Strategic Intelligence Monitor on Personal Health Systems, Phase 2

Country Study: Denmark

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# Table of Contents

LIST OF FIGURES ................................................................................................................................................ 3  
LIST OF TABLES .................................................................................................................................................. 3  
LIST OF BOXES .................................................................................................................................................. 3  

1. **INTRODUCTION** .......................................................................................................................... 5  
   1.1 Outline .......................................................................................................................................................... 5  
   1.2 Scope and Conceptual Setting of the Study .............................................................................................. 5  

2. **SECONDARY DATA COLLECTION – THE DANISH HEALTHCARE SYSTEM AND IPHS DEVELOPMENT** .................................................................................................................. 7  
   2.1 Socio-Demographic Background .............................................................................................................. 7  
      2.1.1 Composition of Population and Age Structure ....................................................................................... 7  
      2.1.2 Housing .................................................................................................................................................. 9  
      2.1.3 Socio-Economics ................................................................................................................................... 9  
      2.1.4 Urbanisation ......................................................................................................................................... 10  
      2.1.5 Education ........................................................................................................................................... 10  
      2.1.6 Use of IT and Internet in Denmark ....................................................................................................... 10  
   2.2 Chronic Diseases, Prevalence and Costs ............................................................................................... 11  
      2.2.1 General Figures ...................................................................................................................................... 11  
      2.2.2 Key Figures: COPD ............................................................................................................................... 11  
      2.2.3 Key Figures: Diabetes ............................................................................................................................ 12  
      2.2.4 Key Figures: Cardiovascular Diseases ................................................................................................. 12  
      2.2.5 Statistics: Chronic Patients and Telecare ............................................................................................ 13  
   2.3 Social and Healthcare Organisation ....................................................................................................... 14  
      2.3.1 Overall Financial Framework ............................................................................................................... 14  
      2.3.2 The Primary Care Sector ..................................................................................................................... 15  
      2.3.3 The Secondary Care Sector ................................................................................................................ 16  
      2.3.4 The State ................................................................................................................................................ 17  
      2.3.5 Recent Developments and Trends ....................................................................................................... 17  
   2.4 Disease Management Programmes and Prevention ............................................................................ 18  
      2.4.1 Programmes for the Continuity of Care: Chronic Diseases ................................................................... 19  
      2.4.2 Prevention ........................................................................................................................................... 20  
   2.5 Strategies and Initiatives for the Promotion of Integrated Care ......................................................... 21  
      2.5.1 Regional Health IT (RSI) and the National Board of E-Health (NSI) ....................................................... 21  
      2.5.2 Local Government Denmark and Digitalisation Strategy ..................................................................... 22  
      2.5.3 MedCom – the Danish Health Data Network ....................................................................................... 23  
      2.5.4 Telemedicine and Remote Patient Monitoring and Treatment ....................................................... 23  
      2.5.5 Model for Assessment of Telemedicine (MAST) ...................................................................................... 24
3. SELECTED DANISH CASES STUDIES ................................................................. 29

3.1 COPD Project no. 1: The Patient Briefcase ......................................................... 29
   3.1.1 Background ........................................................................................................ 29
   3.1.2 Project Description and Objectives ................................................................. 30
   3.1.3 Basic Principles, Organisation, and Technology ............................................. 30
   3.1.4 Description of ICT and Integration ................................................................. 32
   3.1.5 Costs ............................................................................................................... 32
   3.1.6 Mainstreaming Plans ....................................................................................... 32
   3.1.7 Analysis of Governance and Policy ............................................................... 32
   3.1.8 Analysis of Innovation and Drivers and Barriers ............................................ 33
3.2 COPD Project no. 2: The TeleKAT Project ......................................................... 34
   3.2.1 Background ........................................................................................................ 35
   3.2.2 Project Description, Organisations, Patients, Technology and Purpose .......... 35
   3.2.3 Project Method and Timeline ......................................................................... 36
   3.2.4 Costs, Mainstreaming Plans, and Integration ................................................... 37
   3.2.5 Analysis of Governance/Policy ....................................................................... 38
   3.2.6 Analysis of Innovation and Drivers and Barriers ............................................ 39
3.3 Diabetes project: The Diabetic Foot Ulcer Project ............................................. 40
   3.3.1 Background ........................................................................................................ 40
   3.3.2 Project Description, Organisation, and Technology ....................................... 41
   3.3.3 Timeline, Funding, and Patients ..................................................................... 42
   3.3.4 Expected Results ............................................................................................... 43
   3.3.5 Costs, Mainstreaming Plans, and Integration ................................................... 43
   3.3.6 Analysis of Governance ................................................................................. 44
   3.3.7 Analysis of Innovation ..................................................................................... 45
   3.3.8 Analysis of Drivers and Barriers ...................................................................... 46
3.4 CHF Project: The Anti Coagulant (AC) Treatment Project ................................. 47
   3.4.1 Background ........................................................................................................ 47
   3.4.2 Project Description, Organisation, and Funding ............................................. 48
   3.4.3 Technology and Integration .......................................................................... 48
   3.4.4 Patients and Method ........................................................................................ 49
   3.4.5 Costs ............................................................................................................... 49
   3.4.6 Mainstreaming Plans ....................................................................................... 50
   3.4.7 Analysis of Governance and Innovation ....................................................... 50
   3.4.8 Analysis of Drivers and Barriers ...................................................................... 51
3.5 ePatch for Monitoring Heart Arrhythmia of Patients at Home ........................... 53
3.5.1 Background ..................................................................................................................................................... 53
3.5.2 Project participants ........................................................................................................................................... 53
3.5.3 Funding and Project Period.............................................................................................................................. 53
3.5.4 Purpose ............................................................................................................................................................ 53
3.5.5 Technology ..................................................................................................................................................... 54
3.5.6 Results ............................................................................................................................................................ 54
3.5.7 Estimated Cost Savings .................................................................................................................................. 54
3.5.8 Mainstreaming Plans ......................................................................................................................................... 54
3.5.9 Analysis of Governance and Innovation ........................................................................................................... 54
3.5.10 Analysis of Drivers and Barriers ...................................................................................................................... 55

4. THE FUTURE OF IPHS AND RMT ..................................................................................................................... 57
   4.1 Common Dataset for Chronically Ill Patients Project .......................................................................................... 57
   4.2 Integrated Clinical Home Monitoring Project (ICHM) .......................................................................................... 59
      4.2.1 Project Description ........................................................................................................................................ 59
      4.2.2 Costs/Benefits .............................................................................................................................................. 60
   4.3 Interview with CSC ........................................................................................................................................... 60

5. FINDINGS, CONCLUSIONS, AND POLICY IMPLICATIONS ............................................................................. 63

APPENDIX 1 – EXPERT INTERVIEWS SECTION ................................................................................................. 65
APPENDIX 2 – REFERENCES ................................................................................................................................. 69

