook**

It is a challenge for a general practice to become familiar with the telemedicine solutions and integrate them into daily routines. The general practitioners often find that they do not have enough time to use these tools during an appointment.

Digital image communication can be utilised better in the future. One idea is for the general practitioner to go on home visits with a digital camera when the patient returns home from the hospital. Photographs can demonstrate where there is a need for improvements of the equipment of the home.

**Technical solution**

Use of existing systems and link to the Health Data Network. The P-EPJ system, which extracts record data at personal identity number level from medical record systems, has been developed for the project.

**Finance**

There has been limited financial investments in the form of purchases of digital cameras and image modules for record systems. In addition resources are spent in setting-up and definitions of access conditions in systems and networks. Development of the extracting system P-EPJ is funded by the suppliers of GPs’ systems and the Danish Centre for Health Telematics. There are no expenses associated with the operation of the extracting system in the project period.
Videoconferencing in the Department of Orthopaedic Surgery

The aim of this project has been to support an organisational merger of the two departments of orthopaedic surgery. The departments, located in Middelfart and Odense, have a total of 427 employees. In practice the project is concerned with promoting interdisciplinary information and planning between the department’s two sites using videoconferencing. In addition, the department’s doctors will have access to X-ray consultation.

The overall aim of the videoconferences is to promote the process of integration by creating a visual communication environment. The employees should experience that they are a single forum, despite being in different places. The conferences are intended to ensure the daily organisation of work and the coordination of functions and at the same time assist in clarifying difficult patient cases.

The solution also makes provision for remote instruction using a double monitor, so that the participants gain the perception of a common forum and on the second monitor can, for example, follow a PowerPoint slide show or other digitised information. External communication to accomplish national and regional functions can also take place via videoconferencing.

The project was launched in May 2006.

Project description

Using two flat-screen monitors and a web camera, staff in the Department of Orthopaedic Surgery in Middelfart can hold virtual meetings with their colleagues in Odense.

Experiences

The department holds morning conferences daily and heads of department meetings weekly using videoconferencing. In addition, meetings between consultant doctors, staff group meetings and specialist meetings are held by videoconferencing. The solution serves as a management tool for more effective planning and better distribution of tasks and application of resources. The department additionally saves time and resources in travel between the sites.

The department has invested in a number of interactive CD instruction programmes to supplement internal training.

Outlook

Motivation and time are required to familiarise all staff groups with the technology. The solution can usefully be extended, not just to orthopaedic surgery but to all functions that are separated physically and that are to fulfil one function with interdisciplinary planning. Above all it is appropriate to have professional meetings for specialists in the region.

Technical solution

Conference rooms have been set up in Odense and Middelfart, both equipped with two large flat-screen monitors. In Odense a projector has additionally been connected to the equipment. The other equipment is standard videoconferencing equipment linked together via the County of Funen network.

Finance

The investment in the combined equipment, including installation, implementation and support, amounts to around DKK 250,000.
Useful management instrument

The Department of Orthopaedic Surgery of Odense University Hospital has good experiences using videoconferences. The department is physically divided with a third of the staff in Middelfart and the remainder in Odense.

"With the establishment of one department covering two sites, the need for an instrument for internal coordination and planning arose. Videoconferencing equipment was an appropriate tool to use, and it could also help to support the formation of a new common culture," Hans Ri Jørgensen, a consultant in the Department of Orthopaedic Surgery in Middelfart, explains.

Two large flat screens and a video camera were installed in special conference rooms at the two hospitals. In Odense a projector has additionally been connected to the equipment. Every morning the monitors and cameras are switched on in Middelfart and Odense when the department has a joint conference. In Odense 40 staff members typically take part and in Middelfart 16.

"The conferences follow a fixed structure, in which the department management provides guidance on all conditions and on planning. We also exchange information for example on excess occupancy and transfer of patients, so that we make the best possible use of capacity," says Jørgensen.

"We're still experiencing some technical problems, with the sound coming in bursts. The participants in the meeting need to be careful not to interrupt one another."

There is a meeting between heads of department every Tuesday. Here, too, the form of meeting is firmly structured with discussions of such things as coordination and work arrangement. Every other Wednesday it is the consultant doctors who gather in the video-conference room.

"In fact all staff groups can book the conference room for staff meetings. The secretaries in particular are very adept at using the digital meeting forum," says Jørgensen. "A great advantage is that we save time and resources in travelling between Odense and Middelfart. We can spend that time on other tasks and in so doing gain more quality in our work."

Hans Ri Jørgensen, consultant doctor in the Department of Orthopaedic Surgery, Middelfart.

