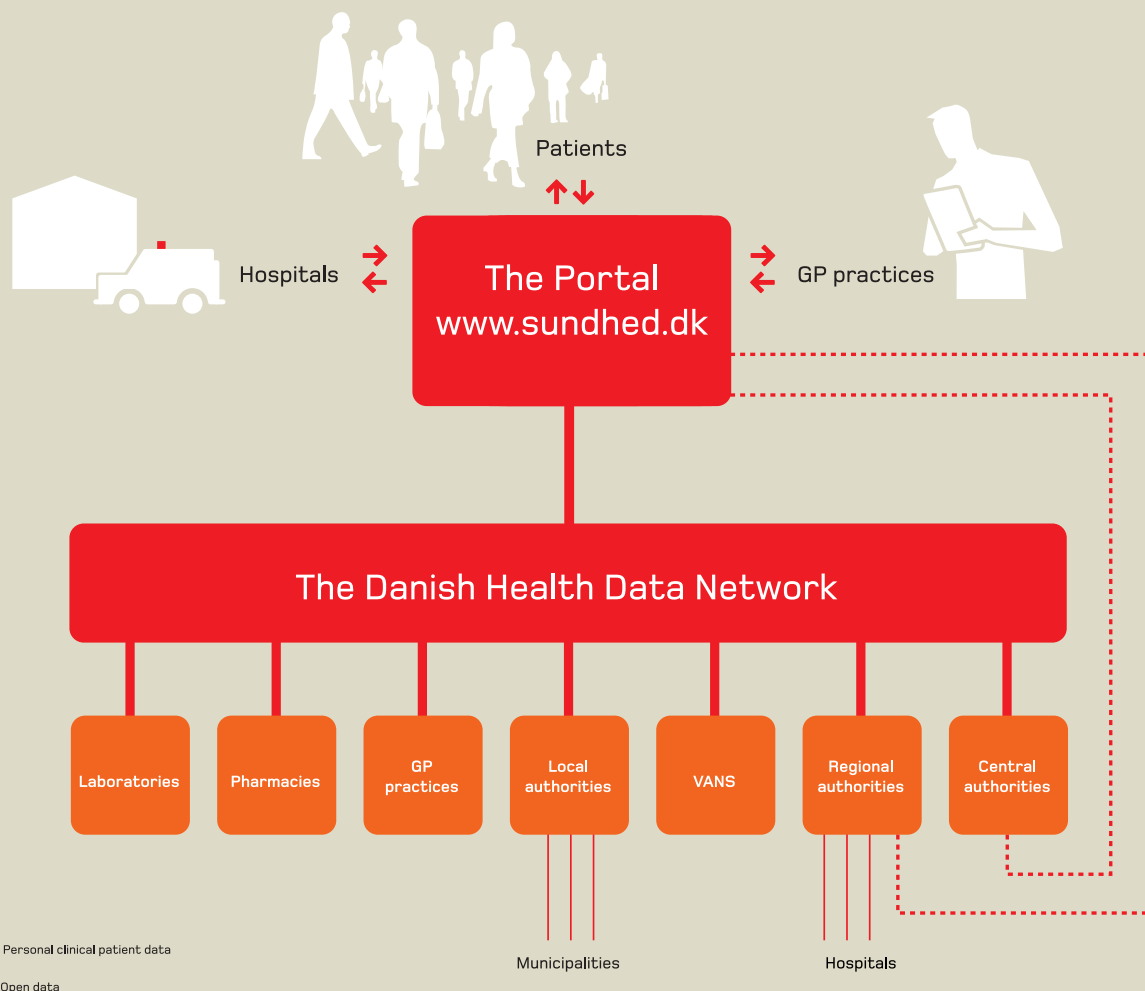


The **Danish** eHealth experience:

# One Portal for Citizens and Professionals



A combination of the public portal, [www.sundhed.dk](http://www.sundhed.dk),  
and a Health Data Network developed since 1990  
gives Denmark an outstanding position on eHealth



