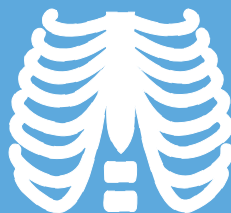
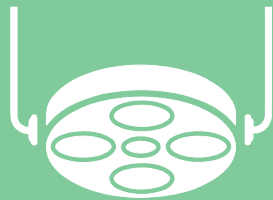


IT brings the Danish health sector together



Danish Healthcare and IT

- North Jutland Region
- Mid Jutland Region
- Region of Southern Denmark
- Sealand Region
- Capital Region of Denmark
- Regional Municipality of Bornholm

Denmark, with 5.5 million inhabitants and divided into five administrative regions, has a predominantly public healthcare provision with 60 public and several small, private hospitals, 3500 primary care physicians, GPs, and 250 pharmacies, not to mention dentists, physiotherapists etc.

In addition to this, the Danish health-care sector is characterised by a

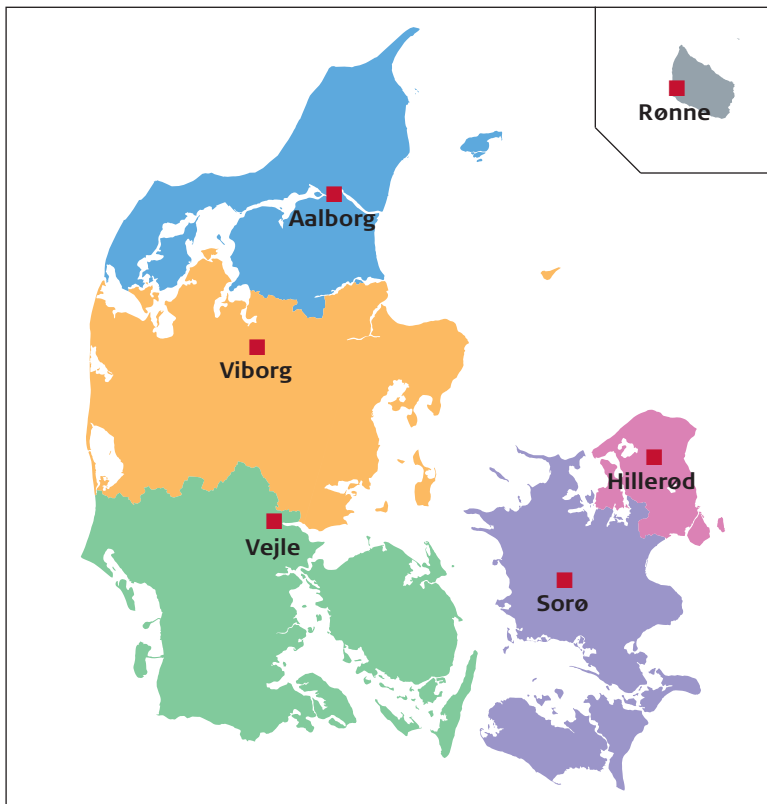
number of aspects that closely link IT to the provision of health and social care:

- Homecare, nursing homes, rehabilitation etc. are municipal tasks that integrate with the health-care system, meaning patients can be discharged early from the hospital.
- Broadband penetration is the highest in Europe and more than 95% of the population have access to the Internet.
- All healthcare institutions and GPs have access to both the open and the secured Danish Health Data Network. All GPs have an electronic patient record system and use electronic communication and transactions extensively.
- About 15 different electronic patient record systems are inter-operable in the GP sector and four different homecare records are used in the municipalities. Through a consensus process with vendors of almost 100 systems, all patient management systems for hospitals, GPs, homecare and pharmacies have incorporated the messaging system after special certification.
- A unique personal identifier is issued to all Danish citizens at birth, and a software-based PKI digital signature is widely used, instead of the hardware-based chip card.

■ eHealth including telemedicine is implemented in municipal, regional and national collaboration.