Digital specialised meetings and instruction

While it has been relatively simple to implement the electronic form of communication in connection with organisational meetings, the challenges are slightly greater with regard to specialist meetings and instruction.

"Every Wednesday we have an opportunity for an instructional conference by video, but we could make even better use of the electronic form of communication in specialist contexts," Jørgensen feels.

"For instance, doctors could view recordings of operations for use in discussion and exchange of experience to an even greater extent."

Some groups of healthcare professionals are still hesitant to use videoconferencing. This may possibly be due to the fact that these groups have never been affected by the problem of having to travel between the two sites.

"To a large extent it's a matter of culture and getting used to the idea," says Jørgensen.

"The best way of motivating staff is simply to use the technology during the regular organisational meetings, so that everyone gradually becomes familiar with the medium.

All in all, I consider that the time is right for extending the use of videoconferencing. Many hospitals have departments divided between two sites. This will also be a practical meeting policy in many contexts in the new regions."
Videoconferencing in general practice

**Project description**

This project is a further development of the Health Optimum project (see page 26) with the aim of optimising the treatment of endocrinology patients.

In connection with the project teleconsultations are initially conducted between a general practitioner and the Medical Department on Funen Hospital. The consultations take place once a month and may relate to all types of endocrinology patients, for example patients with diabetes, hirsutism (increased hair growth), osteoporosis (brittle-bone disease) and thyroid disease (a metabolic disease). One of the aims may be to obtain a second opinion and to confer on transfer of type 2 diabetes patients from hospital to continued checks by general practitioners.

The project does not have any organisational consequences. There may, however, be a need for a nurse at the general practice, to assist with the arrangement.

It is anticipated that the arrangement will optimise patient treatment, for example because more patients can be treated exclusively in the primary healthcare sector, and because outpatient checks and travel to Funen Hospital Svendborg are avoided.

**Outlook**

The project has not yet been put into operation due to technical difficulties in establishing videoconferencing at GP practices.

No special agreements have been made on fees in connection with the arrangement, but the project is carried out on the basis of interest and goodwill on the part of those involved.

**Technical solution**

Standard videoconferencing set-up at the GP practice and use of existing equipment at Funen Hospital Svendborg. A reliable network connection has been established via the Health Data Network.

**Finance**

Video equipment in GP practices has been purchased for around DKK 30,000. In addition there is the connection to the Health Data Network.

Brigitte Lund, GP in Vindeby, Tåsinge, has the telemmedicine equipment ready for videoconferences with the Medical Department of Funen Hospital.
The aim of the project is to carry out a scientific comparison of two different models for early discharge of patients who are suffering from COPD, Chronic Obstructive Pulmonary Disease. One model is known as a “follow me home-scheme”, where a lung disease nurse accompanies the patient to his or her home after discharge and monitors the patient closely for around 14 days.

In the other model, the patient is given a “briefcase” to take home, containing a computer, measuring equipment and communication equipment.

The primary aim of the project is to improve quality from the patient’s point of view. The comparison is therefore going to provide a basis for evaluating how satisfied the patients are with the two arrangements. The project is also intended to show whether there is a difference between the two models in the number of re-admissions, and how frequently the patients are in contact with the hospital department or general practitioner.

Outlook
Pilot trials of the two models will take place in the spring of 2007, and, following from that, the actual project will be launched.

It is planned that the project will cover 100–150 patients. The patients take part in the project for two weeks, followed by a three-month follow-up after discharge. It is anticipated that around 25% of COPD patients in the Medical Department will be suitable to take part.

It is important that the patient feels secure with the arrangement so that re-admission is avoided as far as possible, and monitoring of the patient is an essential element of both models. The hospital is setting up a hotline on which patients in both arrangements can obtain expert help.

It is estimated that there are 250–300,000 patients with COPD in Denmark, and around 20% of all admissions to medical departments are COPD patients. The number of patients is expected to rise considerably over the next few years. The expectation for the project is that COPD patients who are admitted in their own homes will save up to 15–20 days of admissions to hospital each year.

Technical solution
The equipment the patient will be using at home has to be simple to apply and must be possible to operate following a brief instruction and testing. Another requirement for the equipment is that it can be set up and operate with 1–2 hours’ warning. It must be independent of cables, and high data security is required.

The idea is that the equipment is contained in a “briefcase” for satellite-based communication with a monitor, camera and microphone for videoconferencing, a spirometer to test lung function and a pulse oximeter to test oxygen saturation.