List of Figures
   Figure 1 – Demographic challenge .......................................................................................................................... 7
   Figure 2 – The Patient Briefcase .............................................................................................................................. 25
   Figure 3 – The Patient Briefcase .............................................................................................................................. 29
   Figure 4 – The TeleKAT eHealth-Monitoring Box ................................................................................................. 36
   Figure 5 – TeleKAT .................................................................................................................................................. 37
   Figure 6 – The Diabetic Foot Ulcer Project ............................................................................................................... 40
   Figure 7 – The Ulcer Record and Infrastructure ..................................................................................................... 41
   Figure 8 – Foot ulcer ................................................................................................................................................ 42
   Figure 9 – ePatch .................................................................................................................................................... 53
   Figure 10 – The Common Dataset .......................................................................................................................... 58

List of Tables
   Table 1 – Danish Demographics ........................................................................................................................... 8

List of Fact Boxes
   Fact box 1 – New Government Declaration on Healthcare ..................................................................................... 6
   Fact box 2 – sundhed.dk .......................................................................................................................................... 10
   Fact box 3 – The Civil Registration Number (CPR) .............................................................................................. 14
   Fact box 4 – NemID ............................................................................................................................................... 17
   Fact box 5 – Programmes for the Continuity of Care ............................................................................................. 19
Fact box 6 – RSI Indicators

Fact box 7 – MedCom – the Danish Health Data Network

Fact box 8 – Model for Assessment of Telemedicine - MAST

Fact box 9 – DRG and DAGS rates

Fact box 10 – The Common Medication Card

List of Acronyms and Names

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHF</td>
<td>Chronic Heart Failure</td>
</tr>
<tr>
<td>CPR</td>
<td>Central Person Register</td>
</tr>
<tr>
<td>COPD</td>
<td>Chronic Obstructive Pulmonary Disease</td>
</tr>
<tr>
<td>EOJ</td>
<td>Elektronisk Omsorgsjournal (electronic care record)</td>
</tr>
<tr>
<td>EPR</td>
<td>Electronic Patient Record (Elektronisk Patientjournal or EPJ)</td>
</tr>
<tr>
<td>GP</td>
<td>General Practitioner</td>
</tr>
<tr>
<td>HIA</td>
<td>Health Impact Assessment</td>
</tr>
<tr>
<td>ICHM</td>
<td>Integrated Clinical Home Monitoring Project</td>
</tr>
<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
</tr>
<tr>
<td>IPHS</td>
<td>Integrated Personal Health System</td>
</tr>
<tr>
<td>IPTS</td>
<td>The Institute for Prospective Technological Studies</td>
</tr>
<tr>
<td>LGDK</td>
<td>Local Government Denmark (Kommunernes Landsforening or KL)</td>
</tr>
<tr>
<td>NSI</td>
<td>The National Board of E-Health</td>
</tr>
<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
</tr>
<tr>
<td>OUH</td>
<td>Odense University Hospital</td>
</tr>
<tr>
<td>PWT</td>
<td>Public Welfare Technology</td>
</tr>
<tr>
<td>RMT</td>
<td>Remote Patient Monitoring and Treatment</td>
</tr>
<tr>
<td>RSI</td>
<td>Regional Health IT</td>
</tr>
<tr>
<td>SST</td>
<td>National Board of Health, Denmark</td>
</tr>
<tr>
<td>DACEHTA</td>
<td>Danish Centre of Health Technology Assessment</td>
</tr>
</tbody>
</table>
1. Introduction

This study presents and discusses the Danish status for integrated personal health systems (IPHS) and remote patient monitoring and treatment (RMT). It will aim to illustrate the patient and health monitoring systems that are available in Denmark, at what level of implementation these systems are, what impact they have on the general socio-economic context, as well as evaluate the cost-effectiveness of such systems where applicable. Furthermore, the study will discuss policies and initiatives supported by the government, the regions, and the municipalities, herein including the primary and secondary healthcare sector.

Interviews with key experts and stakeholders from Denmark and a substantial secondary data collection will reveal insights to the Danish context as well as serve as a benchmark for similar studies in the rest of the EU27 countries. The study will bring seven good practice descriptions from respectively two RMT projects on chronic obstructive pulmonary disease (COPD), one diabetes project, one chronic heart failure (CHF) project, two future projects and one market interview with the director of telemedicine in the key industrial player, CSC.

1.1 Outline

The study will start with a secondary data collection depicting Danish conditions such as the socio-demographic situation and social and healthcare organisation. In some cases, it will also draw comparisons with other European countries or EU27. This secondary data will serve as an appetiser and proper contextual introduction for the second part of this study, namely the good practice descriptions wherein the study introduces interviews with key stakeholders and experts with special insight to the Danish status of IPHS and RMT. Where relevant, fact boxes will present specific cases that deserve to be introduced separately. A list of experts interviewed is available in Appendix 1, “Expert Interviews Section”.

The case studies have been chosen as illustrations of the Danish situation. To sum up on the case studies, a section follows them on findings. The study finishes with a section on conclusions revealing the national status of IPHS and RTM in Denmark.

In the following, the scope and conceptual setting of the study is described.

1.2 Scope and Conceptual Setting of the Study

This section should help you, the reader, to understand the approach we have chosen in the Danish country study. In short, it follows the general approach set up by the international study team, which means that the country study comprises both a secondary data collection as well as a primary data collection, the latter building on qualitative semi-structured interviews with stakeholders and experts from Denmark. The primary goal of the study is to reveal the Danish status within integrated personal health systems and remote patient monitoring and treatment, specifically focusing on ICT applications (mainly through RMT) for chronic disease management, in particular: diabetes, COPD and CHF. Furthermore, the study should provide insights about development within the field in the coming years by introducing a description of two new IPHS projects and a description of the market from a business player perspective.

It should be noted that the study is based on the Danish political landscape at the time of writing i.e. up until the general election on 15 September 2011. The new government has abolished the Ministry of Interior and Health and founded the Ministry of Health and Prevention. See Fact box 1 below for an insight into changes related to the healthcare and eHealth area established by the new government.¹

¹ The information in this fact box originates from an article in the Danish journal “Dagens Medicin” http://www.dagensmedicin.dk/nyheder/2011/10/03/her-er-regeringsgrundlaget/index.xml
**Fact box 1 – New Government Declaration on Healthcare**

**New Government Declaration on Healthcare**

**Prevention:** The government will establish national goals for the development of the Danish public health 10 years ahead. These goals are to be reached by prioritising prevention efforts at a national and municipal level. The government will raise duties on cigarettes as well as beer, wine, sugar, fat, and other unhealthy foods. The government will allocate funds for a new strategy for the fight against youth smoking, initiate focused health efforts for marginalised groups, and work towards concrete goals for prevention efforts in municipalities.