Danish Health Sector

5.5	Mn. inhabitants
95%	Citizens with access to the Internet
5.8	Mn. mobile phones
60	Public hospitals with 21000 beds
>10	Small private hospitals
3500	GPs in 2100 clinics
811	Private Specialists + 205 part time
250	Pharmacies
2700	Dentists in 1650 clinics
1829	Psychotherapists in 580 clinics
224	Chiropractors
726	Psychologists
5	Regions
98	Municipalities
1	Private Health Insurance



It couldn't work without IT

Over the last 20 years, IT communication has become indispensable to the Danish healthcare services. Data is stored digitally and the communication of text, images and sound via the Danish Health Data Network has become an integrated part of the cooperation between all groups in the health sector. It is impossible to imagine daily life without it.

The fundamental requirement is that information must be available where and when it is needed. It must be communicated without error and with a high level of data security that ensures the confidentiality of personal data.

On this basis, IT solutions are developed and distributed to the entire health sector and always with the citizen as the primary focus in terms of the communication approach. The objective is for properly functioning communication to ensure that there for citizens is access to the best possible diagnosis, treatment and care using the most effective method and in a form that is as easy and accessible as possible. In practice, this means that those involved in the individual patient's course of treatment must have access to all the relevant information. They must also be able to obtain a second opinion from specialists as required. Another basic

principle in the overall communication approach is that, as far as possible, information must follow the patient and not the other way around.

The Danish healthcare services have come a long way with this development. Overall, there has been significant computerisation of the work tools used for record-keeping in hospitals and at GPs' surgeries, for example. Millions of messages – prescriptions, referrals, requisitions, laboratory reports, etc. – are communicated via the Danish Health Data Network every month. One of the biggest current projects concerns the Shared Medical Card, which gives all members of the Danish healthcare services on-line access to an individual patient's status in terms of their medication.

In addition, videoconferences take place and X-ray images, as well as sound and moving pictures, are exchanged and these underpin the cooperation between the specialists involved. Citizens have access to both information and communication with the entire healthcare service via the web portal, sundhed.dk, and telemedicine solutions increasingly enable patients to have direct access to treatment and monitoring in their own homes.

There are still many IT solutions awaiting development, implementation and distribution. The development process never stops. We do feel, however, that we are on the right track and this view is constantly supported by the everyday experiences of eHealth in the Danish healthcare sector.



Jakob Axel Nielsen
Danish Minister of Health and Prevention



Bent Hansen
Chairman of the Association of Danish Regions

Focus on the citizen

The citizen is at the centre of the organisation of eHealth in Denmark. The aim is to make it easy for him or her to communicate with the Danish healthcare services and to obtain information about health and illnesses. At the same time, it is a stated goal that the communication between the parties involved in the Danish healthcare services must be organised in such a way as to ensure that the citizen always

receives the best possible treatment from the health services. It is therefore entirely appropriate to use the term “welfare technology and services” to refer to eHealth.

The two most important access routes to the Danish healthcare services for citizens are their GP and the web portal, sundhed.dk. The emergency department is of course a third option, in the case of sudden illness or accident.



communicate directly with the Danish healthcare services to a certain extent via sundhed.dk.

The citizen is in the picture

The internal communication of the Danish healthcare services is based on the needs of citizens. For example, a citizen can collect his or her medicine from the pharmacy immediately after the GP has sent an electronic prescription. Other examples are notifications of admission, discharge letters and rehabilitation programmes which the hospital sends to the municipal authorities. This ensures that the citizen receives the correct follow-up promptly after hospital treatment. Another example is patients, not least those who have chronic illness, who are in direct contact with their GP or hospital department via tele-medicine solutions.