The project will run as a closed system. Later on it is intended that the system will be integrated with EPR, so that measured data are automatically transferred to the patient’s record.

Finance
The price of the equipment has not yet been fixed.
The aim of the project is to ensure the best possible quality of treatment for the population of Aeroe by giving them direct contact with specialists from Funen Hospital Svendborg and thus saving them a trip to Svendborg. The project has covered two areas of medicine, cardiology and diabetes.

Health Optimum is an eTEN project supported by the European Commission and is taking place in close cooperation between partners from the Veneto region in Italy, the Aragon region in Spain and the County of Funen in Denmark. The Danish part of the project is based at the Medical Department of Funen Hospital.

A specially trained cardiac nurse takes the ferry from Svendborg to Aeroeskoebing once a fortnight. She brings a portable ultrasound scanner, which is used for examining patients at Funen Hospital Aeroeskoebing. The images are assessed by a heart specialist, who is in Svendborg, and he is in dialogue with the nurse and patient via videoconferencing equipment.

Similarly, a diabetes nurse travels to Aeroeskoebing once a fortnight to measure patients’ blood pressure, blood sugar and BMI (Body Mass Index) and to assess circulation and sensitivity in the feet. The diabetes specialist in Svendborg follows the examination on-line and is able to make a diagnosis, commence treatment and prescribe medication. From his or her office, the doctor can even zoom in on foot wounds, changes in the patient’s eyes etc.

The greatest challenges in the project have been the cultural changes associated with the fact that healthcare personnel have to get used to new working methods and ways of thinking. Undoubtedly, the telemedicine tools can be used in other areas of medicine, and the Medical Department of Funen Hospital already has several projects ready for trial in early 2007.

Technical solution
A portable GE ultrasound scanner is used for the telecardiology solution. In addition there is videoconferencing equipment at Funen Hospital Aeroeskoebing and Funen Hospital Svendborg. The heart specialist has two monitors, so that he can assess the examination images and at the same time have a video image and audio communication with the patient and nurse.

Existing videoconferencing equipment at Funen Hospital Aeroeskoebing and at the diabetes specialist at Funen Hospital Svendborg are used in connection with the telediabetes solution. Both solutions use the county network.

Finance
Funen Hospital has purchased the ultrasound equipment with project support from the EU. The hospital already had the videoconferencing equipment.
Better quality for the patients

“The reason why these particular telemedicine projects were chosen was that we had to choose areas with just the right volume in terms of the number of patients. That's vitally important if the staff are to become familiar with the technology,” says senior consultant doctor Michael Hansen-Nord from the Medical Department, Funen Hospital.

Good results
“Our experience with telemedicine has been very positive. Above all it has given a substantial improvement in the quality of treatment, because otherwise some patients would never get to see a specialist. And from the point of view of all the patients involved, they have saved a lot of travel time.

The nurses have become considerably more prominent and assist in ensuring better initial assessment of the patients. In the area of cardiology, for example, the nurses can examine patients with suspected heart problems referred by their own GPs and in many cases make the diagnosis.

“The nurse can sift out those patients who are in good health and make sure that the rest receive treatment,” Hansen-Nord explains.

“The doctor becomes involved to the extent that the nurse finds a need for a specialist assessment. In many cases the doctor’s assessment can be made using videoconferencing equipment. Only in a few cases the patient needs to travel to Svendborg for a personal consultation.”

Shift in tasks
Telemedicine services have thus greatly expanded the set of tasks accomplished by nurses, while doctors are able to spend more time on things for which they are particularly qualified. The outcome is better utilisation of resources.

“The greatest challenge was that staff and patients had to get used to communicating through the videoconferencing equipment. The change-over was quite painless, because both parties were quickly able to see the benefits. Any scepticism patients might have tends to disappear after the first consultation, and, by far, the majority are in favour of continuing their treatment in this way,” says Hansen-Nord.

“It is also found that the diagnostics is just as good as in traditional examinations. And patients on the island of Aeroe have reached the national level with regard to the number of heart scans.”

From project to operation
Today both telecardiography and telediabetes are part of daily operation in the Medical Department. And if it was up to Hansen-Nord, the solution would also be extended.

“We would like, for example, to be able to send a specially trained nurse with a heart scanner to the new municipal healthcare centres or large medical centres. We would also like to be able to extend videoconferencing to other medical areas such as lung diseases and metabolic diseases.

The international dimension has been particularly significant for the project work,” Hansen-Nord emphasises.

“We’ve been pleased with the international cooperation with Italian and Spanish partners who have been working on equivalent telemedicine projects. At conferences we’ve had an opportunity to discuss solutions and talk about the difficulties we’ve encountered along the way.”

