

## Country Brief: Denmark

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## About eHealth Strategies and this report

The eHealth Strategies study analyses policy action and implementation progress of eHealth in EU and EEA Member States, with a special emphasis on barriers and enablers beyond technology. Progress with regard to specific applications such as patient summary and ePrescription is assessed. In addition, legal and regulatory facilitators and financing and reimbursement issues are also dealt with.

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## Executive summary

The current Danish roadmap for eHealth is the “National Strategy for Digitalisation of the Danish Healthcare Service”<sup>1</sup> from 2008. The strategy’s goal is to support the reorganisation of tasks and the adaptation of healthcare structures caused by digitalisation. Digitalisation is to be an integral element of all future healthcare initiatives. The implementation of the strategy is described in a number of specific action plans. Each action plan defines many different aspects, such as development, testing, implementation, application, operation, maintenance, monitoring and efficiency measurement.

Documents from other domains include the “Danish e-Government Strategy” from 2007. This strategy, which acted as the basis for the current eHealth plan, supports the digitalisation of the public sector in general.

In order to consider Denmark’s position regarding eHealth interoperability objectives the following eHealth applications have been examined: patient summaries and electronic health records, ePrescription, standards and telemedicine. In overview Denmark’s situation is as follows:

The 2003 fiscal agreement between the government and county hospital owners resulted in the five new hospital regions adopting the standard of “one patient – one EHR” within each region. Furthermore, many Danish hospitals are carrying out development in relation to electronic patient records (EPR). To begin with there will be a shared EPR for each individual hospital, but this is also a basis for providing an interconnected EPR system for the entire hospital network and in the long term for the Danish healthcare services as a whole.

The National Patient Index (NPI) is Denmark's approach to the formation of a patient summary. The NPI is a "Health IT functionality, which allows an overview of existing health information (of given types) for a given patient / citizen from different and not necessarily otherwise integrated IT (source) systems". A fully integrated index will be in place by the end of 2013.

ePrescription has been widely adopted in Denmark: primary care providers routinely prescribe drugs electronically with ePrescribing and implementation rates at close to 100%. Primary care providers may issue a prescription either in writing, electronically, via telefax or via telephone. After successful implementation in Denmark, Computer Sciences Corporation (CSC) has said that they are prepared to provide their electronic prescription service across Europe.

An additional service for Danes is Apoteket.dk: a health portal created by the Pharmacy Association. This portal does not only provide information on drugs and personal health, but also allows patients to buy medicine online for delivery or pickup at their local pharmacy. In a special section on the website, pharmacists answer questions about the use of medicines.

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<sup>1</sup> Connected Digital Health in Denmark 2007

Standards, as developed by Danish healthcare organisation MedCom, are in widespread use in Denmark. The National Board of Health is Denmark's representative to the International Health Terminology Standards Development Organisation (IHTSDO).

In general, MedCom has been managing the national programme for telemedicine during the period 2008-2012. The programme's overall goal is to manage the problem of staff shortage through the use of telemedical services. This programme concentrates on the development of video conferences, home monitoring and image transfer techniques. The Danish Centre for Health Telematics is sponsoring the building of such telemedical infrastructure and has been integrated into MedCom.

Denmark has rolled-out two telehealth pilots using video conferencing, which are intended for national implementation over the next three years. Another telehealth pilot was also rolled-out at the beginning of September 2009 to monitor around 800.000 unstable chronic obstructive pulmonary disease patients from their home and a project for tele wounds has also been initiated.

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# 1 Introduction to the report

## 1.1 Motivation of the eHealth strategies study

Following the *Communication* of the European Commission (EC) on “eHealth – making healthcare better for European citizens: An action plan for a European eHealth Area”<sup>2</sup> Member States of the European Union (EU) have committed themselves to develop and issue national roadmaps – national strategies and plans for the deployment of eHealth applications addressing policy actions identified in the European eHealth Action Plan.

The *2004 eHealth Action Plan* required the Commission to *regularly monitor* the state of the art in deployment of eHealth, the progress made in agreeing on and updating national eHealth Roadmaps, and to facilitate the exchange of good practices. Furthermore, in December 2006 the EU Competitiveness Council agreed to launch the *Lead Market Initiative*<sup>3</sup> as a new policy approach aiming at the creation of markets with high economic and social value, in which European companies could develop a globally leading role. Following this impetus, the Roadmap for implementation of the “eHealth Task Force Lead Market Initiative” also identified better coordination and exchange of good practices in eHealth as a way to reduce market fragmentation and lack of interoperability.<sup>4</sup>

On the more specific aspects of electronic health record (EHR) systems, the recent *EC Recommendation on cross-border interoperability of electronic health record systems*<sup>5</sup> notes under “Monitoring and Evaluation”, that “in order to ensure monitoring and evaluation of cross-border interoperability of electronic health record systems, Member States should: consider the possibilities for setting up a monitoring observatory for interoperability of electronic health record systems in the Community to monitor, benchmark and assess progress on technical and semantic interoperability for successful implementation of electronic health record systems.” The present study certainly is a contribution to monitoring the progress made in establishing national/regional EHR systems in Member States. It also provides analytical information and support to current efforts by the European Large Scale Pilot (LSP) on cross-border Patient Summary and ePrescription services, the epSOS - European patients Smart Open Services - project.<sup>6</sup> With the involvement of almost all Member States, its goal is to define and implement a European wide standard for such applications at the interface between national health systems.

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<sup>2</sup> European Commission 2004

<sup>3</sup> European Commission 2007

<sup>4</sup> European Communities 2007

<sup>5</sup> European Commission 2008

<sup>6</sup> European Patients Smart and Open Services (epSOS)

Earlier, in line with the requirement to “regularly monitor the state of the art in deployment of eHealth”, the EC already funded a first project to map national eHealth strategies – the eHealth ERA “Towards the establishment of a European eHealth Research Area” (FP6 Coordination Action)<sup>7</sup> - and a project on “Good eHealth: Study on the exchange of good practices in eHealth”<sup>8</sup> mapping good practices in Europe - both of which provided valuable input to the present *eHealth Strategies* work and its reports. Member States’ representatives and eHealth stakeholders, e.g. in the context of the *i2010 Subgroup on eHealth* and the annual European High Level eHealth Conferences have underlined the importance of this work and the need to maintain it updated to continue to benefit from it.

This country report on Denmark summarises main findings and an assessment of progress made towards realising key objectives of the eHealth Action Plan. It presents lessons learned from the national eHealth programme, planning and implementation efforts and provides an outlook on future developments.

## 1.2 Survey methodology

After developing an overall conceptual approach and establishing a comprehensive analytical framework, national level information was collected through a long-standing Europe-wide network of national correspondents commanding an impressive experience in such work. In addition, a handbook containing definitions of key concepts was distributed among the correspondents to guarantee a certain consistency in reporting. For Denmark, the National Institute for Health and Welfare<sup>9</sup> (THL) provided information on policy contexts and situations, policies and initiatives and examples for specific applications. THL generates information and know-how in the field of welfare and health and forwards them to decision-makers and other actors in the field. The centre is overseen by the Finnish Ministry of Social Affairs and Health.

The key tool to collect this information from the different national correspondents was an online survey template containing six main sections:

- A. National eHealth Strategy
- B. eHealth Implementations
- C. Legal and Regulatory Facilitators
- D. Administrative and Process Support
- E. Financing and Reimbursement Issues

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<sup>7</sup> eHealth Priorities and Strategies in European Countries 2007

<sup>8</sup> European Commission; Information Society and Media Directorate-General 2009

<sup>9</sup> National Institute for Health and Welfare (THL) 2010



## F. Evaluation

Under each section, specific questions were formulated and combined with free text fields and drop-down menus. The drop-down menus were designed to capture dates and stages of development (planning/implementation/routine operation). In addition, drop-down menus were designed to limit the number of possible answering options, for example with regard to specific telemedicine services or issues included in a strategy document. The overall purpose was to assure as much consistency as reasonably possible when comparing developments in different countries, in spite of the well-known disparity of European national and regional health system structures and services.

Under Section B on eHealth implementation, questions regarding the following applications were formulated: existence and deployment of patient and healthcare provider identifiers, eCards, patient summary, ePrescription, standards as well as telemonitoring and telecare.

The data and information gathering followed a multi-stage approach. In order to create a *baseline* for the progress assessment, the empirica team filled in those parts of the respective questions dealing with the state of affairs about 3 to 4 years ago, thereby drawing on data from earlier eHealth ERA reports, case studies, etc. to the extent meaningfully possible. In the next step, national correspondents respectively partners from the study team filled in the template on recent developments in the healthcare sector of the corresponding country. These results were checked, further improved and validated by independent experts whenever possible.

Progress of eHealth in Denmark is described in chapter 3 of this report in the respective thematic subsections. The graphical illustrations presented there deliberately focus on key items on the progress timeline and cannot reflect all activities undertaken.

This report was subjected to both an internal and an external quality review process. Nevertheless, the document may not fully reflect the real situation and the analysis may not be exhaustive due to focusing on European policy priorities as well as due to limited study resources, and the consequent need for preferentially describing certain activities over others. Also, the views of those who helped to collect, interpret and validate contents may have had an impact.

## 1.3 Outline

At the outset and as an introduction, the report provides in chapter 2 general background information on the *Danish* healthcare system. It is concerned with the overall system setting, such as decision making bodies, healthcare service providers and health indicator data.

Chapter 3 presents the current situation of selected key eHealth developments based on detailed analyses of available documents and other information by national correspondents and data gathered by them through a well-structured online questionnaire. It touches on issues and challenges around eHealth policy activities, administrative and organisational structure, the deployment of selected eHealth applications, technical aspects of their implementation, legal and regulatory facilitators, financing and reimbursement issues, and finally evaluation results, plans, and activities

The report finishes with a short outlook.