The Danish Health Data Network

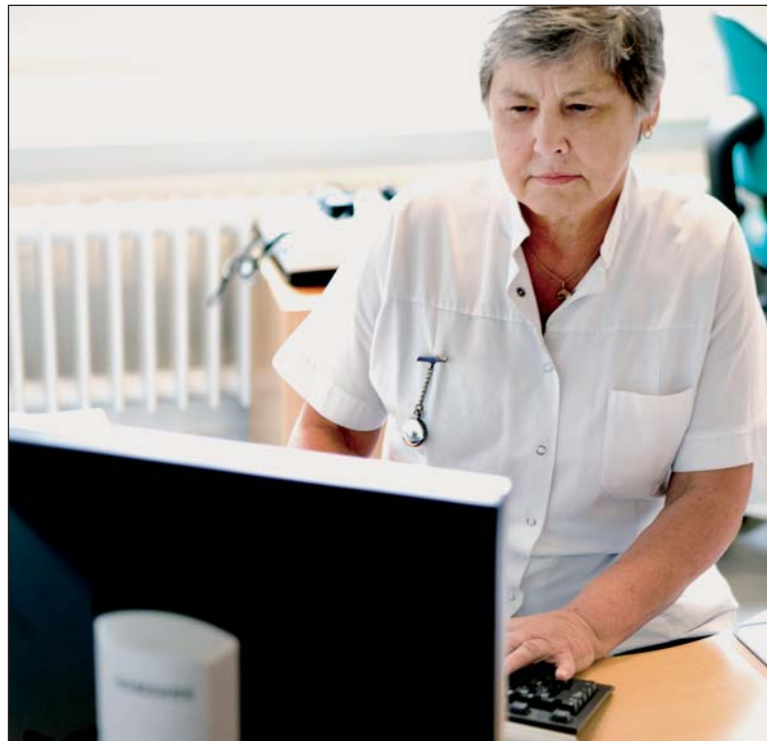


The patient's GP

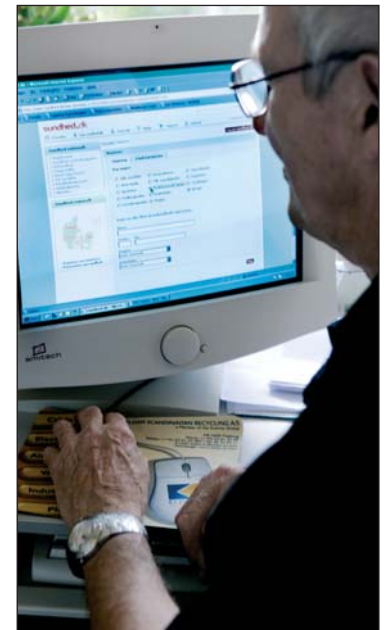
Every citizen has their own doctor, or GP as they are known. He or she handles common health problems and assesses on a case-by-case basis whether they need to involve specialists in the treatment or to refer the patient to a hospital. A large proportion of GPs have their own website, where the citizen can make consultation appointments and renew prescriptions, among other things.

Web-based information and communication

The web portal, sundhed.dk, is the access route to a great deal of information on health, illness and the areas of the Danish healthcare services. Here, citizens can find information on classifications, treatments, waiting lists, and much more. It is also possible to commu-



Citizens and healthcare professionals both searching for information via sundhed.dk



sundhed.dk

sundhed.dk is the official Danish eHealth Portal for the public Danish healthcare services – the word 'sundhed' means health in Danish.

The Danish healthcare services are the joint public services of all the Danish health authorities and providers and they are brought together virtually at sundhed.dk. This makes it possible for patients, their families and healthcare professionals alike to access general and individual

health information and to communicate with each other.

Two purposes and two profiles
sundhed.dk has two purposes – the first is to support the national goals of the Danish healthcare services and the second is to communicate the current activities of the Danish healthcare services.

The portal features on-line services for the general public, who can find

general health information, book appointments with their GP and renew prescriptions, as well as gain access to their own medication data, for instance. For the healthcare professionals, sundhed.dk features include on-line services for access to laboratory test results and to data stored in electronic patient records.

Flow of electronic messages in the health sector



Read the flowchart as follows, for example:

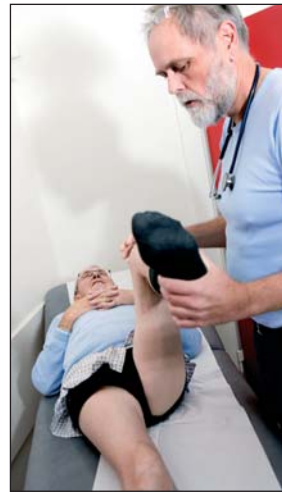
Once the patient has been examined, the doctor sends an → X-ray referral to the Imaging Diagnostic Department and receives an ← X-ray report in return.