Interview

A handful of enthusiasts in the Medical Department of Funen Hospital Svendborg, a portable ultrasound scanner and videoconferencing equipment are the main ingredients in the two Danish sub-projects in Health Optimum.
Outlook
If the project fulfils the expectations, it will be possible to expand and broaden international cooperation in this area. It will be possible to outsource tasks to other hospitals, for example, because there is a need for special expertise, or because it is necessary to have basic tasks solved elsewhere in order to free one’s own specialists.

Baltic eHealth is a cooperative project between Denmark, Sweden and Norway and two hospitals in Estonia and Lithuania. As part of the project, the Danish Centre for Health Telematics in Denmark, Carelink in Sweden and the Norwegian Centre for Informatics in Health and Social Care (KITH) have expanded their cooperation and created the basis for the IT infrastructure that links the healthcare networks of the three countries. A link has also been established with the regional networks in Estonia and Lithuania.

Funen Hospital, represented by the Department of Imaging Diagnostics, is the Danish participant. As part of the project X-ray images from Funen Hospital Svendborg will be sent for routine assessment and description to hospitals in Tallinn (Estonia) and Vilnius (Lithuania).

A pilot project will be carried out at the end of 2006 with around 50 radiological examinations.

Finance
The project is being carried out with support from the Baltic Sea Region Interreg IIIB programme in the EU.

Teleradiology can be used both to obtain expert assessments and to outsource basic tasks.
Outsourcing of tasks

“Outsourcing of tasks”

The Department of Imaging Diagnostics in Svendborg actually viewed teleradiology primarily as a way of obtaining specialist knowledge, but now the focus is just as much on outsourcing basic tasks.

“Special tasks and basic tasks”

“The original approach in the project was that we wanted to use teleradiology to obtain specialist knowledge from experts abroad. We wanted to be able to send images and get an external assessment from a specialist, regardless of whether he or she is in Copenhagen, Malmö or Tallinn. That option is still relevant, but the focus now is on using the technique to outsource tasks. It may be basic tasks that we outsource, either because we lack resources ourselves or because we would like to give our own doctors better ways of ensuring their professional development in other more knowledge-heavy areas,” says Christensen.

“I think it’s a good and correct way of looking at telemedicine, but at the same time we’re aware that it’s a balancing act when we choose to outsource tasks. If we outsource too much, it may be at the cost of our local expertise, and we obviously don’t want that.”

“Mental adjustment”

“The greatest barrier in a project like this is probably the need to get used to the idea that doctors in another country solve some of our tasks. There are some cultural differences to take account of and perhaps some prejudices too. As part of the preparations for the project we’ve been visited by the doctors from Estonia and Lithuania who are taking part in the project, and we’ve had a chance to compare the quality of our work. The result is quite clear, there are no quality differences. Then there is the cultural adjustment, but as I’ve mentioned, we’re used to having doctors of many different nationalities, so it should be possible to deal with that aspect too.

The only condition on our side is that cooperation in telemedicine must not entail communication problems, so it’s important in this context that our cooperating partner has a secretary who speaks Danish and knows the appropriate terminology.

We believe in the project,” Christensen emphasises.

“Right now we’re waiting for the pilot test. When it’s been carried out with satisfactory results, I anticipate that we’ll be able to continue with the cooperation, initially under a two-year contract.”
Telepsychiatry

The project will examine whether it is appropriate to use telepsychiatric treatment based on videoconferencing. The idea is that the teledmedicine solution will reduce the need for psychiatrists to travel between different consultations and thus make more time available for treatment. The solution is also intended to improve the treatment of refugees and immigrants. Teledmedicine will make it easier for these patients to be treated by a psychiatrist who speaks their mother tongue.

The project is based in the Department of Psychiatry of Funen Hospital Svendborg, which attend to the psychiatric patients admitted to Funen Hospital Aeroeskoebing and to supervision under district psychiatry in the Municipality of Aeroe, with premises at Funen Hospital Aeroeskoebing.

A videoconferencing room has been set up in the Department of Psychiatry in Svendborg and at Funen Hospital Aeroeskoebing the staff use videoconferencing equipment that already existed.

Patients with a different ethnic background can receive tele-therapy in their mother tongue from psychiatry specialist Davor Mucic at Psychiatric Centre Little Prince.

Experiences
The project was launched at the end of October 2006, and the first telepsychiatry sessions have taken place, with the expected positive results. Experiences from elsewhere also indicate that the quality of the therapy sessions is just as good as when the psychiatrist and patient are in the same room. The patients have no problems accepting the technology, and the psychiatrists get used to the new way of having therapy sessions relatively quickly. In addition, the psychiatrists save traveling time and expenses.