**Fast treatment:** The government will have as a goal that patients with symptoms of serious illness are diagnosed within 30 days. When the GP has referred a patient with unspecified symptoms of serious illness for a diagnostic examination at the hospital, the patient should not be sent back to the GP, before a diagnosis has been made or the suspicion of serious disease has been dismissed.

**Quality:** The government will identify the need for more mobile intensive care units for the outer areas as well as better electronic records, which are to improve reception at hospital emergency departments.

**Investments in hospitals:** The regions should have the best possible framework for carrying out their tasks. Thus, the government will enter into talks with the regions about the possibility of loaning for investments creating a basis for a more rational operation of hospitals, and thereby breaking even within 10 years.

**Digitalisation and telemedicine:** The government will work for a more coherent effort in telemedicine and will set ambitious and binding objectives, committing regions and hospitals to embrace welfare technology at a large scale. The government will encourage the regions to increase the use of telemedicine treatment. New telemedicine wards are to be included in the construction of the new super-hospitals. This is to ensure qualified telemedicine treatment in all of Denmark. It is to be investigated how choosing telemedicine as part of the treatment can be made a patient right for chronically ill patients and other relevant patient groups.

**Patients:** Focus must be put on diagnosis, treatment, rehabilitation, and care. A coordinator for the course of treatment should be associated for particularly weak or fragile patients, who for instance suffer from more than one disease. The need for more hospital beds is to be examined.

**Psychiatry:** Psychiatric diseases are to be placed on an equal footing with physical diseases. Thus, the government will introduce a diagnosis and treatment guaranty for psychiatric diseases. The government will expand the efforts for patients suffering from anxiety and depression. The first priority for the government is to get faster help for children and young people affected by psychiatric conditions, and cut waiting lists for them to prevent them from losing contact with their family, school, and friends.

**Health insurance:** The government will eliminate tax deductions for health insurance.

**Fees for no-show:** The government finds it fair that people not showing up for ambulant treatment, surgery, etc. are charged with a fee. The introduction of fees for no-show shall be accompanied by better information about appointments such as SMS reminders or easy ways to cancel appointments on time.

**Better incentives:** The government will form a committee with the task of thoroughly investigating structure and incentives in the financial management of the healthcare system, including prices in the healthcare system (DRG rates). The aim for the committee is to ensure a fair settlement for private hospitals, that patients can travel across regional borders and receive fast treatment without being hindered by bureaucracy and disagreement on the price for treatment, and give incentives for prevention efforts in municipalities and regions.

**Modernisation of pharmacies:** The government will examine the possibility of selling medicine from the hospitals.
2. Secondary Data Collection – The Danish Healthcare System and IPHS Development

2.1 Socio-Demographic Background

The current Danish demographic situation is characterised by the same challenge faced by most of the European countries. This is illustrated in the chart below.

Figure 1 – Demographic challenge

![Chart showing the number of people in the workforce vs. those out of the workforce](chart)

Note: From 2008 and onwards, projections are used. A breach is therefore evident in relation to the historical series.

The yellow line starting just above 2.7 m and showing the number of people in the workforce cuts across the orange line starting at 2.4 m and showing the number of people not in the workforce around 2013. This projection shows that in the next couple of years, the number of people not working will surpass the number of people working. Furthermore, the gap between the two is expected to widen for at least the next ten years, thus creating a situation in which less people will have to care for more: the demographic challenge.

This section will give an overview of the current socio-demographic background in Denmark, including the composition of the population, age structure, housing, socio-economics, urbanisation, education, and the use of IT and Internet.

2.1.1 Composition of Population and Age Structure

Table 1 “Danish Demographics” outlines key figures concerning current and projected population size, health and income situation, as well as housing.

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2 The DREAM-group’s population tool (2009) and RAS in Statistics Denmark.
<table>
<thead>
<tr>
<th>Table 1 – Danish Demographics</th>
<th>DK</th>
<th>EU27</th>
<th>Source</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Current population</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total population (in m)</td>
<td>5.56</td>
<td>502.48</td>
<td>Eurostat</td>
<td>2011</td>
</tr>
<tr>
<td>Age group 65+ (% of total population)</td>
<td>16.3</td>
<td>17.4</td>
<td>Eurostat</td>
<td>2010</td>
</tr>
<tr>
<td>Age group 80+ (% of total population)</td>
<td>4.1</td>
<td>4.7</td>
<td>Eurostat</td>
<td>2010</td>
</tr>
<tr>
<td><strong>Projected population</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Old-age dependency ratio 3</td>
<td>24.9</td>
<td>25.9</td>
<td>Eurostat</td>
<td>2010</td>
</tr>
<tr>
<td>Projected old-age dependency ratio in 2020</td>
<td>31.9</td>
<td>31.1</td>
<td>Eurostat estimate</td>
<td></td>
</tr>
<tr>
<td>Projected old-age dependency ratio in 2050</td>
<td>41.3</td>
<td>50.4</td>
<td>Eurostat estimate</td>
<td></td>
</tr>
<tr>
<td><strong>Health situation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Healthy life years and life expectancy at age 65, female (years)</td>
<td>12</td>
<td>n.a.</td>
<td>Eurostat</td>
<td>2009</td>
</tr>
<tr>
<td>Healthy life years and life expectancy at age 65, male (years)</td>
<td>11.9</td>
<td>n.a.</td>
<td>Eurostat</td>
<td>2009</td>
</tr>
<tr>
<td>People having a long-standing illness or health problem (in % of population 65-74)</td>
<td>37.9</td>
<td>54.4</td>
<td>Eurostat</td>
<td>2009</td>
</tr>
<tr>
<td>People having a long-standing illness or health problem (in % of population 75+)</td>
<td>52.4</td>
<td>65.3</td>
<td>Eurostat</td>
<td>2009</td>
</tr>
<tr>
<td>Health care expenditure on Long Term Care – EUR per inhabitant</td>
<td>827.97</td>
<td>n.a.</td>
<td>Eurostat</td>
<td>2007</td>
</tr>
<tr>
<td><strong>Income situation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative median income ratio – Persons aged 65+</td>
<td>0.7</td>
<td>0.86</td>
<td>Eurostat</td>
<td>2009</td>
</tr>
<tr>
<td>At risk of poverty rates – Persons aged 65+</td>
<td>17</td>
<td>19</td>
<td>Eurostat</td>
<td>2006</td>
</tr>
<tr>
<td><strong>Housing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Share of people 80+ living alone</td>
<td>66.3</td>
<td>n.a.</td>
<td>SHARE</td>
<td>2004</td>
</tr>
<tr>
<td>Share of people 80+ living alone with family</td>
<td>5.8</td>
<td>n.a.</td>
<td>SHARE</td>
<td>2004</td>
</tr>
<tr>
<td>Share of people aged 80+ receiving care from household</td>
<td>21.5</td>
<td>n.a.</td>
<td>SHARE</td>
<td>2004</td>
</tr>
<tr>
<td>Share of people 80+ living in a special house for elderly</td>
<td>14.2</td>
<td>n.a.</td>
<td>SHARE</td>
<td>2004</td>
</tr>
</tbody>
</table>