Messages from and to...	General Practitioner	sundhed.dk	Hospital	Municipality
Citizen	→ On-line booking of consultation appointments. On-line consultations. Prescription renewal	→← Information and communication between the citizen and the Danish health-care services		
sundhed.dk	→← Information and communication between healthcare professionals			
General Practitioner	Transfer of patient record		→ Referrals. Bookings	← Request for prescription renewal
Hospital	→ Booking report. Discharge letters			→ Notification of admission and discharge. Notification of completion of treatment. Healthcare report. Rehabilitation programme. ← Admission response. Homecare status.
All parties	→← Letters of correspondence			
Public Health Insurance	← Billing			

Laboratory	Imaging Diagnostic Department	Pharmacy	Physio-therapist	Psycholo-gist	Chiro-practor	On-call GP	Medical specialist	Health Visitor
→ Requisitions ← Lab reports	→ X-ray referrals ← X-ray reports	→ Prescriptions	→ Referrals ← Discharge letters	→ Referrals ← Discharge letters	→ Referrals ← Discharge letters	← Discharge letters	→ Referrals ← Discharge letters	
→ Requisitions	→ X-ray referrals. X-ray discharge reports	→ Prescriptions						→ Notification of birth
← Billing		← Billing	← Billing	← Billing	← Billing	← Billing	← Billing	

Citizens, patients and eHealth

Bruno Elmer Berggreen is an elderly citizen, who is a widower and lives alone. Chronic bronchitis and diabetes have weakened Bruno to such an extent that he receives direct help with cleaning and other chores in his home from municipal homecare. Recently, Bruno has had serious problems with pain in his hip.



This description is very simplified in order to provide a clear overview of the **electronic communication** in relation to the patient's course of treatment.

1. Bruno Elmer Berggreen makes an appointment with his GP because of the pain in his right hip. The appointment is made via the eHealth portal sundhed.dk.

2. Bruno goes to the appointment with his doctor and is examined for the cause of his pain. The doctor takes blood tests which are sent to the laboratory and orders an X-ray examination.

3. The doctor receives the report for the requested examinations and on that basis decides that Bruno should be referred to the Hip Arthroplasty department at the hospital.

4. Bruno is referred to the hospital, where the doctor has access to the X-ray and lab-reports that the GP ordered. The hospital sends a request for Bruno to be admitted for treatment.



5. Bruno is admitted to the hospital. The hospital sends an automatic notification to the municipality so that municipal homecare is aware that he has been admitted.