The diagnostic quality of sessions in foreign languages is judged to be good, and more than 90% of this group of patients prefer therapy sessions in their mother tongue. The advantages clearly exceed the alternative, where a Danish-speaking psychiatrist uses an interpreter, because it is difficult for the psychiatrist to diagnose and treat patients with a substantially different cultural background. As well as improved quality of treatment for refugees and immigrants, the scheme also means lower expenditure on interpreters and travelling.

Outlook
The head of Department P anticipates a favourable outcome from the project and that telepsychiatry will quickly become routine practice. It is also anticipated that it will be possible for the technology to be extended even further in the future. Consideration is given, for example, to installing videoconferencing equipment in district psychiatry, initially in Faaborg, Broby and Assens. It is also thought that in special cases the psychiatrists might be able to use this solution to obtain a second opinion, for example from Copenhagen University Hospital.

Technical solution
Standard videoconferencing solution between the Department of Psychiatry at Funen Hospital Svendborg, Funen Hospital Aeroeskoebing via the County of Funen data network. It is also possible to make calls to IP addresses outside the County of Funen data network in connection with consultations and treatment in other languages with the specialist Davor Mucic.

Finance
The cost of acquiring videoconferencing equipment for the department at Funen Hospital Svendborg totals around DKK 75,000. Funen Hospital Aeroeskoebing uses facilities that were already installed.

Secretary Karen Bentzen demonstrates the videoconferencing equipment.
Cooperation and success

Funen success

Project results and experiences are described on the preceding pages. The projects offer many different prospects. Cooperation across the sector boundaries is greatly increased, and better use can be made of specialists. Patients can be treated earlier and can also gain access to specialist assessments to a greater extent etc. In other words, the projects offer greater opportunities for positive effects, greater efficiency and savings.

An important lesson learnt from the projects is that the use of telemedicine demands a willingness for change, particularly among the staff. It requires conscious and active management, for example in situations where telemedicine involves a transfer of tasks from one group of staff to another. Support from the management is essential. The projects that have yielded the best results have received both support and pressure from the management and, at the same time, initiatives from the bottom of the hierarchy has been welcomed.

Good cooperation

There have been many close cooperative relationships in connection with the projects – within the County of Funen, in the Region of Southern Denmark, national centres of excellence, clinical societies and international partners, including WHO, the Norwegian Centre for Telemedicine in Tromsø, the International Society for Telemedicine and eHealth and the Nordic Telemedicine Association. A number of IT companies have also taken part in the cooperation. And it has worked satisfactorily at all levels.

For most of the parties involved, the telemedicine projects have been extra tasks in an already busy everyday situation. It is judged to be very significant that responsibility for coordination has been placed in an independent project organisation.

As a spin-off from two specific Funen projects, cooperation agreements have been made with external suppliers on joint product development and payment of royalties in connection with sale of the developed product to others. One project is “Telemedicine in the therapy department”, in which the Therapy Department of Funen Hospital has assisted in the development of a “smart exercise mat” together with the Danish Centre for Health Telematics. The external partners are the Mærsk McKinney Møller Institute at the University of Southern Denmark and the company Entertainment Robotics. The other project is COPD-Funen, in which the Medical Department of Funen Hospital, the Danish Centre for Health Telematics and the company of GITS are developing and testing a “briefcase” containing communication and medical equipment to be used by COPD patients who are discharged early.

International success

Ten international projects have been completed, four are in progress, and applications for four new projects have been approved. The County of Funen, together with the Danish Centre for Health Telematics, is consequently one of the leading players in European telemedicine projects. At the same time, the activities mean that the Region of Southern Denmark and the centre form part of a strengthened network and practical cooperation with other regions in the area. In addition, strategic cooperation relationships are being developed with the most significant industrial partners in healthcare IT.
The use of telemedicine in the Danish healthcare system is still in an introductory and testing phase. Many of the obvious ways of using it that are emerging have therefore been exploited for the first time in connection with the projects described in this brochure.

It is nevertheless characteristic that some of the telemedicine solutions included in the projects have already entered general operation, or will be doing so very soon. The advantages are so evident that there is not much to be concerned about. The technique is neither complicated nor costly. It is often found that it is mainly barriers in relation to traditions, organisation and culture that have to be overcome.

In other areas, however, there are still technical challenges to be faced before it will be possible to make full use of telemedicine. This applies for example to integration with IT systems and other information and communication technology solutions in the organisations that are due to take part in cooperation. Here too, however, favourable experience has been gained during the projects.