3 Ratio between total number of elderly persons aged 65 and over and the number of people of working age (15-64).
As the table shows, the old-age dependency ratio is expected to increase in the coming decades. This is a clear symptom of the above-mentioned demographic challenge, meaning that there will be less people to care for more people in need of care. Other figures give an idea of the situation in Denmark compared with the EU as a whole. For example, the percentages of people aged above 65 and 80 are slightly lower in Denmark than in the rest of the EU. Further, the percentage of people having a long-standing illness or health problem is lower in Denmark in both of the shown age groups (65-74 and 75+). This apparent favourable health situation among elderly people in Denmark, when compared to other EU countries, could be argued to be a positive result of the Danish health system. This will be further described and discussed in section 2.3 “Social and Healthcare Organisation”. Even though the percentage of elderly people is lower in Denmark, however, the country’s demographic development in the last century means that the population is much older than it used to be. 100 years ago, only 6.6% of the population reached an age of 65 or over. Today that figure is higher than 16%. Comparatively, 34.3% of the population was younger than 15 years old in 1901. In 2006 that figure was 18.7%. Thus, the Danish population has aged considerably and will continue to do so.

2.1.2 Housing

In Denmark, it has become increasingly common to see elderly people living alone for many years. The Danes are living longer (the above table indicates 12 healthy life years and life expectancy at age 65) and therefore they often have many years to live once they lost their partner. Today, more than 29,000 people at an age of 90 years or older are living alone. This number has increased by 10,000 in a little more than ten years. Typically, women outlive men, and nine out of ten women aged 90 or above are living on their own. The health of elderly people living alone, compared with elderly couples, is more fragile for a number of reasons: they are often alone so if something happens to them, if they get injured or ill they cannot get help. They can also be forgetful, and without anyone to remind them about taking their medicine, going to the GP, or doing their exercises, their health might suffer. Also, their activity level may decrease if they are uncomfortable with or unable to go out on their own.

2.1.3 Socio-Economics

In general, Denmark is one of the countries in the world with the lowest poverty percentage. As a recent study shows, however, a new trend has changed the country’s socio-economic composition. The percentage of rich people has increased, and so has the percentage of the poor. Thus, the middleclass has decreased in size and Denmark is becoming increasingly polarised.

Financially, the majority of the elderly population is doing well. Many pensioners support themselves with occupational pensions and equity pension plans. However, a detailed interview survey of 500 Danes aged 65 years and over carried out in 2009 by the Danish journal Ugebrevet A4 shows that 14% of all pensioners are living under the poverty line and are unable to afford common consumer goods such as clothes and shoes. This group depends on their public pension as a sole source of income. This trend, like the trend in housing mentioned above, is most widely spread among women living alone, as they have to take care of all expenses on their own.

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5 http://nyhedeme-dyn.tv2.dk/article.php?id-9913950:flere-%C3%A6ldre-lever-alene.html
6 http://www.180grader.dk/Oekonomi/danmark-deles-op-flere-rike-endnu-flere-fattige
2.1.4 Urbanisation

Another current trend is the migration from rural areas to big cities. Consequently, 30 municipalities have been categorised as the “outer areas” of Denmark. To be categorised as an outer area, the biggest city in the municipality must have less than 30,000 inhabitants and the municipality must be located more than 40 km from the nearest strong geographic centre (i.e. cities with more than 40,000 jobs and with more people commuting in than out).\(^9\) In comparison to the rest of Denmark, the population in these municipalities is less healthy, less educated, and has lower incomes.\(^9\) As a consequence of urbanisation trends, many health services have been centralised in urban areas leaving the population in the “outer areas” with long distances to medical care. This results in a dangerous combination of an elderly and more fragile population with a lack of medical services in the immediate vicinity.

2.1.5 Education

The Danish educational system consists of approximately 3,000 schools and other educational institutions.\(^10\) In 2006, the general level of education in Denmark was considered one of the highest in the world. The annual statistics on educational levels from OECD, “Education at a Glance”, showed that 25% of 25-64 year-olds had higher education. Furthermore, the statistics showed that a large proportion of Danes participated in continuing education during the course of their working life. This shows how the Danes are willing to continuously perfect their skills. However, young Danes have a tendency to begin their studies at a later age than most other OECD countries.\(^11\) Since 2009, this trend has resulted in Denmark losing its top position on the overall education scorecard. Other countries, especially in Asia, have radically improved their educational level, while Denmark has been standing still. Thus, the Danes are still well educated, but other countries are catching up with the Danish level of education creating tougher competition on the global labour market.\(^12\)

2.1.6 Use of IT and Internet in Denmark

The final issue addressed in this section is the use of IT and Internet in Denmark. In 2010, 86% of Danish families had access to the internet from their own home. This makes the Danes some of the most keen internet users in Europe. In recent years, the use of the internet for health purposes has increased. Privately financed internet portals giving access to health information provide the Danes with a new and easily accessed source of general health related knowledge. In 2003, the publicly financed health portal sundhed.dk was launched and now functions as a hub for the communication between citizens, patients, and health professionals. The portal provides users with a basis for common knowledge and a comprehensive overview of relevant information and patient data.\(^13\) Read more about the health portal sundhed.dk in Fact box 2.

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\(^9\) http://www.dr.dk/Regioner/Sjaelland/Nyheder/Soroe/2011/01/21/130653.htm
\(^10\) See: http://www.denstoredanske.dk/Erhverv_karriere_og_leedelse/P%20C3%86dagogik_og_uddannelse/Danmark_%28Uddannelse%29
\(^12\) See: http://www.ugebreveta4.dk/2009/200936/Baggrundoganalyse/Danmark_taber_kaploeb_om_uddannelse.aspx
**Fact box 2 – sundhed.dk**

**sundhed.dk** is an internet portal allowing health professionals and citizens/patients to access an open part with general health information, and a closed part with confidential and patient-specific information. The closed part is accessible by using the national digital signature NemID.

**For health professionals**, the open part of sundhed.dk gives access to national and regional clinical instructions, referral information, and the catalogue of medicine. The closed part gives access to patient data across the health sector via the National Patient Index with data from the National Patient Register, hospital records (e-journal), medication records, and lab systems.

**For citizens/patients**, the open part constitutes the primary source of general information about the healthcare system, including medicine, patient rights, waiting times, and prevention. The closed part gives access to the patient's own data from hospital records and medication records. Furthermore, the patient has the option to communicate electronically with the GP for email consultations, renewal of prescriptions, and appointments.