## 2 Healthcare system setting

### 2.1 Country introduction<sup>10</sup>

Politically and administratively, Denmark is organised in three levels: state, regions and Kommuner (municipalities). Since 2007, a structural reform consolidated the 15 "counties" (14 Counties plus Copenhagen region) into five "regions", and reduced the number of municipalities from 271 to 98, of which a large number have more than 30,000 inhabitants.

The purpose of the structural reform is strengthening and rationalising the work of the public sector. It leaves fewer responsibilities with the counties, and the power taken from the counties is then divided between the state level and the new, larger municipalities. This, however, does not alter the overall principle of government, namely that the public tasks which are close to the citizens' everyday life such as day-care, care for the elderly, schools and social support also are to be placed in the administrative level close to the citizen. Denmark has a strong tradition of delegating a number of important tasks to the municipalities at the local level.

Like Denmark as a whole, the healthcare sector has three political and administrative levels: the state, the regions and the municipalities (national, regional and local levels). The healthcare service is organised in such a way that responsibility for services provided lies with the lowest possible administrative level. Services can thus be provided as close to the users as possible. Put generally, the state level is responsible for the overall legal framework for healthcare and for the coordination and supervision of the services delivered on lower levels. The regions are responsible for primary and secondary care and the municipalities are responsible for different types of care which are not related to hospital inpatient care including e.g. prevention and rehabilitation.

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<sup>10</sup> eUser 2005

The box below summarises the key facts about the Danish healthcare system:

**Key facts about the Danish healthcare system:**<sup>11</sup>

Life expectancy at birth: 78.1 years

Healthcare Expenditure as % of GDP: 9.8% (OECD 2007)

WHO Ranking of Healthcare systems: rank 25

Public sector healthcare expenditure as % of total healthcare expenditure: 85% (OECD 2007)

## 2.2 Healthcare governance

### Decision making bodies, responsibilities, sharing of power

The Ministry of the Interior and Health is responsible for health policy, guidelines and legislation, including legislation on healthcare provision, personnel, hospitals, pharmacies, pharmaceuticals, vaccinations, maternal healthcare, child healthcare and patients' rights. Furthermore it is in charge of the administrative functions in relation to the organisation and financing of the healthcare system, psychiatry and health insurance as well as the approval of pharmaceuticals and the pharmacy sector. Prevention and health promotion are also part of the Ministry's remit.

The task of the state in healthcare provision is first and foremost to initiate, coordinate and advise. One of the main tasks is to establish the goals for a national health policy. The Ministry of the Interior and Health in its capacity of principal health authority is responsible for legislation on healthcare. This includes legislation on health provisions, personnel, hospitals and pharmacies, medicinal products, vaccinations, pregnancy healthcare, child healthcare and patients' rights.

The Ministry of the Interior and Health's legislation covers the tasks of the regions and the municipalities in the health area. The Ministry also sets up guidelines for the running of the healthcare service. This is mostly done through the National Board of Health. Moreover, the Ministry of the Interior and Health supports efforts to improve productivity and efficiency by e.g. the dissemination of experience and the professional exchange of information and by the introduction of economic incentives and activity based payment.<sup>12</sup>

As the running of hospitals requires a larger population than that of the majority of the municipalities, this responsibility lies with the five regions. The regions are also responsible for the practice sector. The regions organise the health service for their citizens according to regional wishes and available facilities. Thus, the individual

<sup>11</sup> Data from World Health Organization 2000; Health Consumer Powerhouse 2008; World Health Organization 2009

<sup>12</sup> Ministry of Health and Prevention 2010

regions can adjust services within the financial and national legal limits according to needs at the different levels, enabling them to ensure the appropriate number of staff and procurement of the appropriate equipment.

The 98 municipalities are local administrative bodies. The municipalities have a number of tasks, of which health represents one part. In the health field, the municipalities are responsible for home nursing, public healthcare, school health service, child dental treatment, prevention and rehabilitation. The municipalities are also responsible for a majority of the social services, some of which (subsidised housing for older people in the form of non-profit housing, including homes for elderly people with care facilities and associated care staff) have to do with the healthcare service and they are of great importance to the functioning of this service.

### Healthcare service providers<sup>13</sup>

Primary healthcare is provided by self-employed healthcare professionals and municipal health services. General practitioners play a key role in the Danish healthcare system as gatekeepers to specialists, physiotherapists and hospitals. Since the free choice of hospital system was introduced in 1993, general practitioners also fulfil an important function in advising patients on which hospital to choose. General practitioners operate private practices, either on their own (about a third) or in collaboration with other general practitioners. As a result of collaboration between different practices, general practitioners' services are available 24 hours a day.

General practitioners are paid on a combined capitation and fee-for-service basis. The counties control the number and location of general practitioners, and their fees and working conditions are negotiated centrally. Visits to a GP are free for 98% of the population who chose the insurance option 1 which enables them to consult any GP of their choice for free, if they accept to see specialists they can do so with a referral by the GP.

The majority of hospitals in Denmark are owned and financed by the counties. Exceptions to this are private for-profit hospitals (<1% of total beds). Since 1993, many counties have introduced "soft" contracts for hospitals, which supplement the global budget and are intended to raise awareness of costs and increase activity by setting targets for activity, service and quality. A related trend has been to delegate management and financial responsibility to even lower levels, such as hospital departments, in order to create greater awareness of costs and stronger economic incentives at the point of delivery.

Political and media interest in the issue of waiting lists for hospital treatments during the 1990s resulted in the allocation of additional funds to the counties and the declaration of maximum allowable waiting times for specific treatments. In June 2002

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<sup>13</sup> Strandberg-Larsen, Nielsen et al. 2007; Ministry of Health and Prevention 2010

patients were guaranteed access to treatment within two months, a delay that had been reduced to one month by 2007. If public hospitals are unable to offer treatment after this maximum delay has elapsed, patients have the right to refer themselves to private hospitals or hospitals abroad.

The hospital sector deals with medical conditions which require more specialised treatment, equipment and intensive care. In addition to the treatment of patients, both general practitioners and hospitals are involved in preventive treatment as well as in the training of health personnel and medical research.

Some public health services are integrated with curative services, while others are organised as separate activities provided by specialist institutions. Responsibility for the surveillance and control of communicable diseases lies with public health officers. General vaccination programmes are carried out by general practitioners and funded by the counties on a fee-for-service basis. Children have access to free health examinations. Pregnant women have access to free ante-natal services provided by general practitioners, midwives and obstetricians in hospital obstetric departments.

**Figure 1: Important features of primary healthcare organisation in Denmark<sup>14</sup>**

<b>Political/administrative unit responsible for primary healthcare</b>	GPs and other private practitioners at the regional level, other services on the municipal level.
<b>Consumer Choice</b>	Free choice of GP within a list patient system; restricted number of GP changes per year.
<b>Financing</b>	Mainly tax-based financing.
<b>Public or private providers</b>	GPs in private practices; otherwise mainly publicly employed primary care providers.
<b>Gatekeeping function of the GP</b>	Patient access to specialists, physiotherapists, hospitals and some other services regulated by GP referrals.
<b>Integrating health: initiatives for coordination</b>	Individual patient plans; practice coordinators; regional health plans jointly with municipalities.

<sup>14</sup> Krasnik and Paulsen 2009

## 2.3 Recent reforms and priorities of health system/public health

### Currently ongoing reforms in the health and social care systems

A major structural reform of the administrative system was passed by the Danish Parliament in 2005. The reform was implemented in 2007, with 2006 as a transition year. The reform reduced the number of regional authorities from 14 counties to 5 regions (0.6–1.6 million inhabitants per region) and the number of municipalities from 275 to 98 (37% of the new municipalities have more than 50 000 inhabitants; 38% have 30.000–50.000; 18% have 20.000–30.000; and 7% have fewer than 20.000 inhabitants). Both levels are governed directly by elected politicians. The main responsibility of the regions is to provide specialist healthcare services, but some environmental and regional development tasks have also been maintained at this level. Most other tasks have been moved to either the State or the municipalities. The new municipalities have assumed full responsibility for prevention, health promotion and rehabilitation outside of hospitals.

From an economic point of view, several important changes have been implemented. First, the regions' right to tax was removed. Healthcare is now financed by a combination of national earmarked "health taxes" (the new state health contribution), which are redistributed in terms of block grants to regions and municipalities. A total of 80% of the regional healthcare activities are financed by the State via block grants and some activity-based payments (approximately 5%). The remaining public financing for regional healthcare activities comes from municipal contributions, which are paid as a combination of per capita contributions and activity-based payments related to the use of services by the citizens of the municipality.

The idea behind the municipal co-financing is to create incentives for municipalities to increase preventative services in order to reduce hospitalisation. The impetus behind the new state health contribution is to create greater transparency for taxpayers with regards to their health contributions and priorities. The size of the block grants from the State are calculated according to a formula, which includes the expected healthcare needs of the population as a central component. The expected need is assessed by combining the number of inhabitants in different age groups and across certain socioeconomic status levels.<sup>15</sup>

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<sup>15</sup> Strandberg-Larsen, Nielsen, Krasnik & Vrangbaek 2006

## 2.4 eHealth setting in the country

*This section provides a brief overview of relevant ICT related infrastructure and services data. It draws on earlier studies commissioned by the EC, notably the Indicators eHealth Study . Although the results of this study date from 2007 and may therefore not reflect latest changes, a more recent pan-European survey is not available<sup>16</sup>.*

In terms of infrastructure, 99% of the Danish GP practices use a computer. The same share of practices disposes of an Internet connection. In Denmark, broadband represents the usual form of access to the Internet with 91% of GP practices resorting to broadband connections.

With regard to the availability of a computer in the consultation room as compared to the actual use of the PC in consultations with the patients, there is nearly no gap as both availability and use are nearly universal (98% of practices and 92% of practices respectively).