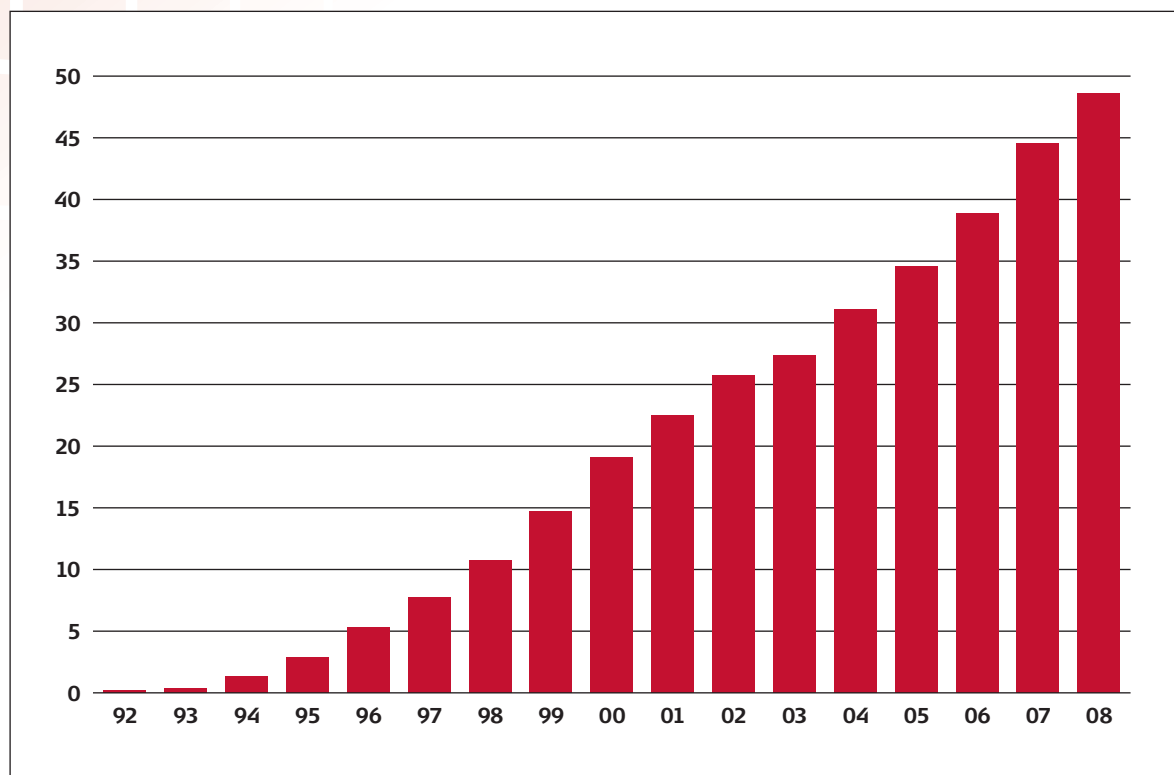
6. Bruno is discharged from hospital and comes home. Municipal homecare receives a notification in advance when he is discharged from the hospital.

7. The homecare nurse orders pain relief medicine and a prescription renewal from the GP.

8. The GP receives the discharge letter and a copy of the rehabilitation programme from the hospital. The GP also receives the request for prescription renewal from municipal homecare and sends it to the pharmacist.

9. The municipality receives the rehabilitation programme and starts the rehabilitation process.

Millions of messages every month



Million messages per year.

It all started as a pioneer project, when one GP decided on his own initiative to develop a solution that would enable him to send electronic prescriptions to the pharmacist. That was at the beginning of the 1990's, and that was the start of the Danish Health Data Network.

More accurate and effective

Since then, the Danish Health Data Network has been expanded to

include the transmission of all standard messages for healthcare communication and between almost all involved parties. Electronic messages have replaced paper ones, which in many cases used to be sent by post. Sending messages electronically is much faster and more accurate, as data only has to be written down once. It is also more effective, as data is automatically integrated into the recipient's

computer system – for example, the electronic patient records at the GP clinic as well as at the hospital and the citizen care record at municipal homecare.

At the same time, the simple transmission of messages from sender to recipient has now been supplemented by forms of communication where the recipients retrieve the information themselves, such as looking up the laboratory test report.

Putting the idea into practice

A communication standard is specified for each individual message, which is tested and then implemented and distributed for general use by MedCom. An important experience is that implementation and distribution require detailed information, and to a certain extent organisational adjustment, if electronic communication is to work most effectively.

It is characteristic of this development that it is user-led to a large degree and that a number of public officials act as coordinators in the process. They have, to a great extent, specified the framework and guidelines, which have subsequently provided the conditions for private suppliers to be able to develop and market communication solutions under market conditions.

The vision of the paperless hospital



These days, many Danish hospitals are carrying out extensive development work in relation to electronic patient records (EPR). At some hospitals even, EPR has been implemented and is already in use, although not in its fully developed form. The vision is that these records will replace paper records in the not too distant future and will in fact become the definitive main source for all relevant patient information.

The individual patient's course of treatment typically involves several health professionals, partly because treatment and care take up many hours of the day and partly because holistic treatment can easily involve a number of specialists, each with a different area of expertise. Previously, many of the specialists involved each had their own paper record, which made the coordination and organisation of a flexible course of treatment more difficult.