### 2.2 Chronic Diseases, Prevalence and Costs

#### 2.2.1 General Figures

Around 1.8 m people i.e. one third of the Danish population suffer from one or more chronic diseases. In addition, several hundred thousand remain undiagnosed. The costs incurred by chronically ill patients take up approx 80% of the Danish healthcare system resources, which corresponds to 145 bn. DKK (19.5 bn. EUR). The following eight chronic diseases have been identified as areas that demand an increased effort and attention: diabetes, cancer, cardiovascular diseases, osteoporosis, muscle and skeleton diseases, asthma and allergies, COPD, and mental illnesses. According to an analysis from 2011, approx 54% of all visits to the GP are related to one of these eight diseases. The same survey reveals that the percentage of hospitalisations directly related to one of the eight chronic diseases, i.e. not counting hospitalisations caused by sequelae of these illnesses, is approx 36%. This means that 32% of patient days in hospital are directly related to chronic diseases. As well as hospitalisations, home care accounts for a large share of the public sector expenditure. Citizens suffering from a chronic disease often need help for carrying out everyday tasks. As stated in the analysis, 6.7% of the adult Danish population, i.e. almost 300,000 people, have experienced difficulty in carrying out everyday activities in the past six months. This has a direct influence on the expenditure for municipal home care.

Self-monitoring and self-treatment are considered a way to reduce the resources needed in the care for chronic patients. Also, letting patients carry out parts of their own care and treatment is regarded as a way to increase quality of life. This aspect will be treated further in section 2.3 “Social and Healthcare Organisation”.

#### 2.2.2 Key Figures: COPD

Current calculations show that 430,000 Danes suffer from COPD. This number is much higher than previously assumed. Every year 3,500 Danes die of COPD and an additional 2,200 die of illnesses partly caused by COPD. On a global scale, Danish women have the highest COPD related mortality

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16 Hulbæk, 2011: 76

17 See: [http://www.centerforfolkesundhed.dk/forskning/rehabilitering/klinsk+obstruktiv+lungesygdom+%28kol%29+-c12+-forsknin](http://www.centerforfolkesundhed.dk/forskning/rehabilitering/klinsk+obstruktiv+lungesygdom+%28kol%29+-c12+-forsknin)
rate and the COPD related mortality is higher in Denmark than in other European countries. Approx 15,000 Danes suffer from COPD to such a degree that they are considerably disabled in their everyday lives.\textsuperscript{18} According to a business case for home monitoring carried out by Rambøll,\textsuperscript{19} 45,000 COPD patients are hospitalised every year and 46\% of these patients are readmitted within one year. At the same time, a study from 2003 shows that the total costs of hospital treatment (admissions, ambulant treatment, and emergency ward) are close to 600 m DKK (80.5 m EUR) every year.\textsuperscript{20}

The high Danish mortality rate related to COPD along with the considerable costs for traditional treatment call for a commitment in the process of exploring other opportunities and possibilities in terms of integrated personal health systems and remote patient monitoring and treatment.

\subsection{2.2.3 Key Figures: Diabetes}

It is estimated that between 200,000 and 300,000 Danes are suffering from type 2 diabetes. The emergence of type 2 diabetes is increasing radically in the population. This is linked to the increasing elderly population, to the fact that type 2 diabetes patients live longer and to a general increase of overweight and inactivity among the Danish population. Approx 80\% of the diabetes patients are overweight.\textsuperscript{21} It is estimated that each year about 4,400 patients die of diabetes and 26,600 patients are diagnosed. Furthermore, diabetes costs Danish society a total of more than 31 bn. DKK (4.1 bn. EUR) every year.\textsuperscript{22} Statistics show that in 2008 approx 9,400 diabetes patients were hospitalised.\textsuperscript{23} Many diabetes patients function well at work on equal terms with their co-workers. However, late complications can result in serious handicap and reduced ability to work.\textsuperscript{24}

Because of the radical increase in diagnoses, diabetes has also become the focus of efforts towards the development of the Danish healthcare sector into an integrated and IT supported system.

\subsection{2.2.4 Key Figures: Cardiovascular Diseases}

Almost 200,000 Danes live with a cardiovascular disease. Each year approx 57,000 patients are hospitalised and 13,000 patients die as a consequence of such diseases.\textsuperscript{25} Since 1990, the number of hospitalisations has been increasing slightly because of the growing elderly population and improved nursing and treatment possibilities.\textsuperscript{26} This indicates that there are now more ways to treat a heart patient, which results in a larger number of admissions. In 2005, each hospitalised cardiac patient spent an average of 9.3 days in hospital at an average cost of 6203 DKK (818 EUR) per bed day. The same year, the total amount spent on hospitalisations of cardiac patients was 4.4 bn. DKK (595 m EUR).\textsuperscript{27} Apart from hospitalisations, cardiovascular diseases are at the root of costs for home care and aid, sick days from work, early retirement, and early death. Cardiovascular diseases

\begin{footnotesize}
\begin{enumerate}
\item Dansk sygeplejeråd: “Forebygelse er fremtiden– et forslag til en National handleplan for sundhedsfremme og forebygelse 2007–2011” \url{http://www2.dsr.dk/dsr/upload/3/0/203/Forebygelse_er_fremtiden.pdf}
\item Rambøll business case: “Business case for hjemmemonitorering” \url{www.medcom.dk/dwn2996}
\item Statens Institut for Folkesundhed: \url{http://www.si-folkesundhed.dk/upload/kol.pdf}
\item \url{http://www.kroniker.dk/Default.aspx?ID=61}
\item \url{http://www.diabetes.dk/Presse/Fakta_om_diabetes.aspx}
\item \url{http://www.statistikbanken.dk}
\item \url{http://vidensnetvaerket.dk/handicap-sygdom/fysiske-handicap-sygdomme/diabetes-sukkersyge}
\item Dansk sygeplejeråd: “Forebygelse er fremtiden– et forslag til en National handleplan for sundhedsfremme og forebygelse 2007–2011” \url{http://www2.dsr.dk/dsr/upload/3/0/203/Forebygelse_er_fremtiden.pdf}
\item Statens Institut for Folkesundhed: “Hjertestatistik 2008” \url{http://boccawired.ipapercms.dk/Hjerteforeningen/Rapporter/Hjertestatistik2008/}
\end{enumerate}
\end{footnotesize}
account for approx 17% of the total number of bed days and every year 2.7 m consultations in the private sector are related to these diseases.\textsuperscript{28}

As cardiovascular diseases are the cause of most deaths in Denmark,\textsuperscript{29} this, along with the two other chronic diseases mentioned above, is one of the main focus areas for the development and innovation in the healthcare sector.

\subsection*{2.2.5 Statistics: Chronic Patients and Telecare}

In the publication, "Chronic Illness – a Digital Society Diagnosis. Potentials and Barriers" the ICT company KMD has studied the attitudes of 1,100 Danes with chronic illnesses towards telecare\textsuperscript{30}. The study presents the results of a survey of chronic patients attitudes and expectations to the use of new technology as part of prevention and treatment of their illnesses. The survey was conducted in April 2011 and includes patients suffering from diabetes, cancer, CHF, asthma, osteoporosis, skin-illnesses, arthritis, psychical illnesses and illnesses in the central nerve system.