#### Danish Health Sector

78 public hospitals: 28.000 beds  
10 private clinics: 150 beds

3500 GPs (2168 clinics)  
1100 Private Specialists  
330 Pharmacies  
2700 Dentists

- 70% of the population have direct Internet access at home
- 92% of the 2168 GP clinics, all 78 hospitals, all 332 pharmacies and a few independent laboratories use electronic EDI communication to communicate between one another
- Information about every hospital and county in Denmark is available on the Internet
- Every month, more than 2,5 million healthcare messages are being sent. Today, electronic communication thus covers 84% of the discharge letters from hospitals to GPs, 97% of the laboratory results, and 66% of the reimbursement
- 81% of all prescriptions (more than one million per month) are electronic. One decisive reason is that more than 95% of all GPs are networked and have installed electronic patient record (EPR) systems.

Ever since the development, implementation and bringing together of the two nationwide public initiatives, The Health Portal and the Danish Health Data Network, Danish citizens and health professionals have been offered a greatly improved eHealth service

# A Network to a Service-loaded Portal for Denmark

## The Health Portal – [www.sundhed.dk](http://www.sundhed.dk)

In December 2003, the citizens of Denmark were offered a better overview of the health sector as well as information about health, medicine, illnesses and their prevention. For the first time, the Portal brings together the entire Danish health service on the Internet, making this the electronic way for patients, their families and healthcare professionals to obtain information, communicate and maintain an overview.

It has been designed to inform citizens of health-related issues and ensure the quality and efficiency of work processes within and between various parts of the health-care sector.

Online banking has changed our approach to banks, and our vision is for the Portal, [sundhed.dk](http://sundhed.dk), to change our perception of the health service in the same way. As the health service becomes more and more reliant on electronic communication, more tools and services will become available on the Portal.

Healthcare, medicines and prevention are popular topics on the Internet, and via the Portal, you will be able to find information and communicate with the Danish health service. No advertising or sponsorship credits will appear on the Portal, as it is the public health authorities that are responsible for its creation and running.

A well-functioning eHealth system as complex as the Portal is developed in several stages, as the health service becomes more and more reliant on electronic communication. Thereby, more and more tools and services will become available on the Portal over time. Feedback from its users is considered to be of great importance, and more complex services, several pilot tests and data developments concerning security are to be developed on the basis of this feedback.

The initiative was launched by the Danish Regions, the Ministries of the Interior and Health, Greater Copenhagen Hospital Board, Copenhagen Municipal Authority, Frederiks-

berg Municipal Authority, and the Danish Pharmaceutical Association. A non-commercial site, the Portal is the result of collaborations between the various health authorities, as well as part of the Danish government's IT strategy. No advertising or sponsorship credits will appear on the Portal, and the portal is 100% free of commercial interest.

## Based on a Pioneering Health Data Network

The Portal has achieved such remarkable results so quickly because of pioneering efforts in the area of healthcare communication. The entire project had its tender beginnings in the early 1990s. Since then, a Health Data Network has been established which presently comprises the vast majority of healthcare players. By virtue of technological advances, its efforts are targeted in earnest on the system's *raison d'être*: patients.

The Health Data Network is developed, coordinated and managed by the Danish Centre for Health Telematics and is backed by the MedCom organisation with a board of trustees with representatives from all health stakeholders. In its initial stages, the Health Data Network focused solely on professional users. The network itself was fully VANS-based, messages were sent in EDIFACT-compliant text format, and special software solutions were developed for the many different computer systems linked to the closed data network.

Just two years ago, it was decided to allow the Health Data Network to enter the Internet age in order to exploit the widespread proliferation of the Internet as well as new communicative opportunities. The very fact that communications have advanced from the VANS-system's "push" strategy to the Internet's "pull" strategy has been very important. Now the recipient, rather than the sender, handles communications.