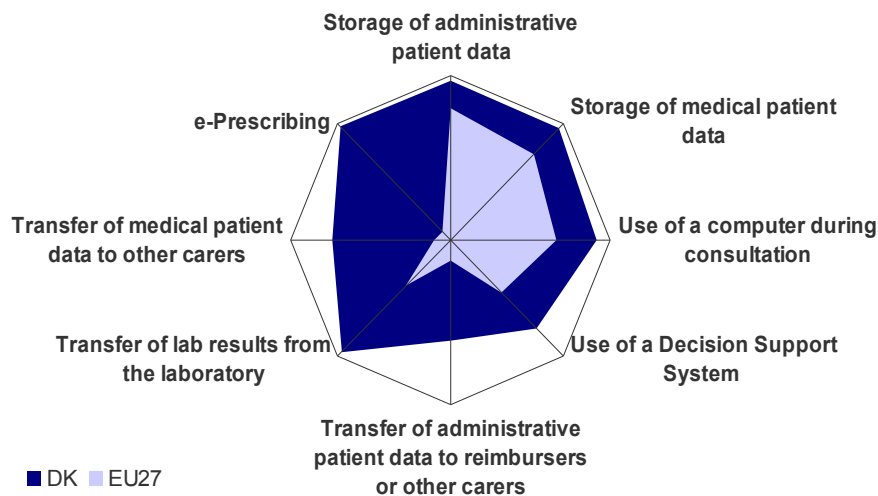
Local Electronic Health Records are common practice in Denmark. Medical patient data is stored in digital form in more than 90% of GP practices. Especially remarkable is the high share of stored radiological data which in Denmark is the reality in 98% of the GP practices.

In Denmark the use of electronic networks for the trans-mission of medical patient data is well established and widespread. 96% of GP practices receive analytic results from labs and 74% exchange data with other healthcare providers. As far as ePrescribing is concerned, ePrescriptions are extensively used. Also with regard to this point, 97% of GP practices reported the regular utilisation of ePrescribing.

Denmark's history of dedicated eHealth strategies ranges back to 1996. The development of Electronic Patient Records (EHR) in particular was already launched in 1996. Later on, the eHealth strategy of 2003 provided for the comprehensive implementation and the further upgrading of EHRs. Plans were made for the extension of the ePrescribing system to arrive at a personal medication profile stored on a national prescription server and 29 individual initiatives in the eHealth domain were agreed on.

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<sup>16</sup> ICT and eHealth use among General Practitioners in Europe 2007

**Figure 2<sup>17</sup>: eHealth use by GPs in Denmark**

**Indicators:** Compound indicators of eHealth use (cf. annex for more information), % values. **Source:** empirica, Pilot on eHealth Indicators, 2007.

### 3 eHealth strategies survey results

The following sections present the results of the eHealth strategies country survey. In a first section, the eHealth policy actions undertaken in Denmark are presented. This is followed by a presentation of administrative and organisational measures taken. Section 3.2 presents results on key eHealth applications. Section 3.3 focuses on the technical side of eHealth, namely the role of patient and healthcare provider identifiers and the role of eCards. Legal and regulatory facilitators as well as financing and reimbursement issues are presented in the following chapters, 3.4 and 3.5. The report concludes with evaluation activities (3.6) in the country and an outlook (4.).

#### 3.1 eHealth policy action

The eHealth strategies of EU and EEA countries are not always labelled as such. Some countries may indeed publish a policy document which refers to the ICT strategy in the healthcare sector. Countries such as France and Germany for

<sup>17</sup> The notion of „compound indicator“ designates an indicator built from a set of other indicators/survey questions regarding the same topic. The compound indicator reflects an average calculated from different values. (see Annex 6.1.1) The final results of the study on eHealth Indicators is available at [www.ehealth-indicators.eu](http://www.ehealth-indicators.eu).



*example have enshrined the central eHealth activities in legislation governing the healthcare sector. In Germany, the relevant law is the law on the modernisation of healthcare; in France the introduction of an electronic medical record is included in a law concerning social security.*

*Sometimes, also documents from domains such as eGovernment or Information Society strategies may contain provisions which concern eHealth. In cases where the healthcare system is decentralised, i.e. where power is delegated to the regional level, there may even be strategy documents regarding eHealth from regional authorities.*

### 3.1.1 Current strategy/roadmap<sup>18</sup>

National Strategy for  
Digitalisation of the  
Danish Healthcare  
Service 2008-2012

The current Danish roadmap for eHealth is the “National Strategy for Digitalisation of the Danish Healthcare Service”<sup>19</sup> from 2008. It was developed by the organisation “Connected Digital Health in Denmark” The strategy is connected to four programmes, which govern a number of projects and are realised in different specific action plans. As Denmark already has a history of eHealth strategies, this policy paper is the fourth one, which is concerned with governance of digitalisation in healthcare.

The strategy has the goal of supporting the reorganisation of tasks and the adaptation of healthcare structures. Digitalisation is therefore said to be an integral element of all future healthcare initiatives, including e.g. the organisation of health services, the expansion and modernisation of hospitals, equipment and infrastructures.

Specific goals that the strategy addresses are:

- Digitalisation, as a tool for the employee to create quality and productivity;
- Better service and inclusion of citizens and patients;
- Stronger cooperation to create digital connectivity.

The implementation of the strategy is described in a number of specific action plans. These plans address issues, objectives and projects within limited areas in the period from 2008 to 2012. Each action plan defines many different aspects, such as development, testing, implementation, application, operation, maintenance, monitoring and efficiency measurement. At present, four different plans are encompassed by the digitalisation strategy in Denmark:

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<sup>18</sup> Connected Digital Health in Denmark 2007; Sammenhængende Digital Sundhed i Danmark 2008; Ministry of Health and Prevention 2010

<sup>19</sup> Connected Digital Health in Denmark 2007

Action Plans connected currently to the digitalisation strategy:

Action Plan 1: describes the projects aimed at establishing staff tools for supporting healthcare quality and productivity.

Action Plan 2: describes projects aimed at improving services and involving citizens and patients.

Action Plan 3: describes the projects aimed at establishing a common infrastructure.

Action Plan 4: describes projects aimed at local digitalisation.

Thereby, the Danish national strategy represents a stable overall governing tool. This means that it does not operate with a fixed number of initiatives to be carried out during the strategy period, but supports implementation by various dynamic action plans, which again consist of different programmes and projects. In sum, the strategy builds on incremental digitalisation of the whole health sector.

As already mentioned, this is already the fourth Danish strategy for eHealth, following earlier documents from 1996, 2000 and 2003. The specific goals of the strategies have been different, but throughout this time, the core element remained the same - the goal of being valuable to patients and professionals in the healthcare sector. The present strategy is based on the following previous policy papers:

Previous Danish policy papers for eHealth:

(1) Danish Action plan for EHR (1996)

(2) National Strategy for IT in the Danish Hospital System<sup>20</sup> (2000-2002)

(3) National IT strategy for the Danish Health Care Service<sup>21</sup> (2003-2007)

The first plan from 1996 was developed on the basis of several user group analyses made in cooperation with healthcare professionals, IT-vendors and health informatics specialists. It consisted of several recommendations and led to the financing of EHR-projects, addressing topics such as standards, security, organisation, implementation and information. The responsibility for carrying out the action plan was rather decentralised and resulted in a slow and distributed approach. Based on the experiences of the first action plan, the Ministry of Health stated in 1999 the need for a coordinated development, focusing on key elements in the healthcare sector. Consequently the "National Strategy for IT in the Hospital Sector 2000-2002" was developed.<sup>22</sup>

The objective of this strategy was to point out the necessary initiatives for the hospital IT systems, in order to support the work and realisation of the political

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<sup>20</sup> National Board of Health 2003

<sup>21</sup> The Ministry of the Interior and Health 2003

<sup>22</sup> Lippert and Kverneland 2003

healthcare goals, which were: high health professional quality, clear information and short waiting times, high user acceptance, better information regarding service and quality and efficient use of resources.

The National IT Strategy for the Danish Health Care System 2003-2007 had the core principle of creating shared information as the foundation for seamless care and patient involvement.

Denmark was part of the “Baltic eHealth” and the “eHealth for Regions project”

Documents from other domains include the “Danish e-Government Strategy” from 2007. This strategy, which acted as the basis for the current eHealth plan, supports the digitalisation of the public sector in general, in the form of more cohesive and efficient digital services to citizens and businesses.

On the regional level, Denmark participated in the “Baltic eHealth” <sup>23</sup> and the “eHealth for Regions” <sup>24</sup> projects. Here, the network members worked together in transnational projects, including organisations from Sweden, Finland, Germany, Lithuania and Poland. For Denmark, the “Danish Regions” and the “North Denmark Region” took part, aiming to establish a network for healthcare data and integrated eHealth structures.