Overall the projects provide a good picture of the potential and outlook for the use, development and expansion of telemedicine.

### Telemedicine on a large scale

The projects demonstrate that it is possible to attain good effects, efficiency improvements and savings. It is important that this becomes widely known in the healthcare sector, and that initiatives are taken for solutions on a large scale at local, regional and national level. This will mean that telemedicine becomes fully effective.

### Increased cooperation across sector boundaries

Telemedicine can greatly assist in increased cooperation across sector boundaries. General practitioners can consult specialists and special centres. Specialists in private practice can consult specialists in hospitals. Hospitals which principally fulfil basic tasks can consult hospitals with national or regional specialisms. Telemedicine also provides opportunities for expanded cooperation between the healthcare sector and home care, all with a view to improving quality and optimising the treatment of patients.

### Decentralisation and centralisation

Most patients do not need highly specialist treatment, or only need it to a limited extent. They therefore do not need to be transported over long distances if they can attend the necessary consultations near home or if their local contact with the healthcare system can obtain advice at the right place. In other words, there is a need for a combination of a decentralised and centralised structure, in which telemedicine ensures that the decentra-
lised functions have access to consultation, advice, quality development etc.

**New views of procedures and shift of skills**

Optimum use of telemedicine very often necessitates adapting the distribution of tasks and arrangement of work. It is important to develop a culture where there is a willingness to embrace change, where it is not just the ones who are given new tasks who are prepared for change. The ones who are to give up tasks must also be able to see the gain. Experience from the projects shows clearly that it is among healthcare personnel that attitudes have to change – patients are ready for the new situation.

**Better use of specialists**

There is great potential in telemedicine in an increased proportion of the population receiving more advanced healthcare, as there is easier access to specialists regardless of where the patient lives. At the same time it is possible for the time of specialists to be focused on the patients who really need it. One example is the situation where a specially trained nurse in the outpatients department of the hospital scans the patient and depending on need involves the specialist. Experience also shows that in connection with telecardiology the cardiologist spends a maximum of 10 minutes on a consultation, while the time spent on an outpatient consultation typically is around 30 minutes. The assessment made on the basis of the project is that clinical effectiveness in telecardiology is just as good as when the patient consults the specialist personally.

**Distance is relative**

There is often a tendency to view telemedicine as an aid used over long distances. In many cases healthcare professionals will, however, be able to use telemedicine internally between departments in the hospital and within the individual department to great advantage.

**In the patient's own home**

Society is currently undergoing development in the direction of an ageing population that demands more treatment and towards there being fewer people of working age from whom to recruit healthcare professionals. This entails a great need for solutions under which more patients can help themselves and that enable them to be diagnosed, treated and monitored in their own homes. Telemedicine has much to offer in this context.

**Greater patient satisfaction**

Telemedicine makes treatment more readily available to patients. It can be said that the healthcare system comes to the patient, rather than the other way round. This successfully
meets the political objective that all patients must have equal access to high-quality treatment and a specialist when and where they need one.

**Early treatment, continued treatment**

Decentralisation of particular treatment options in many situations makes it easier to bring patients into treatment earlier and keep them in treatment. Tele-alcohol abuse therapy is a good example. Some patients start on the therapy while they are hospitalised for a somatic illness. Others say yes to the offered therapy because they can receive it without having to make several long journeys.

**Contact network and international projects**

Being involved in telemedicine projects in many cases entails that the individual function is given a high profile in meetings, congresses and visits. This applies particularly in international projects. An important incidental gain in this context is many new contacts, inspiration and motivation to continue with the work of developing and improving telemedicine solutions and thus the range of treatments offered by the function.

**National index**

In some contexts it is easy to imagine archives being built up of test and examination results at regional, national or international level and these archives being available on-line. One example might be an index or archive of all radiological examinations in the form of images and descriptions, which can be accessed via the public healthcare portal Sundhed.dk.
## Outlook for the individual projects