In the future, all relevant information will be gathered in one place and will be accessible anytime from anywhere. Initially, the idea is to have a shared EPR for each individual hospital, but this is also a natural basis for providing an interconnected EPR system for the entire hospital network and in the longer term for the Danish healthcare services as a whole.



Telemedicine



The ultimate purpose of developing and implementing telemedicine solutions in Denmark is to provide patients with the best information and the best treatment as close to them as possible. Telemedicine is ideal for patients living in remote areas, such as islands, but is also particularly important for patients who need contact with the health service because of long-term or chronic illness and telemedicine can also be used as a collaborate platform for health professionals and specialists.

In cases of chronic illnesses, telemedicine solutions can mean, for instance:

- that diabetics are able to have their blood sugar levels monitored from their own home.
- that patients with chronic bronchitis can measure their lung functionality from home and they can also have electronic consultations with their doctor.
- that the time spent in hospital can be reduced for COPD patients, thus radically improving their quality of life.
- that a visiting homecare nurse can obtain specialist advice on-line when treating sores in the patient's own home (teledermatology).

In providing services to patients over distances, the Danish health sector can use telemedicine solutions to monitor diabetics and heart patients, but also to conduct consultations with alcoholics undergoing treatment, for example.

New forms of telemedicine solutions are continually being developed for communication between healthcare professionals. These include video conferences and specialist consultation during the video transmission of operations. Telemedicine is also used to transfer duties between hospitals, such as X-ray and mammogram screening diagnosis.

International projects

In large parts of the development process, the parties behind the Danish Health Data Network have stressed the importance of international cooperation. A number of specific projects have been carried out over the years and the results are reflected in the achievements in healthcare communication, both for Denmark and for the collaborative partners and countries.

Alongside actual cooperation on projects, there is also significant cross-border networking taking place. In this respect, the Danish healthcare sector is particularly involved in the Nordic and European networks.

It is only natural that some institutions and countries are further along with their development work in certain areas than others. The positions of strength change, however, as the individual countries typically



place emphasis on different areas of eHealth. As a result, international cooperation is a kind of give and take situation for all concerned – no-one takes part solely to learn or to teach but rather to do both.

where they are used to diagnose and determine further treatment. Similar cooperation has been established between Denmark and Sweden for diagnosis based on mammogram screening.

A good example of an international cooperation project is the transfer of tasks from resource-weak areas to resource-strong ones. Specifically, this relates to X-ray diagnosis, where X-ray images are taken in Denmark, for example, and transmitted to Estonia, where the reports are made. The results are transmitted back to the Danish hospital,

This cooperation is possible because the Danish Health Data Network is connected not only to the Norwegian and Swedish national Health Data Networks, but also to regional networks in Estonia and Lithuania, so that data and images can be transmitted via a closed and secure network called the Baltic Health Network (BNH).



There are many behind the successes

It is a feature of the Danish Health Data Network that many different groups – large and small, public and private, users and suppliers – have worked closely together to develop the communications solutions into what they are today. The requirements have mainly been specified by the users, in the form of healthcare professionals. A number of public groups have worked together with the healthcare professionals to define the standards, framework and guidelines, while private suppliers have provided the solutions under market conditions.

Three public institutions operate at national level:



DIGITAL HEALTH

CONNECTED DIGITAL HEALTH IN DENMARK

Digital Health “Connected Digital Health in Denmark” provides the framework for the computerisation of the Danish healthcare sector and the goal is to create a coordinated health service, where doctors, practitioners and citizens have access to all necessary health data. The Shared Medical Card, for example, is a project running under SDSD, which will give all members of the Danish healthcare services on-line access to an individual patient's status in terms of their medication.

The organisation creates the channels of communication through which the health data must flow as well as the language in which the systems should communicate. Through cooperation with regions, municipalities and hospitals SDSD works on making the many, local, well-functioning systems communicate with one another.