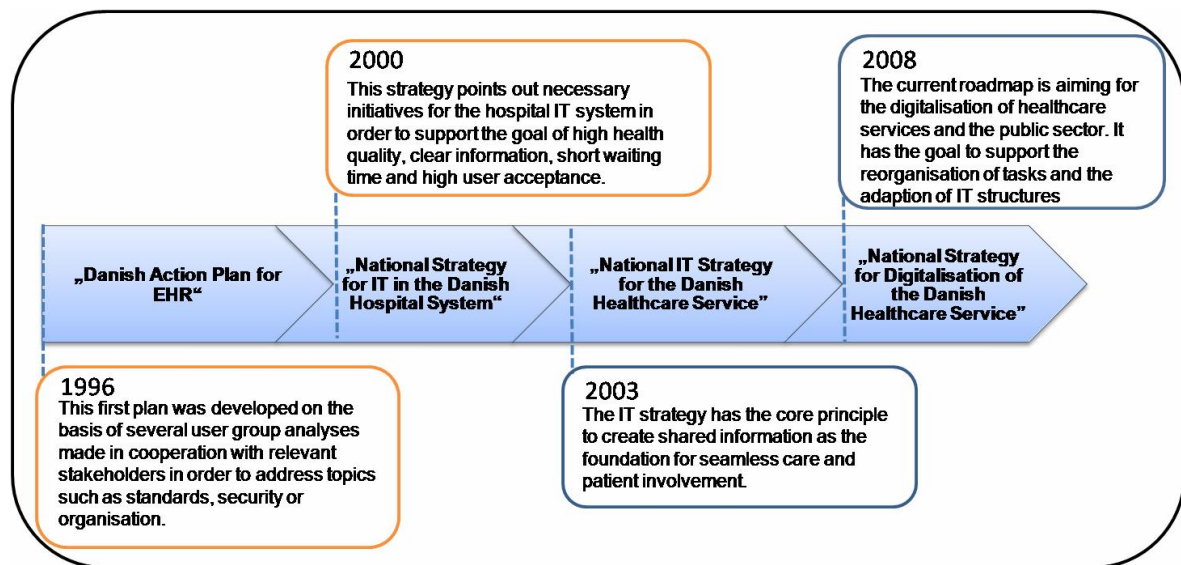
The “Integrated eHealth Structures in the Baltic Sea Area” Project was a cooperation from June 2004 until 2007 in the main fields of eCardiology, eRadiology, Exchange of patient information and Ferries with Tele ECG at the Baltic Sea. The other project, “Baltic eHealth”, aimed – between 2004 and 2007 – to establish a Baltic Healthcare Network by connecting existing national and regional healthcare data networks in the participating countries and carrying out full-scale eHealth trials within the fields of radiology and ultrasound.

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<sup>23</sup> Baltic eHealth

<sup>24</sup> eHealth for Regions

Figure 3: Danish policy documents related to eHealth



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## Administrative and organisational structure<sup>25</sup>

Cross-governmental  
organisation  
“Connected Digital  
Health in Denmark”

In Denmark, the main organisation responsible for eHealth procurement as well as strategy and specification of infrastructure has been reformed in 2010. To ensure efficient development efforts are made to ensure collaboration across sectors, but also to ensure that responsibilities are uniquely defined. Institutions, which are important for the day-to-day running of the infrastructure, are: 1) the eHealth Portal “Sundhed.dk”<sup>26</sup> and 2) the non-profit cooperative venture “MedCom”<sup>27</sup>.

In the summer of 2010 the work on eHealth was reorganised.

The Ministry of the Interior and Health and its various agencies remain the authority in decision-making in relation to e.g. national standards and national infrastructure. . Regions and municipalities are in charge of managing their own projects and observing the framework and requirements laid down at the national level. Consequently, the regions and municipalities are essential to the successful implementation of the strategy. It is therefore necessary to ensure a professional and well-structured effort at the local level.

<sup>25</sup> Connected Digital Health in Denmark 2007; Danish eHealth portal 2008; Ministry of Health and Prevention 2010

<sup>26</sup> Sundhed.dk

<sup>27</sup> Medcom

The Ministry has assumed responsibility for the overall coordination of e-health. To that end an advisory board is to be established in the autumn of 2010 with representatives from government, regions and municipalities. Under the auspices of the Ministry activities concerning cross sectorial communication are being dealt with (standards, architecture etc.).

On the more operational level the regions has established an organisation aiming at setting goals for the digitalisation of primarily the hospitals. Activities are initiated on the basis of the national strategy for digitalisation of the healthcare service 2008-2012. Focus is on ensuring increased collaboration i.e. by efficient investment in eHealth on the basis of shared procurement, shared operations and shared solutions.

The Danish eHealth portal "Sundhed.dk"

The other two institutions mentioned above, Sundhed.dk and MedCom, also operate at a national level and are part of the public eHealth infrastructure. These organisations are providing solutions in well defined areas.

Sundhed.dk is an eHealth portal established between all public health authorities in Denmark. The portal was launched in 2003, and is part of the common infrastructure in the healthcare sector in Denmark. It is the official Danish eHealth portal for the public healthcare services and can be accessed with a digital signature – distinguishing between 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. Regarding stakeholder involvement, the portal is run by a political board with members from Danish regions, the Ministry of Health, the Association of Municipalities and the Association of Pharmacies.

The non-profit cooperative venture "MedCom" and "MedCom International"

The other institution operating at the national level is MedCom. This non-profit cooperation between authorities, healthcare professionals and private firms was established in 1994 to primarily serve the needs of GPs. Generally speaking, it is a national project organisation, involved in the development, testing, distribution and quality assurance of the electronic communication and information in the healthcare sector. Thereby, it focuses on the following fields: 1) project implementation and 2) communication standards and health data networks. MedCom is financed through the Ministry of Health and Prevention, the Ministry of Social Welfare, the Danish National Board of Health, the Danish Regions, by the Local Governments and the Danish Pharmaceutical Association. As an extension, MeCom International<sup>28</sup> was established in January 2007, in order to carry on the active role of MedCom in international eHealth collaboration.

As a consequence of the reorganising SDSD will be closed by the end of 2010. The Ministry of the Interior and Health has as a consequence of this assumed a more direct responsibility of a number of the tasks previously handled by SDSD i.e.

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<sup>28</sup> MedCom International

national governance and coordination of activities as well as the carrying out of prioritised projects. The reason for this is a desire of at stronger national governance.

## 3.2 Deployment of eHealth applications

### 3.2.1 Patient summary and electronic health record (EHR)<sup>29</sup>

*In this study, the epSOS project's definition<sup>30</sup> of a patient summary was used as a general guideline. There a patient summary is defined as a minimum set of a patient's data which would provide a health professional with essential information needed in case of unexpected or unscheduled care (e.g. emergency, accident), but also in case of planned care (e.g. after a relocation, cross-organisational care path).*

*Lacking a standard definition, a patient's electronic health record (EHR) is here understood as an integrated or also interlinked (virtual) record of ALL his/her health-related data independent of when, where and by whom the data were recorded. In other words, it is an account of his diverse encounters with the health system as recorded in patient or medical records (EPR or EMR) maintained by various providers like GP, specialists, hospitals, laboratories, pharmacies etc. Such records may contain a patient summary as a subset. As of yet, fully-fledged EHR systems rarely exist, e.g. in regional health systems like Andalusia in Spain or Kronoberg in Sweden, or in HMOs (health maintenance organisations) like Kaiser Permanente in the USA.*

*It should be noted that in most policy documents reference is made simply to an "EHR" without any explanation of what is meant by it, thereby in reality even a single, basic electronic clinical record of a few recent health data may qualify. As a consequence, this section can only report on national activities connected to this wide variety of health-related records without being able to clearly pinpoint what (final) development stage is actually aimed for or has been reached so far.*

Danish National  
Patient Registry  
(DNRP) collecting  
data since 1977

Denmark has a common infrastructure in the form of the National Patient Registry (DNRP), which has served as a data set of hospital contacts since 1977. This is a unique registry featuring long-term comprehensive documentation, on the level of the individual. It has been collecting discharge diagnoses, surgical codes and recently also different diagnostic and treatment codes from all Danish hospitals in accordance with the current legislative framework. Besides being an administrative tool and a tool for epidemiological research through recent years, the DNRP has also supported national clinical quality databases.

<sup>29</sup> The Ministry of the Interior and Health 2003; Connected Digital Health in Denmark 2007; European Commission 2007; Castro 2009; Lidegaard, Vestergaard et al. 2009

<sup>30</sup> European Patients Smart and Open Services (epSOS)

With regard to current developments, it can be stated that Denmark benefited from this common infrastructure established in relation to the National Patient Registry: a number of shared services have been or are being established. These include the National Patient Index providing access to all relevant information about individual patients.

The National Patient Index (NPI) is Denmark's approach to the creation of a patient summary and the answer to the problem of inadequate access and overview of patient data. The NPI is a "Health IT functionality, which allows an overview of existing health information (of given types) for a given patient / citizen from different and not necessarily otherwise integrated IT (source) systems".<sup>31</sup> The vision for the National Patient Index (NPI) is to provide patients and healthcare professionals in Denmark access to relevant patient data at the right time and right place. By establishing the patient reference list or index, the sharing of patient data across countries, regions and sectors will become possible. In turn, appropriate availability of patient data could allow for greater patient safety, improved treatment quality and more efficient workflow. In addition, patients will be guaranteed the possibility of a more active involvement in their own treatment.

The index will in the outset be based on existing data sources, and will be supplemented with new relevant sources continuously. An index fully integrated to the clinical workstation shall be in place at the end of 2013. This index will also be made available to citizens through sundhed.dk. The service called "My Health summary"<sup>32</sup> is available through the Danish eHealth portal 'Sundhed.dk' for citizens and allows authenticated users to obtain a faster and better overview of their own patient data.<sup>33</sup>

Once logged into the health portal with their digital signature, users can access personal health information that has been gathered from various healthcare sources. The available data includes:

- Summary of hospital admissions (back to 1995);
- Recent notes from hospital charts;
- Summary of medication prescribed over the last two years;
- Overview of personal wishes in relation to organ donation and receiving life-prolonging treatment (living wills);
- Status of laboratory tests ordered by physicians;
- Contact information for the personal General Practitioner (GP).
- "My Health summary" will be replaced by the above-mentioned patient index. With the index it will be possible to integrate and access information directly into for example the HER or the EMR.

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<sup>31</sup> Clausen and Bruun-Rasmussen 2009

<sup>32</sup> Ministeriet for Sundhed og Forebyggelse [Department of Health and Prevention]

<sup>33</sup> ePractice.eu 18/3/2010



Mature data  
collecting and  
communication  
systems at a local  
level

Denmark's common national IT infrastructure also provides – through the service of Sundhed.dk and MedCom (see 0) – general and individual health information. The eHealth portal Sundhed.dk allows Danish citizens and healthcare professionals to access this kind of information and communicate with each other. Another component of the national health infrastructure is the Danish Health Data Network managed by MedCom, which enables healthcare organisations to securely exchange health data.