<table>
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<tr>
<th>Project</th>
<th>Description</th>
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| **Tele-alcohol abuse therapy** | ● Experience is so good that the greatest challenge now is to ensure a general dissemination.  
● This form of alcohol abuse therapy can also be used in general practice, in social services, at large workplaces, on ships, on drilling platforms, in prisons and in patients’ homes using a secure Internet solution and a web camera.  
● Another area of use is Internet chat-rooms, where young people can receive advice anonymously.  
● Extension of a similar solution to other areas – dietary advice from a dietician, treatment for abuse for example of narcotic substances, treatment of social phobias etc.                                                                                                                                                                                                                      |
| **Teleradiology**             | ● The solution can be directly extended to all hospitals in the Region of Southern Denmark.  
● The solution can also be immediately extended to departments that need to outsource basic tasks to other departments in Denmark and abroad, or which need a special opinion from particular specialists in the specific area.  
● In addition, the solution can be used to transfer images of elective patients and outpatients.                                                                                                                                                                                                                                               |
| **CAG cooperation**           | ● The solution can be immediately extended to all hospitals in the Region of Southern Denmark.                                                                                                                                                                                                                                                                                                                                                                                             |
| **Tele-wound assessment**     | ● The solution can be directly extended to other hospitals in the region and can also be used by nurses who work in the homes of patients.  
● The solution should be extended to also support cooperation with municipal home care.                                                                                                                                                                                                                                                                                                                                                   |
| **IT in paediatric home care**| ● In the slightly longer term, and with extended technical capabilities, it will be possible for videoconferencing to be established from the homes of sick children to specialists at the hospital.                                                                                                                                                                                                                                                                                                |
| **Videoconferencing in hospital department** | ● The solution with videoconferencing between several wards in the same department can be directly extended to other functions that are physically separated.  
● Possibility of adding mobile phone with camera between first and second on-call doctor and duty period reporting to morning conference via the videoconferencing system.                                                                                                                                                                                                                               |
| **Telecardiology and telediabetes** | ● The solution can be directly extended to other departments where there is a need to carry out consultations and check-ups remotely.  
● The solution can be extended to cover general practice and hospitals, hospital departments across geographical distances etc.                                                                                                                                                                                                                                                                              |
In addition to the specific telemedicine projects, the Danish Centre for Health Telematics conducts a whole series of activities to extend knowledge of technologies and opportunities in telemedicine. The activities comprise training, holding of and participation in conferences and the issuing of publications, brochures and articles. The Centre has additionally established relations with the business community and cooperates with national and international players.

Training activities

The Danish Centre for Health Telematics offers a photography course in teledermatology and tele-wound assessment to medical specialists and GPs. In this connection an instruction CD-ROM has been prepared with detailed instructions on how to take dermatology photographs. In cooperation with the Norwegian Centre for Telemedicine, the Danish Centre for Health Telematics also holds videoconferencing courses.

Conferences

The Danish Centre for Health Telematics regularly attends conferences on telemedicine to present projects and technologies and gather professional inspiration. The Centre has, for example, taken part in or arranged the following conferences:

Telemedicine themed day, February 2004
Arranged by the Danish Centre for Health Telematics as a launch-pad for the Funen telemedicine initiative.

Telemedicine – global opportunities and status in Denmark, December 2005
Conference arranged in cooperation between the Danish Society for Clinical Telemedicine and the Danish Centre for Health Telematics.

TTeC, Tromsø Telemedicine and eHealth Conference, June 2006
The Danish Centre for Health Telematics was responsible for the practical arrangements for participants from the County of Funen. In cooperation with the Norwegian Centre for Telemedicine, the centre also arranged a Danish-Norwegian workshop on public use of the Internet in connection with healthcare services.

Telemedicine without frontiers, December 2006
Conference arranged in cooperation between the Danish Society for Clinical Telemedicine and the Danish Centre for Health Telematics.

Publications, brochures and articles

The Danish Centre for Health Telematics has issued a number of publications, articles and brochures on telemedicine. For example:

Notes on general organisational conditions in the use of telemedicine
Drawn up by Peder Jest, medical director, Funen Hospital, and Lars Hulbæk, Danish Centre for Health Telematics, in November 2005.

Telemedicine – an important tool for the future healthcare sector
Published December 2005.

Patient data migrate securely from hospital to hospital
Article on the Health Data Network and telemedicine in Computerworld, CIO, no. 3 April 2006.

Telemedicine and the Health Data Network

How to take a good digital photograph in 2 minutes
Guidance on CD-ROM.

The good teledermatology consultation
Published July 2003.
Partners in cooperation

Business relations

The Danish Centre for Health Telematics has taken various initiatives to involve IT companies in the development of telemedicine. The Centre has also entered into cooperation agreements with a number of Funen IT suppliers on product and IT development in connection with the implementation of the telemedicine projects. The IT companies are Team-Online, Digi-Eyes, Munk IT, Robotics Entertainment and Global IT Systems.