The overall picture from the completed survey is that the chronic patients are positive towards an increased use of videoconferences, automatic remote monitoring and similar technologies, which many respondents see believe can make their everyday life easier. Meanwhile, most of the consulted chronic patients mean that the healthcare sector should take the lead and offer more of this type of RMT solutions in prevention and treatment of people with chronic conditions.

Seven out of ten chronic patients believe that video consultations, automatic RMT and similar types of new technology to a higher or lower degree will be able to make their everyday life easier. Of these, 16% mean that it to a high or very high degree will be the case while additional 30% mean that the technology to some extent will be able to make a difference. Less than 20% of the respondents do not mean that the technologies will make any difference.

Nearly 60% of the respondents could imagine to use video consultations, RMT and similar technologies in connection to running follow-ups and controls at their GP. The corresponding number for running follow-up and control at ambulatories or hospitals are nearly 40%. A bit more than 45% can imagine using the technologies in connection to running reporting of personal health data. The same number could imagine using online contact when in acute need for advice and guidance from the GP.

More than 55% of the respondents experience to a high or lower extent that treatment of their chronic illness lacks coordination because different hospital wards, specialist doctors, GP and the municipality does not coordinate and communicate properly with each other. 37% sees it to some extent while nearly 18% to a high or very high degree sees that coordination is missing.

Nearly 20% of the respondents assess that use of video consultations, RMT and similar technologies with be able to replace most or all visits at the GP and at the ambulatory or hospital. Further 15% mean that half of all visits could be replaced, while 32% mean that a few visits could be replaced. Only just about 20% mean that the new technologies can not at all replace visits at the GP, ambulatory or at the hospital.


\textsuperscript{29} http://www.hjerteforeningen.dk/hjertestatistik/fakta_om_apopleksi/

Finally, the completed study shows that people with chronic illnesses expect that the public care sector take the lead when it comes to development and use of technical solutions. In this way, almost half of the respondents are positive if the public care-sector offers more technical solutions that can enable people to be more self-supporting in dealing with their own chronic condition. 41% of the respondents answer maybe to this question, while only about 4% does think that this is not needed.

### 2.3 Social and Healthcare Organisation

This section will give an overall description of the Danish social and healthcare organisation, including funding, coordination, and challenges. The Danish healthcare sector is divided into a primary care sector, consisting of private practitioners, and a secondary care sector comprising hospital services. A total of four authorities run different parts of the healthcare system, i.e. the state, the regions, the municipalities, and the private practitioners. See the below paragraphs for insight into each sector and the role of each authority.

### Fact box 3 – The Civil Registration Number (CPR)

The Civil Registration Number (CPR)

A CPR number is an unequivocal identification number given to all persons listed in the Central Person Register. It was introduced in Denmark in 1968 and in Greenland in 1972. A CPR number consists of 10 digits usually written with a hyphen between the first six and the last four digits. The first six digits represent the person’s birth date like this: dd.mm.yy. The seventh digit indicates the century in which the person was born. The eighth and ninth digits are serial numbers. The tenth digit indicates the gender of the person and functions as a check digit. If this digit is even, the person is female, if it is odd, the person is male.

### 2.3.1 Overall Financial Framework

Every year, the Danish healthcare system spending amount to approximately 97 bn. DKK (13 bn. EUR). This corresponds to 17,370 DKK (2,334 EUR) per citizen. Within the healthcare system, the costs are divided between hospitals (78%), private practitioners (15%), and subsidies for medicine (7%). In the last 11 years, the costs for the Danish healthcare system have increased by 27 bn. DKK (36 bn. EUR) or about 39%. In six years, the productivity has increased by 8.7%.

The Danish society is a so-called welfare society, in which all citizens pay taxes and these taxes provide welfare for all citizens. This system is founded on the idea that all citizens should have equal access to a range of services, paid for by taxes. For example, all citizens should be able to get help if they lose their job or if they fall ill. This help includes financial support, medical care, and hospital treatment amongst others. All children must go to school and have the possibility to get an education. All citizens should also be able to get necessary information and guidance. The Danish tax level is one of the highest in the world. However, the Danish public system is very comprehensive and it takes care of many services that citizens in other countries have to pay for themselves or that do not exist at all. 10.6% of all Danish tax revenues go to the healthcare system.31

The Danish system of long-term care provision is needs-based. This means that each individual in need of long-term care services is entitled to receive them. Any person who is lawfully resident in Denmark is entitled to receive assistance and long-term care services under the Consolidation Act on Social Services.32 They are eligible to receive personal care and help with practical duties, irrespective of age, income, or other aspects. There is no minimum requirement in terms of impairments to receive personal and practical help. However, an individual assessment of the recipient’s functional abilities, welfare, life content, home conditions, and individual needs is carried out.

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Generally, the different kinds of long-term care services are provided free of charge. The municipalities are responsible for financing the costs for long-term care services. This is done through local taxes and block grants, equalisation grants and temporary subsidies from the national government.33 34

Temporary home care requires a minor co-payment (mostly for products and materials) from the patients, depending on income.37 However, permanent personal and practical assistance is free of charge. Citizens living in a residential care home have to pay a monthly rent, depending on income and capital. However, the co-payments are in general rather low and this plays only a minor role in the social service funding scheme.38

In 2007, approx 206,600 people received personal and practical help. This represented 3.8% of the population. 87% of the beneficiaries were 65 years old and older. Around 44% of people living in their own home receive help solely for practical duties. Most of the recipients live in their own home (80%), and 20% in nursing homes or nursing dwellings.39

2.3.2 The Primary Care Sector

The primary care sector consists of two main players: the municipalities and the private practitioners.

Municipalities

In Denmark, there are a total of 98 municipalities. These are responsible for the planning, organisation, delivery, and financing of care and help at home and in day homes and centres, nursing homes, and various forms of housing for older people. According to national law, the municipalities are obliged to offer home care services and adequate supply of nursing homes and dwellings for older people as well as conducting preventive home visits to older people.40 41 Either the municipalities provide the services themselves or they outsource service provision to external providers. Family care plays a minor role in Denmark.42 Thus, the majority of long-term care services for older people and people with chronic diseases are being provided by the municipalities. Furthermore, the latter are obliged to provide social welfare allowances such as sickness benefits or disability pensions. The municipalities finance the costs of long-term care through local taxes and block grants from the state.

As mentioned, some municipalities make use of the possibility to outsource some services to local non-profit (and increasingly also to private for-profit) organisations. Privately contracted services include long-term inpatient care in nursing homes, care in day care centres, and social services for chronically ill and/or older people.