# The [www.sundhed.dk](http://www.sundhed.dk) portal

## What is online:

### Access to patient data in the laboratory systems

The aim of the supporting access to laboratory data is to give healthcare professionals Internet access to patient data stored in another county, hospital or laboratory database. This is usually relevant in situations where the health professional has to treat a patient without having any knowledge of the patient's data, for example in the case of emergency hospital admissions or when treated by a specialist.

### Access to data local electronic patient records

The Portal introduces web access to data stored in local electronic patient records. The purpose is to increase the accessibility to patient data and to support the clinical decision-making process. Access is granted to doctors and nurses after authentication via a national digital certificate based on the Danish OCES-standard and after a registration of consent from the patient.

### Appointment booking

By accessing the Portal the patient fills in a form requesting a time for an appointment with the general practitioner (GP). Patients are identified by a personal user-ID and a password distributed by the GP. The

request is sent as an EDIFACT via the Health Data Network to the GP and integrated directly in the GP's appointment calendar. The GP may then choose to either accept or refuse the request. In both cases, an email is sent to the patient's secure mailbox on the GP's website.

### Prescription renewal for citizens or homecare

Chronic patients may renew their prescriptions regularly, and in many cases there is no need for a visit to the GP's surgery. The prescription service functions in much the same way as the booking of an appointment. However, in this case the patient fills in a form on the webpage and is asked to provide information about the medication s/he wants to have renewed. When the GP has approved the renewal, the prescription is sent electronically to the pharmacy requested by the patient. The patient is then notified by email.

### Email consultation

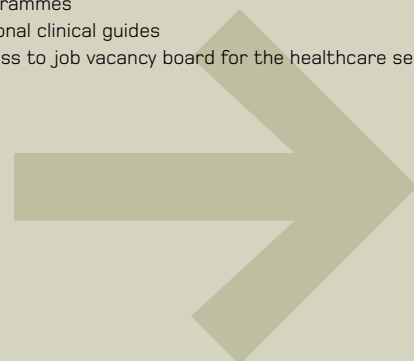
The technical solution for the email consultation is the same as the other two services. With the email consultation, the patient can put questions to the GP and ask him or her for advice. Emailing has obvious advantages. It is possible for a patient to send a question immediately when thinking of it, and hopefully s/he will get a fairly quick response. The patients also get an opportunity to ask

## Functions available to all users:

- Overview of the structure of the health service
- Site map with contact information for the entire health service
- Hospital patient information (examination, treatment, post-treatment)
- E-booking for own GP, prescription renewal, email consultation, change of GP etc.
- Information about health, illnesses and prevention
- Information about choice of hospital and other patient rights
- Handbook of medicine and interactive database
- Information about general preparation for contact with the health service
- Waiting-list information and information about quality and performance
- E-commerce for prescription-only drugs
- Self-generated information from all regional health authorities, hospitals, departments etc.
- Practice declarations to support choice of GP
- Access to current status concerning public reimbursement in personal medical expenses.

## Functions available for healthcare professionals:

- Access to data stored in electronic patient records
- Access to laboratory test results
- Access to editing own practice declaration (GPs)
- Personalisation (own profile and customised information)
- Visit data and access to confidential phone numbers – e.g. hospital departments
- Profile areas: practice information
- Regional clinical guides, consensus reports and reference programmes
- National clinical guides
- Access to job vacancy board for the healthcare sector.



questions that they might not want to ask face to face. The threshold is lowered by the “anonymity” behind the screen.

If the patient agrees, the GP can also send information about non-critical laboratory test results to the patient.

#### **ePrescriptions**

Moving away from paper-based prescriptions from the GP, 81% of prescriptions today are sent electronically directly to the pharmacy. The solution is based on the full integration of electronic communications with the GP's electronic healthcare record and the pharmacy systems.

The electronic transaction has many advantages. Studies show that handwritten prescriptions cause more work for both the pharmacy and the GP. In addition to being time-consuming, illegible handwriting can cause medication errors. Furthermore, through the electronic administration of prescriptions, the patient does not have to wait for the medication to be administered. Upon entry into the pharmacy, the medication has already been prepared. The patient can go back to work or back to bed much more quickly.