Partners in cooperation

The Danish Centre for Health Telematics cooperates with both national and international organisations on the development and implementation of telemedicine. The principal organisations concerned are:

Nordic Council – Nordic Telemedicine Cooperation Forum set up on the initiative of the Nordic Council of Ministers. The aim of the forum is to contribute to the development and increased use of telemedicine in the Nordic countries. The Danish Centre for Health Telematics has been designated by the Danish Board of Health as the Danish representative.

NTA – Nordic Telemedicine Association. This organisation focuses on Nordic exchange of knowledge and experience and arranges a Nordic Telemedicine Congress once every two years. The Danish Centre for Health Telematics is represented on the board.

DSKT – Danish Society for Clinical Telemedicine. The Society’s task is to promote theoretical knowledge and practical advances in the use of telemedicine tools. The Danish Centre for Health Telematics is represented on the board and assists in the arranging of annual meetings.

ISFTeH – International Society for Telemedicine and eHealth. The organisation’s overall aims are to facilitate international dissemination of knowledge and experience in telemedicine and eHealth and provide access to recognised experts in the field worldwide. The Danish Centre for Health Telematics is represented on the board.

NST – Norwegian Centre for Telemedicine, Tromsø is the national centre of excellence for telemedicine in Norway. The centre is a world leader in research and development, instruction, guidance and advice on telemedicine. The Danish Centre for Health Telematics and the Norwegian Centre for Telemedicine cooperate on international projects and training facilities.

The Danish Technology Council has the task of promoting the technology debate, assessing the capabilities and consequences of technology and advising the Danish Parliament and Government. The Danish Centre for Health Telematics cooperates with the council on Pervasive Healthcare/telemedicine.

Sundhed.dk The joint public healthcare portal is intended to make electronic communication possible between doctor and patient. At the same time the patients will be able to keep track of their records from home. Sundhed.dk and the Danish Centre for Health Telematics cooperate both generally and in connection with specific projects. The two organisations to a large extent supplement and complement one another, and it is therefore natural for the cooperation to become ever closer.
Danish Centre for Health Telematics

The Danish Centre for Health Telematics is concerned with electronic communication in the healthcare sector, nationally and internationally. The centre's principal tasks are the development of communication standards and the development and dissemination of electronic communication solutions in general. The overall aim is to promote quality, service and cohesion between the various parties in the healthcare system to the benefit of effective and rational handling of tasks – and ultimately to the benefit of patients.

The Funen telemedicine initiative 2004–2006 is an example of a practical area of effort. In this context the centre appointed a special telemedicine team with the task of implementing telemedicine solutions in the Funen healthcare system. The team has additionally contributed to telemedicine initiatives in cooperation with the four counties in the future Region of Southern Denmark.

The Danish Centre for Health Telematics was set up in 1994 on the initiative of the County of Funen, and up to the end of 2006 has had Funen, national and international sections. Following the structural reform the Centre has two departments, MedCom and International. In addition, a cooperation agreement has been entered into between MedCom and the Region of Southern Denmark on the secondment of staff from the Region to the Centre.

MedCom

The purpose of MedCom is to contribute to the development, testing, dissemination and quality assurance of electronic communication and information in the healthcare sector at national level. The initiative is intended to support cohesive treatment, nursing and care in patient pathways.

MedCom is responsible for nationwide communication standards, which are to be used by all parties involved in the Danish healthcare system. Its activities also extend to the development of the Health Data Network and project management.

The Ministry of the Interior and Health, the Ministry of Social Affairs, the National Association of Local Authorities, the Danish Board of Health and the Danish Pharmaceutical Association support and finance MedCom.

International

International was set up in 1996 with the aim firstly of passing on the knowledge the Danish Centre for Health Telematics has obtained in connection with its regional and national projects and secondly to learn from the experiences and knowledge of other countries with regard to electronic healthcare communication.

The principal focus of the department is on developing the necessary infrastructure for the use of telemedicine service, telemedicine across borders and sectors and standardisation of electronic communication.

International has attained considerable experience in managing and taking part in projects supported by EU and other international bodies. The projects cover a broad range – from telemedicine in outlying areas of Europe to projects in which bio-informatics and healthcare informatics are combined to achieve synergistic effects. International is an organisational part of MedCom from 2007.
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Telemedicine links

International Society for Telemedicine and eHealth:
www.ISFT.org

Nordic Telemedicine Association:
www.Nordictelemedicine.org

Danish Society for Clinical Telemedicine:
www.dskt.dk

Telemedicine information exchange:
www.tie.telemed.org

MedCom – the Danish Health Data Network:
www.medcom.dk

Danish Centre for Health Telematics:
www.cfst.dk

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