Most of the data sets and communication structures are in place at a local level in a mature way. But eHealth sector stakeholders are aiming for shared services with consistency in and access to data at a national level. A number of specific shared services are being developed, making data and/or functionality available via Sundhed.dk or via the integration with local solutions of the individual players, which are then made available to users (e.g. via integration with EPR<sup>34</sup>, ECR<sup>35</sup> or practice systems).

Goal of integrating  
different systems to  
create EHR

The local storage of patient data is extremely commonplace, and not limited to administrative data: It is related to medications, lab results, radiological images, information on symptoms and medical history, as well as data on treatment outcomes, basic medical parameters and examination results. In addition to local data storage, different IT systems are used within healthcare services. Some of these systems are combined to what is known as the electronic health record, including e.g. IT systems giving access to notes, medicine data, treatment plans and results of examinations, planning and booking of examinations and support for clinical decisions. According to an external EPR review performed in 2007<sup>36</sup>, there are 23 EPR landscapes (17 in 2010 and a goal of having 5 by the end of 2013) (each linking a number of systems), 13 practice systems and 4 electronic care record (ECR) systems.

As the integration of the different systems in Denmark is required and could be an advantage for areas where technologies are relatively mature, common guidelines and agreements are in the process of development. The Ministry of Health for example launched its first strategy for the development of electronic patient records in 1996 when through a number of decentralised, regional pilots the need for standards and common terminology was identified (see section 3.1.1). The 2003 fiscal agreement between the government and the county hospital owners required that electronic health records based on shared standards being implemented in all Danish hospitals by the end of 2005. The five new hospital regions have adopted the principle of “one patient – one EHR” within each region.

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<sup>34</sup> Electronic Patient Record

<sup>35</sup> Electronic Cash Register

<sup>36</sup> Deloitte 2007



Furthermore, many Danish hospitals are carrying out extensive development work in relation to electronic patient records (EPR). 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. 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.

Another example for making local systems consistent is the "Personal Medicine Profile": The Personal Medicine Profile is a register which provides the patients and the healthcare professionals, via Sundhed.dk, with an electronic overview of the individual patient's consumption of prescribed medicines. Registration is mandatory and automatically, but the goal is to integrate the Medicine Profile with local solutions. This has to optimise the use of medication, for example at hospitals, by GPs or at old people's homes.

The following are examples of existing or future solutions that could be developed towards shared services:

Examples of existing/future shared services:

E-journal: makes information from hospital PAS and EPR systems available to GPs and the citizens themselves.

Shared medicine record: makes updated information about the current medicine consumption of the individual patient available to relevant staff at hospitals, GPs, old people's homes, etc.

Decision-making support for clinicians: makes clinicians aware of previously registered allergy to drugs for a certain patient or warns of interaction between different drugs.

National patient index: provides an overview of healthcare data about each patient.

Course of treatment service: provides information about recommended courses of treatment for given diagnoses. Clinicians can use this information to plan the individual patient's journey through the healthcare service.

Text reminder service: can be used by individual healthcare players to send reminders to patients before examinations, etc.

In sum, work is underway to further interact between established local systems e.g. by linking hospital medication systems to the personal electronic personal medical profile.

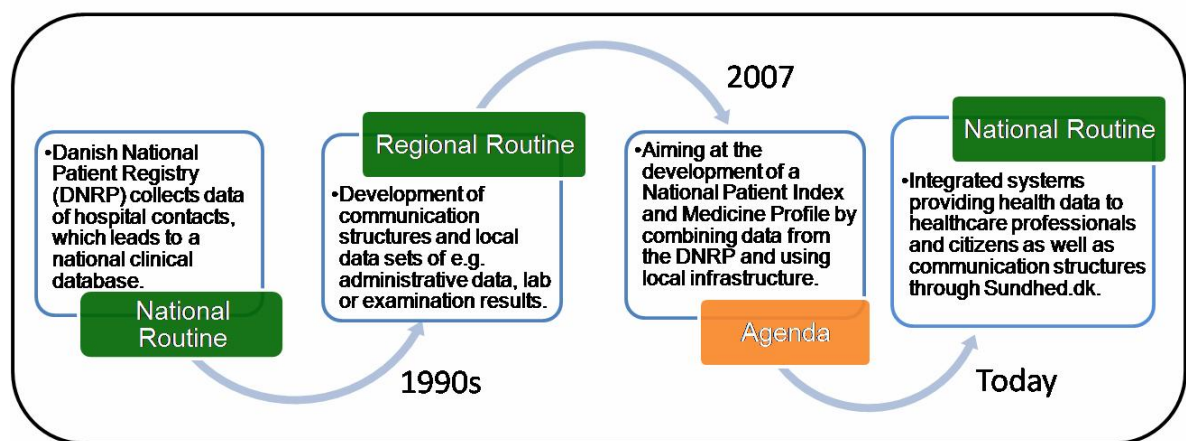
Regarding condition-specific summaries, Denmark has a cardiac summary where every patient has a custom-made webpage with information relevant to his or her own medical history. Additionally, patients have the possibility to participate in a

Cardiac summary in place, Diabetes management system under development

diabetes management system that allows them to better understand their medical history, treatment options and self-care regimen.

Challenges mostly occur in relation to the introduction of IT systems that could replace traditional hardcopy records as well as IT booking systems for planning work at hospital departments. This is to a large extent due to the absence of standard IT systems in these areas. It is pointed out that the use of a single national EPR system by all hospitals would mean launching a national project of considerable size, complexity and duration. In this perspective, it is suggested to lay down a number of requirements for regional consolidation, based on common architectural principles, so that regional consolidation will to some extent prepare the regions for a more coherent national technical infrastructure.

**Figure 4: Patient summary in Denmark**



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### 3.2.2 ePrescription

Denmark as leading  
country in  
ePrescription

*In the framework of this study and following work in epSOS<sup>37</sup>, ePrescription is understood as the process of the electronic transfer of a prescription by a healthcare provider to a pharmacy for retrieval of the drug by the patient. In this strict sense, only few European countries can claim to have implemented a fully operational ePrescription service.*

At the moment, Denmark is one of the leading countries in ePrescribing, as primary care providers routinely prescribe drugs electronically with ePrescribing adoption rates at nearly 100%. This high rate of ePrescriptions is related to the action taken by the national government, as ePrescribing is made possible for primary care

<sup>37</sup> European Patients Smart and Open Services (epSOS)

providers which may issue a Prescription either in writing, electronically, via telefax or via telephone. In addition, primary care providers can issue all patient referrals to specialists electronically and maintain electronic clinical records using MedCom standards. As of 2009, the providers also offer online booking and e-mail consultations.<sup>38</sup>

Central Prescription  
Server and Medicine  
Profile in place

The Danish architecture for ePrescribing includes a Prescription Server and the Medicine Profile, which have been established in recent years.

The Medicine Profile is an electronic overview of the purchase of prescription medication in Denmark. All purchases are automatically registered and gathered in an individual, personal medical profile for every citizen. This is achieved by substituting earlier EDI-based prescription messaging by XML -messages sent directly to the National Health Portal. The Medicine Profile project aims to improve quality of drug therapy, while giving a valuable overview of patient compliance.<sup>39</sup> The next step related to the Medical Profile is to complement it with medications from hospital treatment in order to complete medication information. The aim is to integrate the Profile with local solutions and to optimise the use of medication, for example at hospitals, by GPs or at old people's homes.<sup>40</sup>

In 2007, the Danish Medicines Agency launched a central prescription server which can send prescriptions electronically from doctors to pharmacies. Since its launch the server has repeatedly been down, stopped the sending of prescriptions or worked slowly. To resolve these problems, the Association of Danish Pharmacies put pressure on the authorities.<sup>41</sup>

“Apoteket.dk” and  
“Medicinkombination.  
dk” as eHealth  
portals for drugs and  
drug interaction  
information

Additionally, Apoteket.dk as a health portal for Danes has been created by the Pharmacy Association. This portal does not only provide information on drugs and personal health, but also allows patients to buy medicine online for delivery or pickup at their local pharmacy. In a special section on the website, pharmacists answer questions about the use of medicines. Every week, more than 28,000 Danes visit the portal. To ensure the security of the system, customers must use the digital signature, provided by the national government, when purchasing medicines electronically. Pharmacies can also offer online consultation for their customers through online chat, webcams or e-Mail.<sup>42</sup>

In cooperation with the Danish Medicines Agency, the Pharmacy Association also launched “Medicinkombination.dk”<sup>43</sup>, which is a website for anyone who uses more than one kind of medicine, medicinal herbs, potent vitamins or minerals. In a simple

<sup>38</sup> Juhl 2006; Castro 2009; MedCom Statistics 2009; Protti, Johansen et al. 2009

<sup>39</sup> European Commission 2007; Ministry of Health and Prevention 2010

<sup>40</sup> Connected Digital Health in Denmark 2007; Ministry of Health and Prevention 2010