# The Health Data Net

From June 2001, the task has been to establish a closed and secure IP-based network for all parts of the Danish healthcare sector and to establish a number of services.

Technically speaking, the Health Data Network has been established by linking existing, closed and secure IP-based data networks of the Danish healthcare sector to a central hub by the use of VPN (Virtual Private Network). An “agreement system” has been established that enables incoming and outgoing data traffic between the local network and the Health Data Network to be controlled.

A new top-level domain, [www.health.medcom](http://www.health.medcom), which is only available from within the Health Data Network has been established. The top-level domain ensures that none of the healthcare services can be accessed via the Internet.

The use of VPN and the creation of the MedCom top-level domain have allowed the partners to reuse the existing Internet connections and equipment. This was essential, since all organisations already had broadband connections.

To enable existing EDIFACT communications to be maintained, an EDI (Electronic Document Interchange) mail standard was developed. It allows participants to send EDIFACT messages from the old VANS to the new Internet-based network.

#### **Functions for the next two phases (2004–2005):**

- Pilot project with link portal (from practice system to information sources, such as [sundhed.dk](http://sundhed.dk), via ICPC code)
- Access to editing own practice declaration (GPs)
- Overview of patient medicine use  
Personal electronic medicine profile)
- Access patient's totally history of illness
- Access to electronic mobile records and special services connected to prenatal care
- E-decision support systems
- Consent declarations
- Booking and advising (e.g. treatment at hospital) (text-messaging and email)
- Project with link portal (from practice system to information sources, such as [sundhed.dk](http://sundhed.dk), via ICPC code).

#### **Perspectives for the later phases (2005–):**

- Intelligent booking across sectors in several different booking systems
- Telemedicine, including video conferencing and remote diagnoses
- Patient-monitoring using the patient's own registration
- Completion and despatch of relevant forms
- Further access to data
- Secure clinical emails between GPs, district nurse service, hospital consultants, physiotherapists etc.
- Platforms for e-learning and further education.

# work – The Infrastructure behind the Por

## New Communications on the Health Data Network

The Internet-based Health Data Network is the backbone of the Portal. The network is already offering many advanced services to a wide spectrum of users. A number of services have been established over the years. For each service, a project group comprising representatives from hospitals, GPs, counties, municipalities and MedCom has been established to carry out the development and the dissemination of the services.

A hospital section receiving an acute patient can make an online information search through the laboratory's analysis results. A small surgical ward can request a second opinion from university hospital experts regarding x-rays or video recordings; a patient can book an appointment with a GP or participate in a consultation via the Internet, and much, much more.

### Web access to patient data in the diagnostic radiology department systems

The "Internet X-ray Image and Description Search" project aims to provide healthcare professionals with direct access to essential patient information stored in the X-ray system of another county or hospital. This is highly relevant for dealing with emergency admissions or national and regional patients and for preparing the treatment of new patients.

### Teledermatology

The overall objectives of the teledermatology project are to support the patient's free choice of specialist, to replace or supplement general referrals to dermatologists with telemedicine consultations, to ensure that patients have equal access to dermatological assessments of skin images, to support the continuing education of GPs through communication with dermatologists, and to establish the nationwide provision of telemedicine skin-image consultation.

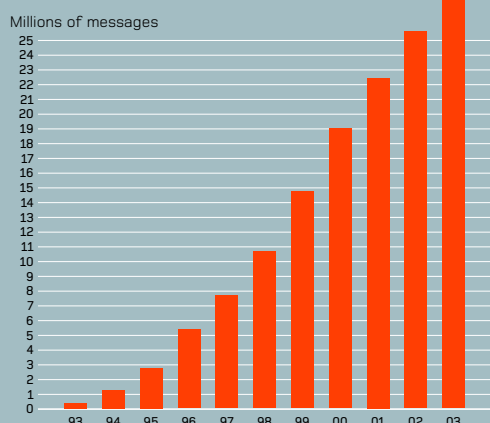
### EDI communications

Although it is possible to send any kind of EDI communication, e.g. XML, EDIFACT, HL7 or DICOM, an open standard for EDI-mail has also been developed to ensure compatibility with existing VANS-based communications and interoperability between the new IP-based network and the old VANS network. This service has been implemented nationally and covers all important communication flows among the various healthcare service units.