Before the introduction of a law in 2002 (“Greater choice of provider”) municipalities were the only providers of long-term care services in Denmark. This law provides citizens in need of home care with the choice to hire private help as an alternative to the public services. Up to a certain amount, this option is free of charge for the citizens, but if the price of private home care exceeds the predefined limit, citizens are to finance the difference themselves. As mentioned, informal care provided by families and friends is not common in Denmark. However, the municipalities also...

33 Schultz (2010).
34 Mutual Information System on Social Protection (MISSOC), Comparative Tables on Social Protection January 2010, Country: Denmark, Section XII. Long-term care.
35 Schultz (2010).
39 Schultz (2010).
42 Schultz (2010).
provide substitute or respite care as well as cash allowances for palliative care. Some practical help such as gardening and financial tasks is often provided by informal carers.43

A report from 2011 looks into how many of the 98 municipalities offer prevention services for the three groups: diabetes, cardiovascular disease, and COPD. According to the report, 84 municipalities offer prevention services for at least one group, while only 43 offer services for all three groups. COPD is the disease that most municipalities focus on in terms of prevention.44 For a closer look into the area of prevention, see Section 2.4 “Disease management programmes and prevention”.

As to rehabilitation of patients, inter-sectorial collaboration is vital. Patients discharged from hospital may be in need of rehabilitation, in which case this task is carried out by the municipality. In this process, the municipality will work together with the hospital as well as the GP. In order to strengthen the inter-sectorial collaboration in the rehabilitation process, regions and municipalities have produced a number of initiatives. These initiatives mainly target clear division of labour and objectives of efforts, knowledge sharing about resources and competencies, as well as exchange of information between sectors.45

Private Practitioners
The overall term “private practitioners” covers GPs, practising medical specialists, physiotherapists, chiropractors, psychologists, dentists, and chiropodists. These practices are run as self-employed businesses.46 All private practitioners are paid by the public Danish health insurance. Each practitioner is allocated a service number as a condition for remuneration from the public health insurance.47

The services delivered by the private practitioners are provided in close collaboration with the hospital service and the municipal welfare services.48

In connection with public health insurance, Danish citizens are free to choose between insurance groups 1 and 2. Most people belong to the first group, which means that they are affiliated to a specific GP. For people in this group, GP consultations are free of charge. People in the second group can choose freely between all practices. However, they have to pay part of the costs of each consultation.49

2.3.3 The Secondary Care Sector
The Danish secondary care sector consists of two main players: the regions and the hospitals.

Regions
In Denmark, there are five regions: Capital Region of Denmark, Region Zealand, Region of Southern Denmark, Central Denmark Region, and North Denmark Region. The regions have a general responsibility for most parts of the Danish healthcare system. This includes the treatment offered by private practitioners, prevention, rehabilitation, research, eHealth, etc. Additionally, the

43 Schultz (2010).
46 http://www.regioner.dk/Sundhed/Praksissektoren.aspx
47 See: http://www.denstoredanske.dk/Krop_psyke_og_sundhed/Sundhedsvidenskab/Sundhedsuddannelser/ydermumder
48 http://www.sum.dk/Sundhed/Praksissektorene.aspx
49 https://www.sundhed.dk/Artikel.aspx?id=23853.833
regions have a direct responsibility for the running of public hospitals. This area will be described in further detail below.

**Hospitals**

In Denmark, there are 53 public hospitals with a total of 18,303 beds. 104,000 full time employees work in the public hospitals. Of these, 14% are doctors, 33% are nurses, 23% are other forms of health professionals, and 30% are other forms of employees, i.e. psychologists, social workers, administrative employees, cleaning staff, technical staff, etc.

Besides the public hospitals in Denmark, about 200 private hospitals and clinics have entered into an agreement with the regions about the extended free choice of hospital. This means that patients subjected to waiting times of more than one month (two months for psychiatry) are free to choose treatment in a private hospital instead of a public one. This initiative is an attempt to meet the challenge of cutting hospital waiting lists.

### 2.3.4 The State

The Ministry of the Interior and Health was established on February 23rd 2010. The Ministry is in charge of the administrative functions in relation to the organisation and financing of the health care system, psychiatry, and health insurance as well as the approval of pharmaceuticals and the pharmacy sector.

Furthermore, the Minister for Welfare monitors the five regional state administrations. The supervision of the regions and municipalities in Denmark is performed by five regional state administrations, from a legal point of view. The supervisory authorities do not consider whether transactions made by local councils are reasonable or appropriate, nor do they consider issues concerning discretionary actions, as long as the actions comply with the law. The supervision does not extend to issues of compliance with the principles of good administrative practice.

### Fact box 4 – NemID

**NemID**

NemID (easy ID) is the new electronic signature meant to speed up the Danish vision of one common log-in for both the public and the private sectors. NemID makes it possible to use the same log-in for everything. It can be used for online banking, municipal online self-service, and much more. Before, Danes could only access this information by using a digital signature from one particular computer, but with NemID it is possible from almost any computer. Security is ensured by the key card, a physical card with code numbers (something you have) used in combination with a personal username and password (something you know).

### 2.3.5 Recent Developments and Trends

Three major trends characterise the current developments in the Danish healthcare system: future-proof hospitals, centralisation of medical services, and the prevalence of private health insurance.

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50 [http://www.regioner.dk/Sundhed.aspx](http://www.regioner.dk/Sundhed.aspx)
51 See: [http://www.regioner.dk/Aktuelt/Temaer/Fakta+om+regionernes+effektivitet+og+%C3%B8konomi/Kopi+af+Fakta+om+sundheds+og+%C3%A6snet.aspx](http://www.regioner.dk/Aktuelt/Temaer/Fakta+om+regionernes+effektivitet+og+%C3%B8konomi/Kopi+af+Fakta+om+sundheds+og+%C3%A6snet.aspx)
52 [http://www.regioner.dk/Sundhed/Udvidet+frit+sygehusvalg.aspx](http://www.regioner.dk/Sundhed/Udvidet+frit+sygehusvalg.aspx)
53 After the election of September 15th 2011, this ministry was renamed the Ministry of Health and Prevention.
54 [http://www.im.dk/English/The%20Ministry.aspx](http://www.im.dk/English/The%20Ministry.aspx)
55 [http://www.im.dk/English/Municipalities-regions.aspx](http://www.im.dk/English/Municipalities-regions.aspx)
In the financial agreement of 2008, the Danish government and Danish Regions agreed that there is a need for a structural change in the hospital system, which calls for investments in physical adaptations and new technology. In order for this to happen, 41.4 bn. DKK (5.5 bn. EUR) will have to be invested in the construction of new future-proof hospitals. The structural changes are centred on the need for increased specialisation by gathering treatments in fewer locations with the purpose of increasing quality and optimising use of personnel resources. An expert panel has been formed for the assessment of operational economic profitability, efficiency, effectiveness, and quality. Investing in a future hospital structure is regarded as a unique opportunity to create innovation in the healthcare system.