<sup>41</sup> The Association of Danish Pharmacies 2008

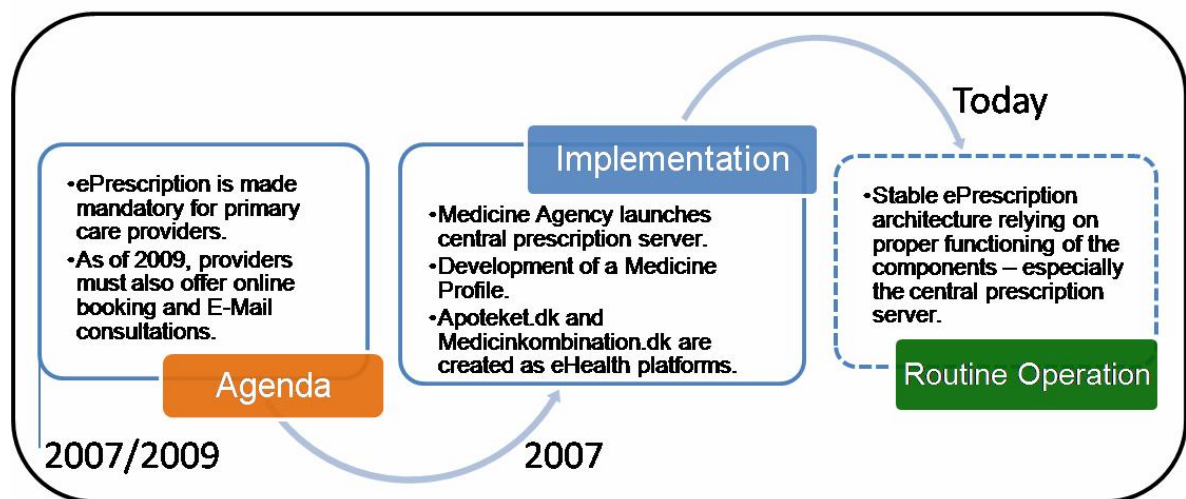
<sup>42</sup> The Association of Danish Pharmacies 2008; Castro 2009

<sup>43</sup> The website won the World Summit Award in the category eHealth in 2007.

language the user receives clear information about what to do if there is a risk for interaction. The database is part of the new eTrade solution at “Apoteket.dk”.<sup>44</sup>

Furthermore, Computer Sciences Corporation (CSC) has said that they are prepared to provide their electronic prescription service across Europe after successful implementation in Denmark. The system is based on CSC’s Opus Medication solutions and Home Care Solution, CSC VITAE suite, which interfaces with a national repository of prescriptions developed by the Danish National Board of Health<sup>45</sup>.

**Figure 5: ePrescription progress in Denmark**



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### 3.2.3 Standards

*Standards are not only crucial to enable interoperable exchange of meaningful information in the healthcare system; they also ensure secure access to patient records by healthcare providers and citizens. This study aims to identify, among other usage, standards related to the domain of health informatics, such as the SNOMED Clinical Terms or the LOINC terminology.*

Standards – mainly for message-based communications – are in widespread use in Denmark. Responsible for the development and deployment of these standards is the Danish healthcare organisation MedCom, which sets standards for IT systems, acts as a coordinating body to bring together healthcare providers, laboratories,

<sup>44</sup> The Association of Danish Pharmacies 2008

<sup>45</sup> Sarah Bruce; E-Health-Media Limited 2010

vendors and others in order to develop interoperable standards. Denmark's representative to the International Health Terminology Standards Development Organisation (IHTSDO) is the National Board of Health.

The digitalisation strategy for the public sector foresees that standards should in general be based upon international, market-driven common public standards. In order to ensure gradual development and prioritisation of these areas, where the need is the greatest, future work is aiming towards "inside-out" standardisation, which means focusing on limited areas and gradually extending the standards from there. This is said to be done in sufficient interaction with the "outside-in" standardisation principle, which entails the standardisation of the overall framework, followed by a specification development for individual areas.

Relevant international standards exist in a number of areas in Denmark, for example classifications and terminologies such as ICD10, ICPC and Snomed CT. There are also relevant standards for laboratory data and imaging (X-rays, etc.), for example the DICOM standard. Internationally, technical standardisation is performed by, for example, the standardisation organisations ISO (global), HL7 (US) and CEN (European). MedCom's standards for communication of messages are based on CEN standards and are in widespread use in Denmark.<sup>46</sup>

### 3.2.4 Telemedicine

*The use of telemedicine applications is recognised as beneficial to enable access to care from a distance and to reduce the number of GP visits or even inpatient admissions. Commission services define telemedicine as "the delivery of healthcare services through the use of Information and Communication Technologies (ICT) in a situation where the actors are not at the same location"<sup>47</sup>. In its recent communication on telemedicine for the benefit of patients, healthcare systems and society, the Commission re-emphasises the value of this technology for health system efficiency and the improvement of healthcare delivery<sup>48</sup>.*

Telemedicine has raised increased attention in Denmark, especially connected to tele-homecare, which is important for patients who need constant contact to healthcare services because of long-term or chronic illnesses or because they live in rural areas. In general, MedCom manages the national programme for increased use of telemedicine during the eHealth strategy period between 2008 and 2012. The program has the overall goal of dealing with the shortage of staff through the use of telemedical services, without loss in the quality of provided care. This programme

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<sup>46</sup> International Health Terminology Standards Development Organisation; Connected Digital Health in Denmark 2007

<sup>47</sup> Europe's Information Society 2009

<sup>48</sup> European Commission 2008

## Denmark

concentrates on the development of video conferences, home monitoring and image transfer techniques.

The Danish Centre for Health Telematics, which has been integrated into MedCom, has furthermore sponsored multiple programmes to build a useful telemedicine infrastructure.

Examples of National Programmes by the Centre for Health Telematics are listed below:

### National programmes by the Centre for Health Telematics:

- Tele-dermatology project
- Tele-alcohol and -abuse rehabilitation programme
- Teleradiology programme
- Tele interpretation
- Tele wounds
- Cross-border telemedicine (Baltic eHealth project)

New forms of telemedicine solutions are continually developed in different pilot projects with the focus on two major areas: 1) Communication between healthcare professionals; 2) Tele-homecare.

For the communication between healthcare professionals, the focus has been on video conferences and specialist consultation during the video transmission of operations. Telemedicine is also used to transfer results between hospitals, such as X-rays and mammogram screening diagnosis. Related to this, Denmark has rolled-out two telehealth pilots, which are intended for national implementation over the next three years. One of the projects, already rolled-out at the Odense University Hospital, involves using a video conferencing service to allow foreign patients who do not speak Danish to communicate with hospital staff. The service uses a video conferencing system, linked to a call centre with multi-lingual operators, who can translate a person's needs or problems immediately to help them receive a better diagnosis. The first interpretation centre was opened at the beginning of June 2009. Regional implementation of the system is expected by 2010, with a national roll-out to be completed by 2012.

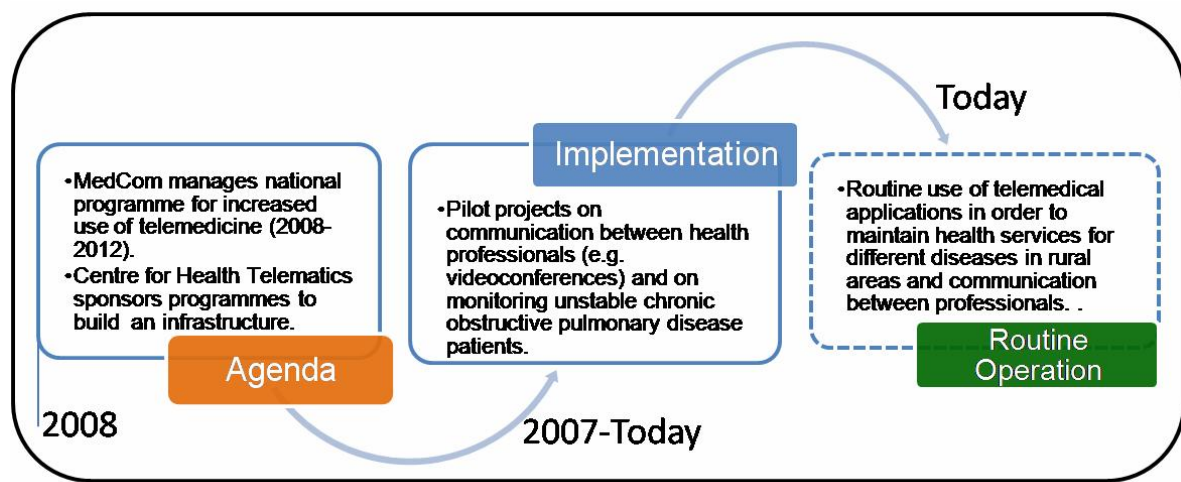
A telehealth pilot was also rolled-out at the beginning of September 2009 to monitor around 800.000 unstable chronic obstructive pulmonary disease patients from their home. Hereby, patients receive a package of video conferencing equipment and monitoring devices and the nurses do their normal rounds over a video conference system where they record the patients' vital signs. The solution is expected to be rolled-out nationally from 2012.<sup>49</sup>

<sup>49</sup> Danish eHealth portal 2008; Bruce 2009

Finally a project concerning tele wounds has been initiated. This project provides functionality making it possible for an expert to interpret a picture of a wound e.g. taken by the home nurse and on the basis of this picture instruct the nurse in the correct care of the wound. This way it gets possible to use specialised competences in a cost efficient manner.

The Danish National Board of Health has also issued legal guidelines regarding the use of telemedical services, which are further explained in section 3.4.

**Figure 6: Telemedicine services in Denmark**



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### 3.3 Technical aspects of implementation

A key prerequisite for the establishment of an eHealth infrastructure is the ability to uniquely identify citizens/patients and healthcare professionals. This part of the survey deals with identifiers and how they are stored. This section does not deal with the tokens through which identification can or will take place. One such possibility would be via an eCard. This topic is dealt with in the following section. The current section focuses solely on whether or not unique identifiers are in place in Denmark and for which purpose.

#### 3.3.1 Unique identification of patients

Since 1968, every Danish citizen receives at birth a personal identification number called "CPR" (Centrale Personregister). It is a ten-digit code of which the first six digits indicate the date of birth, while the last four digits are a serial number. The last



digit (control digit) shows the person's gender by giving women an even number and men an odd number. The CPR-number is registered in the central National Register. In that register comprehensive information about the citizens is stored, including information about the name, address, birth registration, citizenship, marital states, kinship and relations to the national church. It does however not contain any medical information. The number is mandatory to all persons born in Denmark and persons with a residence permit receive a personal identification number in connection with their permit<sup>50</sup>. The CPR-Office is the Danish government agency that houses the central registration system.