### Web requisitions for clinical-biochemical and immunological tests

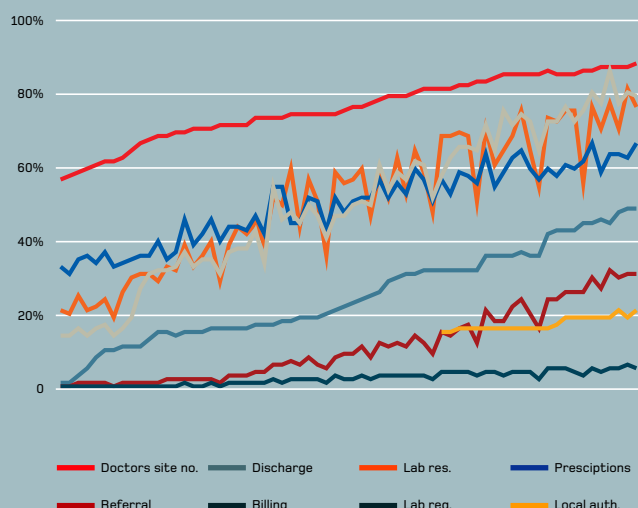
GPs' requests for analyses from departments of clinical biochemistry and immunology are replacing pre-printed paper request forms. The departments will be able to receive electronic requests that GPs fill in via a standard form on the Portal. Using the WebReq programme, all GPs can send an electronic request in MEDREQ format as a normal EDI-file to the relevant departments of Clinical Biochemistry and Immunology.

EDI messages sent in the Danish Health Data Network 1993–2003



The spread and use of the Health Data Network have developed appreciably over the last ten years. Today, 2,5 million messages are communicated per month.

Dissemination of different types of EDI messages 1993–2003



## The MedCom Success Based on 12 Years of Practical Experience

More than two and a half million messages are communicated every month between the parties involved in the Danish healthcare sector. The primary communication artery in this system is the Health Data Network, which has grown from a very modest scope in the early 1990s to a nationwide network with thousands of users – GPs, specialists, dentists, hospital wards and departments, radiology departments, laboratories, pharmacies, the home nursing sector, regional and local authorities, etc.

A characteristic feature of the Health Data Network is that it has grown from the bottom up – the need has principally arisen among its users and has been defined by them. The solutions have been developed, tested, implemented and finally disseminated to the entire healthcare sector.

The prime mover throughout this process has been MedCom, which was founded as a project organisation back in 1994. Since then, MedCom's status has been made permanent under the governance of a board of trustees comprising all stakeholders for the purpose of propagating and developing electronic healthcare communications in Denmark.

Characteristically, visions have corresponded to reality throughout the process. The idea of fast and secure direct communications between users and between computer systems was well-defined from the outset.

In this context, a decisive factor has been the involvement of a highly complex set of users, ranging from a large university hospital to a single GP, where the importance of a few people – or perhaps only one person – would be equal to that of a hospital ward. The Health Data Network has become an indispensable tool for all users in their daily work, simply because the benefits are so apparent.

Electronic communications have also streamlined various procedures. Whenever the Health Data Network has made new advances, organisational changes have been an important consequence. Procedures and working methods have been refined and streamlined in order to derive the full benefit of the new information technology.

Overall, the services provided through the Health Data Network have improved the quality of patient treatment nationally. Different studies show that the services of the Health Data Network described above have made communications between health professionals faster and more efficient, thereby improving patient treatment. The spread and use of the Health Data Network have increased appreciably over the last ten years. More than 2,5 million (2,783,230 in March 2004) electronic messages are now communicated every month.