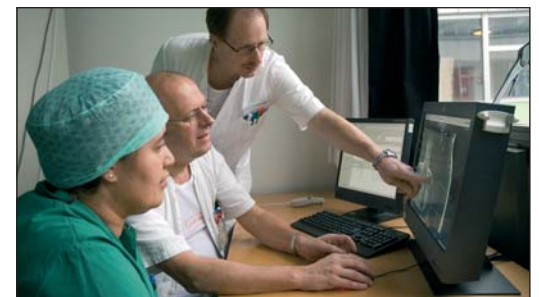
sundhed.dk

The eHealth Portal is the official Danish eHealth portal for the public healthcare services. The portal can be accessed with a digital signature – different for citizens and professionals. Citizens can gain access to general and personal information and professionals have access to a number of services including reading electronic records etc. under the ruling of the Danish Data Protection authorities.



MedCom was established in 1994, primarily to serve the needs of GPs. It currently manages the secure **Danish Health Data Network** and intersectoral **communication** for more than 50 MedCom standardised and certified message of various types. Today more than four million messages are transmitted per month.

MedCom also focuses their efforts on telemedicine at a national and international level, and is closely involved in many European projects.



of IT in the Danish health sector



Private suppliers:

Suppliers of X-ray systems

Agfa
Logica Danmark A/S
EDB Gruppen
Formatex
IT-driftscenter Odense
Sectra A/S
Medos
Medical Insight
GE Healthcare Technologies
First Impression MyClinic A/S
CSC Scandihealth
Carestream Health (Kodak)

Suppliers of laboratory systems

CSC Datalab ApS, LABKA
Logica Danmark A/S
Skejby Sygehus
IT-driftscenter Odense
ADBakt
Capio Diagnostik a.s.
NordTeamGruppen ApS
TietoEnator A/S
Safirlis
Misys Healthcare Systems –
International Databyrån för
informationsbehandling AB

Suppliers of pharmacy systems

Cito Data A/S
Apoteksdata I/S
NNIT-PharmaNet

Suppliers of healthcare systems

Rambøll Informatik A/S
CSC Scandihealth A/S
Lyngsoe Systems A/S
KMD A/S
Avaleo ApS
Zealand Care A/S

Suppliers of hospital systems

Logica Danmark A/S
EDB Gruppen
Formatex
EM-data A/S
IT-driftscenter Odense
ACURE – an IBM Division
CSC Scandihealth
First Impression MyClinic A/S
FICS Danmark A/S
TM Software
Systematic Software Engineering A/S
Skejby Sygehus
Gamma-Soft

Suppliers of medicine systems

CSC Scandihealth
ACURE – an IBM Division
Logica Danmark A/S
FICS Danmark A/S
TM Software
Systematic Software Engineering A/S

Suppliers of doctor's systems

Nordteamgruppen ApS
PC-Idé/PC-Praxis
EG Data Inform Medwin
A-Data ApS
Datagruppen Vejle MultiMed ApS
Profdoc A/S
Formatex
Aver & Lauritzen ApS
EM-data A/S
Docbase A/S
Lægernes edb-central
Dan-Med-Soft
Structura IT ApS
First Impression MyClinic A/S
Medol ApS
Profdoc
Linet

Danish Regions

Association of Danish Regions.
www.regioner.dk

sundhed.dk

The Danish eHealth Portal.
www.sundhed.dk

MedCom

A national public project organisation involved in cooperative ventures with authorities, organisations and private firms.
www.medcom.dk

Digital Health

Connected Digital Health in Denmark.
www.sdsd.dk

Local Government Denmark

Association of Danish Municipalities.
www.kl.dk



Text: arki•tekst kommunikation
Photos: Nils Lund Pedersen (pages 5, 6, 8, 9, 11 right),
Alex Tran (page 4), Colourbox (pages 11 left, 12 right),
Grafik & Klinisk Foto, OUH (page 14),
Regionshospitalet Viborg, Skive, Kjellerup (page 15)
Graphic Design: Christen Tofte
Printed in Denmark 2008 by onezone, Odense