The CPR-number is used as identifier in all parts of the public sector, as well as the finance sector. In the healthcare sector the CPR-number is used for identification of the patient, both by public and private healthcare providers. The number must furthermore also be included in all patient records<sup>51</sup>.

The CPR-number is however not incorporated in an identity card. As an identifier the in 2007 introduced Health Card is used. The Health Card substitutes the social security card and contains the patient's CPR-number, name and address, name of his doctor, social security category and municipality. Apart from being an identifier – used not only in healthcare – the card also gives access to healthcare free of charge.

### 3.3.2 Unique identification of healthcare professionals

In Denmark, the following professions must hold an authorisation to be able to use their professional title:

Professions, which need an authorisation number:

Chiropodist, chiropractor, clinical dental technician, clinical dietician, dental hygienist, dentist, medical doctor, medical laboratory technologist, midwife, nurse, occupational therapist, optometrist or contact lens optometrist, physiotherapist, prosthetics and orthotist, radiographer and social and healthcare assistants.

Those professionals are registered in a central national register which is available online and which is maintained by the National Board of Health (Sundhedsstyrelsen). The register contains the name, data of birth, occupation, specialisation of the healthcare provider and authorization identification number.

<sup>50</sup> Det Centrale Personregister [Central Citizen Index]

<sup>51</sup> See section 8 of Order nr. 1373 of 12 December 2006, Sundhedsstyrelsen [Board of Health] 2006, <https://www.retsinformation.dk/Forms/R0710.aspx?id=11055>.



### 3.3.3 The role of eCards

Denmark adopted official digital signatures instead of eCards

Regarding eCards, the Danish government has decided to adopt an official digital signature as an alternative to electronic ID cards. Reasons for this decision are connected to pragmatic technical and economic choices, as the digital signature is said to be not the most flexible or secure form, but is expected to achieve widespread uptake more rapidly than other solutions and moreover is a cost-effective approach.

Thereby, the goal is to enable all Danes to conduct their business with public authorities securely from their home computers, using the same identification system for all eServices without having to pay additional charge for providing their identity or having to carry an eCard. In general, citizens can get free, software-based “official” digital signatures e.g. to access the portal Sundhed.dk and other secure websites containing personal information (taxation, housing etc.).

Sundhed.dk was launched in 2003 and acts as a single access point to healthcare services for both citizens and professionals. Citizens have access to both information and communication with the entire healthcare service through the web portal and it provides a framework for communication between citizens and professionals as well as between professionals.

In detail, citizens can log on to their personal web space and use the offered services, such as:

Services for citizens offered by Sundhed.dk:

- Book GP appointments
- Order medications and renew prescriptions
- Review medication and health data
- Communicate with healthcare authorities
- Register wishes in a Living Will
- Become an organ donor
- Access directory services, general and disease-specific health information
- Access national guidelines and basic information regarding hospitalisation

Sundhed.dk provides service for citizens and healthcare professionals in terms of access to data and communication infrastructure

This portal will be further developed until 2012. Up to this point, the National Health Portal (Sundhed.dk) signed a cooperation agreement in 2009 with the portal for government services to citizens called “Borger.dk” for developing a health section and for coordinating strategy and IT development. The Health section on borger.dk will provide insight on health matters and will provide citizens with extra privileges and access to the digital portal for healthcare. Citizens will also have access to their personal health data from the “My sundhed.dk” through borger.dk’s “My Page”.

As mentioned above, the official eHealth portal Sundhed.dk also provides services for health professionals. Through their digital signature professionals can log on to the portal. The portal provides a framework for communication between healthcare professionals about specific patients– as well as access to information about diseases/disorders and the healthcare service in general. Two examples of systems that can be accessed via Sundhed.dk are the Personal Electronic Medicine Profile (PEM), with medicine information from general practitioners, and e-journal, which contains excerpts of records from hospitals in Denmark.

By using special security certificates, healthcare professionals can also access laboratory test results and data stored in electronic patient records as well as utilise various resources (guidelines, clinical pathways, etc).

### 3.4 Legal and regulatory facilitators

*Legal and regulatory issues are among the most challenging aspects of eHealth: privacy and confidentiality, liability and data-protection all need to be addressed in order to make eHealth applications possible. Rarely does a country have a coherent set of laws specifically designed to address eHealth. Instead, the eHealth phenomenon has to be addressed within the existing laws on professional liability, data protection etc.*

Act on Processing of  
Personal Data and  
the Act on Patient  
Data

Generally, the Danish legislation has been very flexible with regard to healthcare reforms whenever legal provisions were perceived as an impediment to technological progress. However, in the latest national eHealth Strategy more attention is paid to the regulation of data security and patient privacy. The necessity to investigate how technological solutions may be used to ensure compliance with the legislation was stressed.

The most important legal initiatives which prove necessary to pave the way for eHealth are: The separate rules contained in the Health Act regarding access for healthcare professionals to patient information stored in electronic medical records or registers; The rules contained in the Health Act regarding access to registries concerning medicine and vaccinations<sup>52</sup>; The separate rules in the Consolidation Act on Legal Protection and Administration in Social Matters regarding automatic electronic exchange of information between the hospitals and home care services consolidated in August 2007, and the revised health act paragraph 37 on patient's right to see own data<sup>53</sup>.

<sup>52</sup> Health Act, §157 act nr. 534, 26 May 2010

<sup>53</sup> Lovbekendgørelse nr. 1047 af 27 august 2007 and Health Act § 57 act. Nr. 1521 27 December 2009.

Up to this point, legislation determines which types of healthcare professionals have access to which data and the conditions to be met before access can be given. Thereby, the Danish Data Protection Agency monitors all activities regarding the Act on Processing of Personal Data.

The Act on Processing of Personal Data entered into force in July 2000 and marked the end of a long legislative process in which there has been a discussion on whether the individual member states were free to build upon the EU Directive<sup>54</sup> or if it was a tool for harmonisation. In the end, it was decided that some of the central provisions of the Directive were harmonising, but that others are left to each Member State for own interpretation. This is reflected in the 2000 Act, which replaced the Public Authorities' Registers Act and the Private Registers Act. Rather than working in a vacuum, the new Act forms part of a complex legal environment, with a battery of other acts, ministerial orders and guidelines supplementing it. Since the Act on Processing of Personal Data entered into force in 2000, the Act has been amended several times - most recently on July 1st 2007. . It is important to always read the Danish Act on Processing of Personal Data together with special, supplementing provisions in other Acts.

The Danish Health Act (2007) specifies the rules for transfer of data to healthcare professionals. It distinguishes between the disclosure of health information to other healthcare professionals in connection with treatment and care, collection of electronic medical data in connection with treatment and care and disclosure of health information for other purposes. There are special rules concerning disclosure of health information for scientific and statistical purposes and disclosure to third countries.

Finally, the Danish Board of Health issued legal guidelines regarding the liability and other legal matters in connection with practitioners' use of telemedicine. The guidelines refer to rules and principles in the existing legislation which also applies in connection with the use of telemedicine. The guidelines conclude that the use of telemedicine does not affect the usual legal liability and other legal obligations of practitioners<sup>55</sup>.

### 3.4.1 Patient rights<sup>56</sup>

In order to ensure patients' legal rights, a number of laws have been passed regulating patients' rights and the possibility of making complaints and receiving compensation for injuries caused by the Danish healthcare system. The main parts of patients' legal rights are gathered in the Health Care Act §§ 40-49. Thereby,

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<sup>54</sup> Directive 95/46/EC

<sup>55</sup> Vejledning nr. 9719 of 9 november 2005.

<sup>56</sup> Datatilsynet; European Patients; Privireal 2005; Connected Digital Health in Denmark 2007; European Commission 2007; Rossing 2009

Denmark respects the patients' and citizens' rights as recommended by the Council of Europe and ratified EU directives such as 95/46, 97/66 and others.

In general, the patient has the right to opt out of gathering or communication of their health information for use in their treatment. The legislation requires proof of patient consent prior to delivery/transmission of data for other purposes e.g. research or administration. Patients consent is also needed whenever confidential information is shared with people and institutions outside of healthcare.

The Danish Health Act regulates the way patient related information must be handled in the Danish healthcare service. The ruling principle is that health information can be gathered electronically without patient consent. But the patient has to be informed and has the right to opt out.. There is an exception, though, which ensures that healthcare professionals involved in an actual episode of care will normally have access to pertinent information.

This means that information residing in department A may only be passed on to department B or to district healthcare when the information is to be used in an ongoing episode of care. In all other cases, the explicit approval of the patient must first be obtained. One of the most important objectives underlying this principle is to protect the patient from unintentional access to health information from the "outside world", like the place of work or social authorities. In practice, treatment of a patient mostly involves many different healthcare professionals from different sectors and together they provide a number of services such a prevention, examination, treatment and care. Here is a fine line between giving all information to relevant healthcare professionals within this network and protecting data against unauthorized access.

The provisions regarding professional secrecy and disclosure of information in the Danish Health Act originate from the Act on Patients' rights which came into force in 1998. At that time there was no widespread use of electronic medical records in the hospital sector, and the provisions regarding medical files in the Act on Patients' rights were designed to function in a non-electronic information environment. Later it became apparent that the wording of the provisions was not suitable in an electronic information environment where healthcare professionals are provided with direct access to electronic medical records and databases. As a result, the Health Act was amended in 2007. These provisions are explicitly dealing with the collection of electronic medical data.<sup>57</sup>

Additionally, doctors are obliged to inform the patient about the illness, the possibility of treatment, the side effects etc. It is also possible to set up a "living will", informing doctors about one's wishes regarding pain, treatment and prolongation of life treatment if one is no longer able to communicate. Patients have a right to see their own medical records free of charge, and doctors or other medically trained staff have

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<sup>57</sup> Sundhed; European Commission 2007; Castro 2009; Protti, Johansen et al. 2009

the obligation to interpret case records if the patient so wishes. Records after 1 January 2010 can be accessed electronically by the patient. (law nr. 534 27/12-2009).