### Digital Signature – the Key to Security

Security is essential for the Portal and the network. Citizens and patients may only access their own data following individual authentication via a personal digital certificate based on the national OCES-standard. Health professionals may also access patient data having obtained the relevant consent and a local authentication.

### International Synergy

Having proven that we can create nationwide interoperability in a network of regional networks, the Danes are eager to prove interoperability with other nations or regions, and together we can share relevant services.

Very early in the process, the Danish development work took on an international dimension. This was due to a desire to enter into close collaboration with related communication projects abroad in order to inspire others and be inspired in return.

Experience has shown that engaging in international teamwork is not only justifiable, but also necessary.

To a great extent, the situation of and perspectives for the use of information and communication technology in the Danish

healthcare sector are characterised by ideas and experiences that mirror similar projects in practically every EU member state. At the same time, it is evident that the Danish development work has also had an impact on the way other countries have chosen to realise the potential of this new technology.

Over the years, the Danish Health Data Network has thus developed in close correlation with other corresponding initiatives under the auspices of a large number of international collaboration projects, including:

- CoCo (Coordination and Continuity in Health Care), which gathered eleven regional health providers in ten countries.
- PrimaCom (Primary Care Physicians Communication Network), which compr-

sed health-communication projects in Hungary and Slovakia and a number of EU member states, including Denmark.

- Wise (Working in Synergy for Europe), which included thirteen organisations in ten EU member states.
- PicNic (Professionals and Citizens Network for Integrated Care), a project that involved health providers, technology centres, industries and universities in nine EU countries.

Other examples of joint international projects are Propractition, JUST, Open ECG and HC-Interest. A highly relevant example of international cooperation is the "Cittis" Interreg 3a-project, in which three German hospitals have been linked up to the Danish Health Data Network for the purpose of exchanging telemedical services with Danish hospitals.

In June 2001, it became a political wish and goal to provide and empower the citizens of Denmark with a centralised healthcare information point and health-care service.

The vision was to bring together the regional information systems. This would ensure that citizens as well as health professionals would be able to cross administrative regions to find information and communicate directly without being limited by either time or geography.

This was to be accomplished through the Portal, which would provide an interactive access to general and individual healthcare information and services.

The Portal is to reach its goals through the realisation of four sub-objectives:

- 1) To enable citizens to gain access to all relevant parts of an existing but expanded messaging and information system originally designed for communication between health-professionals only.
- 2) To modernize the network and
- 3) To create new services
- 4) To create a national, Internet-based health portal to serve as a source for general information as well as a tool for communication between citizens and healthcare providers.

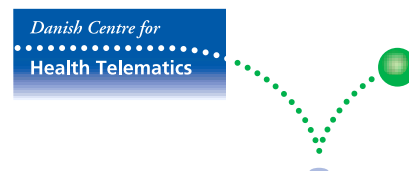
Today, whether you are patient, GP, nurse or have another role in the Danish health sector, the Portal – [www.sundhed.dk](http://www.sundhed.dk) – is the electronic forum that both informs and creates an overview of the health sector, both for citizens and health-care professionals.



The Ministry of the Interior and Health area deals with the legislation and planning of the health sector and healthcare service functions as well as the organisation and running of the municipalities around Denmark. The ministry and its departments coordinate the work between the government, the parliament, different organisations and the public.

**sundhed.dk**

Sundhed.dk gathers all information and communication about the Danish health service. It is the direct entry to the Danish health sector and offers increased insight and dialogue between the citizen and the public health system as well as supporting the electronic knowledge-sharing and communication within the health sector.



MedCom – the Danish Health Data Network. MedCom is a non-profit organisation with the purpose of creating a market and developing and disseminating electronic communication in the healthcare sector with a view to supporting coherent treatment, nursing and care.