Regarding mistreatment, a complaints system was established in 1988 for professional treatment in health service. The Patients' Complaints Board is an impartial public authority, which may express criticism of healthcare professionals not acting in accordance with commonly agreed professional standards or submit particularly serious cases to the public prosecutor with a view to bringing the cases before a court. Patients may seek compensation for injuries caused by examination or treatment in hospitals or by authorized healthcare professionals in private practice through the Patient Insurance Scheme, which was set up in 1992.

In relation to telemedical treatment, the Danish National Board of Health has issued legal guidelines regarding liability and other legal matters in connection with the use by physicians<sup>58</sup>. The guidelines refer to rules and principles in the existing legislation which also apply in connection to telemedicine. The guidelines conclude that the use of telemedicine does not affect the usual legal liability and other legal obligations of physicians. There is no jurisprudence with regard to the liability of physicians using telemedicine<sup>59</sup>.

### 3.5 Financing and reimbursement issues<sup>60</sup>

The system of financing health and IT systems in Denmark is one of the most important advantages for the country in comparison to other EU member states. It has a significant impact on health IT adoption, because of the Danish single-payer healthcare system. This means that the costs and benefits of investing in eHealth are better aligned than in other countries, where multiple governmental and non-governmental entities pay for healthcare.

Furthermore, financial incentives for health IT adoption by healthcare providers are an effective policy tool to spur the use of health IT. In Denmark early efforts to computerize medical practices relied on financial incentives. In the 1980s for example, primary care physicians received small subsidies for submitting medical claims electronically by disk. Denmark has also set national reimbursement rates for email consultations and in 2008 had over 20.000 e-mail exchanges per month between patients and doctors.

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<sup>58</sup> Telemedical Legislation: Vejledning nr. 9719 af 9. November 2005

<sup>59</sup> Dumortier 2009

<sup>60</sup> Connected Digital Health in Denmark 2007

Generally, the Danish government can afford to take long-term views and make investments that might not pay off fully in short term. This government involvement also leads to more accountability.

In sum, this implies that the Danish healthcare system is publicly funded: 85% of healthcare costs are financed through taxes and the majority is provided directly by the public sector. The healthcare system is based on a principle of free and equal access for all citizens. For financing of the majority of the regional and local healthcare expenditure, the state imposes a healthcare contribution tax – whereas 8% is from taxable income.

### 3.6 Evaluation results/plans/activities<sup>61</sup>

*From a public policy perspective, evaluation is a key activity in the policy-cycle. It provides insights into the success or failure of a policy or project and leads to new policy goals and new methods of implementation. The need for evaluation of eHealth policies and projects has been stressed time and again by the EC, not least in order to further the spread of eHealth in the process of healthcare delivery.*

In Denmark it is one of the eHealth Strategy principles to optimise the prospects of successful digitalisation by ensuring scope for development, trials, testing and research. Thereby, a number of limited development and pilot projects – referred to as pathfinder projects – are planned to be launched in cooperation with authorities, professional organisations, research institutions, providers and other relevant parties.

Action, which is taken on behalf of these plans, includes:

- Pathfinder projects on a small scale at the local level
- Establishment of a framework to ensure ongoing external evaluation of new initiatives
- Ongoing revision of action plans in order to provide a basis for using the plans actively to gain an overview of and manage the overall developments and coherence between individual projects

A specific study, which has been carried out by Deloitte in April 2007, conducted a review of the work carried out so far in relation to electronic patient records. The EHRs had been commissioned by the Board of Organisation of the Connected Digital Health Organisation (SDSD) – at that time known as EPR organisation. The review was performed with assistance from an independent panel of experts. The review also served as input to the new strategy for the years 2008-2012. Earlier

<sup>61</sup> Voss 2005; Stroetmann, Jones et al. 2006; Wanscher, Pederson et al. 2006; Connected Digital Health in Denmark 2007; Deloitte 2007

evaluation studies of electronic patient records (EPR) include EHR Observatory status reports from 2000-2006<sup>62</sup> and Evaluation reports of B-EPR implementations<sup>63</sup>  
<sup>64</sup>

At the European level, an evaluation of specific cases/eHealth applications has been carried out as part of the eHealth Impact Study. Among the “100 studies - an overview of good practice in Europe”<sup>65</sup>, some are from Denmark. In these studies economic impact of eHealth is underlined. Evaluation of Danish eHealth applications include: Baltic eHealth - Improving Life in Rural Areas of the Baltic Sea Region by eHealth Services; Healthcare delivery optimisation through telemedicine; Danish Health Data Network and the Danish eHealth portal.

## 4 Outlook

The Danish eHealth system has two characteristics, which make the country a frontrunner in the field compared to other EU member states: First, IT applications in the field of health are already deeply rooted at a local or regional level. This means that mature systems are in place not only for communication between health professionals, but also for patient access and data management, which leads to a certain amount of trust into health technology. Second, Denmark has a long history of financing and developing new IT applications in governance and health. Examples for this can be found in the deployment of patient summaries and in the area of policy documents, as 1996 the “Action Plan for EHRs” was created.

But the mature local IT systems also pose a challenge for future eHealth developments in Denmark, as the creation of national platforms and the combination of different systems is a difficult task. Especially for the development of the central prescription server and the medicine profile, the interoperability and coherence of these systems has to be assured.

In sum, Denmark stands out because of it's a) early adoption of ICT and electronic message communication among GP's partly due to the financing mechanisms, partly due to the pragmatic approach and ongoing work by MedCom, b) national registries some of which were established many years ago c) the establishment of shared services e.g. the medicine profile and the e-journal, and joint solutions/projects, such as the national eHealth portal (sundhed.dk) its single-payer financing system and the far-reaching development of patient data and access platforms. These unique features make the Danish eHealth system a frontrunner in Europe and give good examples for other European member states.

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<sup>62</sup> epj-observatoriet [EHR-Observatory] 2006

<sup>63</sup> Appel 2005

<sup>64</sup> Bosse 2007

<sup>65</sup> empirica

## 5 List of abbreviations

CSC	Computer Science Corporation
DNRP	Danish National Patient Registry
DRG	Diagnosis Related Group
EC	European Commission
EEA	European Economic Area
EHR	Electronic Health Record
EMR	Electronic Medical Record
EPR	Electronic Patient Record
epSOS	European patients Smart Open Services
ERA	European Research Area
EU	European Union
GDP	Gross Domestic Product
GP	General Practitioner
HCP	Healthcare Provider
HL7	Health Level Seven International (authority on standards for interoperability)
HMO	Health Maintenance Organisation
HPC	Health Professional Card
ICT	Information and Communication Technology
ID	Identification (e.g. number, card or code)
IHTSDO	International Health Terminology Standards Development Organisation
IT	Information Technology
LSP	Large Scale Pilot
NPI	National Patient Index
OECD	Organisation for Economic Co-operation and Development
PHS	Personal Health System



R&D	Research and Development
SDSD	Connected Digital Health Organisation
SNOMED	Systematized Nomenclature of Medicine-Clinical Terms
WHO	World Health Organization

## 6 Annex

### 6.1.1 Annex 1: Compound indicators of eHealth use by GPs

Compound indicator name	Component indicators	Computation
Overall eHealth use	<ul style="list-style-type: none"> <li>- Electronic storage of individual medical patient data</li> <li>- Electronic storage of individual administrative patient data</li> <li>- Use of a computer during consultation with the patient</li> <li>- Use of a Decision Support System (DSS)</li> <li>- Transfer of lab results from the laboratory</li> <li>- Transfer of administrative patient data to reimbursers or other care providers</li> <li>- Transfer of medical patient data to other care providers or professionals</li> <li>- ePrescribing (transfer of prescription to pharmacy)</li> </ul>	Average of component indicators
Electronic storage of individual medical patient data	<ul style="list-style-type: none"> <li>- A2a - Symptoms or the reasons for encounter</li> <li>- A2c - Medical history</li> <li>- A2c - Basic medical parameters such as allergies</li> <li>- A2d - Vital signs measurement</li> <li>- A2e - Diagnoses</li> <li>- A2f - Medications</li> <li>- A2g - Laboratory results</li> <li>- A2h - Ordered examinations and results</li> <li>- A2i - Radiological images</li> <li>- A2j - Treatment outcomes</li> </ul>	Average of component indicators
Electronic storage of individual administrative patient data	<ul style="list-style-type: none"> <li>- A1 - electronic storage of individual administrative patient</li> </ul>	A1 value
Use of a computer during consultation with the patient	<ul style="list-style-type: none"> <li>- B2 - Computer use during consultation</li> </ul>	B2 value
Use of a Decision Support System (DSS)	<ul style="list-style-type: none"> <li>- B3a - Availability of DSS for diagnosis</li> <li>- B3b - Availability of DSS for prescribing</li> </ul>	Average of component indicators
Transfer of lab results from the laboratory	<ul style="list-style-type: none"> <li>- D1e - Using electronic networks to transfer prescriptions electronically to dispensing pharmacists?</li> </ul>	D1e value
Transfer of administrative patient data to reimbursers or other care providers	<ul style="list-style-type: none"> <li>- D1a - Using electronic networks to exchange of administrative data with other healthcare providers</li> <li>- D1b - Using electronic networks to exchange of administrative data with reimbursing organisations</li> </ul>	Average of component indicators
Transfer of medical patient data to other care providers or professionals	<ul style="list-style-type: none"> <li>- D1c - Using electronic networks to exchange medical data with other health care providers and professionals</li> </ul>	D1c value
ePrescribing (transfer of prescription to pharmacy)	<ul style="list-style-type: none"> <li>- D1d - Using electronic networks to transfer prescriptions electronically to dispensing pharmacist</li> </ul>	D1d value

Dobrev, Haesner et al. 2008

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