As mentioned in section 2.1 “Socio-Demographic Background”, the Danish healthcare system faces a demographic challenge currently on the rise. The centralisation of hospital services in the future hospital structure, which aims to increase the level of quality and effectiveness of treatment, leaves the “outskirts” with longer distances to fewer, but highly specialised hospitals. This calls for a strengthening of the interaction and collaboration between the primary and secondary care sector as well as an increased use of telemedicine and remote patient monitoring and treatment.

Despite treatment in the Danish healthcare system being free of charge and despite a waiting list guarantee enabling patients to seek treatment in private hospitals, an increasing number of Danish citizens are getting private health insurance. Some can get health insurance from their employer, others choose to take out a health insurance policy on their own. This way, patients can be sure to have access to free treatment in private hospitals and thereby avoid the waiting time in the public system. According to the Danish newspaper “Politiken”, one third of the Danish population subscribes to a private health insurance.

2.4 Disease Management Programmes and Prevention

In a report produced by the National Board of Health in 2005, a number of challenges were identified in relation to society and healthcare system initiatives required to address the needs of chronically ill citizens. The report points out needs in the treatment of this patient group, including the need to introduce programmes for the continuity of care for the large patient groups with chronic disease and the need for supporting patients’ ability to care for themselves.

As a follow up on this report, the National Board of Health decided to elaborate on the overall recommendations by establishing two projects: “The patient with chronic disease” (Patienten med kronisk sygdom) and “The healthcare system and chronic disease” (Sundhedsvæsenet og kronisk sygdom). The first project was given the task of describing the possibility of operationalising the concept of self-care and pointing out concrete suggestions to be implemented in the healthcare system. The project was carried out by an interdisciplinary work group and resulted in the report “The patient with chronic disease – An idea catalogue” (Patienten med kronisk sygdom – Et idékatalog), published by the National Board of Health in March 2007. This report builds on the considerations, examples, and ideas discussed in the work group, and is to be regarded as an idea catalogue providing inspiration and supporting prioritisation and development of the initiatives for chronically ill citizens. It points out possibilities for strengthening and supporting individuals suffering from a chronic disease. The target group is health professionals and planners in regions and municipalities as well as patient organisations. Among other things, the report shows that in

56 http://www.regioner.dk/Sundhed/Sygehusbyggeri.aspx
57 Hulbæk, 2011: 77.
58 http://politiken.dk/indland/ECE783130/hver-tredje-har-privat-sundhedsforsikring/
case of some diseases, patients are able to monitor themselves or register symptoms or measurable parameters with significance for the progression and treatment of the disease, and carry out adjustments of treatment on the basis of this. The second project will be described in the following paragraph.

2.4.1 Programmes for the Continuity of Care: Chronic Diseases

The project “The healthcare system and chronic disease” aimed at outlining a generic model for programmes for the continuity of care as well as concretising this model in a programme for a specific chronic disease (diabetes). This work has been organised in different work groups running in parallel and with a high degree of knowledge sharing and mutual inspiration. The programme for diabetes has been presented to the national diabetes steering committee, and the generic model for programmes for the continuity of care as well as the programme specifically for diabetes have also been presented in a public hearing in 2007.

The purpose of a generic model for programmes for the continuity of care is to give an overall framework for the content of the programmes, that can be used by health managers, administrators, decision makers, health personnel in regions and municipalities as well as patient organisations and others involved in the development and implementation of programmes for the continuity of care for chronic disease. The report “Programmes for the continuity of care for chronic disease” (Forløbsprogrammer for kronisk sygdom) shows that it is essential to ensure that every initiative in the actions for chronically ill patients is organised in a suitable way at patient level as well as at organisational level. The goal is to ensure coherence between the different health related interventions in the course of a disease, in order to ensure that the involved health professionals as well as the patient have a common objective with the course of treatment, that the professionals have or acquire the necessary competencies, as well as ensuring that the individual components lead to the best clinical results possible. It is recommended that the main emphasis be on the primary care sector as well as the municipal healthcare system. Furthermore, interaction and co-ordination with the specialised level is to be ensured.

The programmes for the continuity of care aim at achieving high quality interventions and patient safety in the entire course of the disease as well as an appropriate utilisation of resources. Emphasis is on a systematic proactive action preventing exacerbation of disease, acute episodes and complications, and continuously monitoring the quality of the course of treatment.

Fact box 5 – Programmes for the Continuity of Care

Programmes for the Continuity of Care

A programme for the continuity of care describes the overall interdisciplinary, inter-sectorial, and coordinated healthcare actions for a given chronic disease, and is meant to ensure the use of evidence-based recommendations for the treatment and care, a precise description of the division of tasks as well as coordination and communication between all parties involved. The generic model for programmes for the continuity of care focuses on treatment and care, and the primary focus for these efforts is the part of the population that has been diagnosed with a chronic disease. A main purpose of the programmes for the continuity of care is to keep the individual patients as the core focus.

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2.4.2  Prevention

As described earlier, maintaining public health is a common responsibility; state, regions, and municipalities work together to ensure a coherent and high quality continuity of care across sectorial borders.

As a result of the Health Act of 2005 and the structural reform in 2007, the organisation of prevention in Denmark has changed. Now, the municipalities have the overall responsibility for creating healthy surroundings and providing prevention for local citizens, i.e. citizen-oriented prevention. Municipalities and regions have a common responsibility for health promotion and prevention of diseases in cooperation with patients, i.e. patient-oriented prevention. The National Board of Health advises regions and municipalities about prevention.  

Unhealthy lifestyles reduce our quality of life and cause more than 40% of all deaths every year. This has resulted in the Danish government having an increased focus on prevention and health promotion. With the health programme “Lifelong health” (Sund hele livet), introduced by the government in 2002, goals for risk factors and eight diseases were set. In 2007, the municipal reform meant that the municipalities were assigned the responsibility for the citizen-oriented prevention effort closely related to each citizen. With “Health Package 2009” (Sundhedspakke 2009), the government has introduced a national action plan for prevention, in which one of the focus areas is the role of municipalities concerning citizen-oriented prevention.

The government has a goal to prolong life expectancy of the Danes by three years in the course of the next 10 years. In 2008, a Prevention Commission was formed and given the task of presenting recommendations for future efforts in prevention. The commission finished its work in 2009 and presented a number of suggestions, which formed the basis of the national action plan introduced by the government.

The report from the prevention commission concluded that the life expectancy of the Danish population is shorter than it is for populations in the countries we normally compare ourselves with. Not only do Danes live shorter lives, in many cases the last years are also characterised by poor health and reduced quality of life. This is the result of unhealthy habits especially related to four factors: diet, smoking, alcohol, and exercise. Of these factors, smoking is the main culprit. Furthermore, the report states that there is a correlation between level of education and health. This means that people with higher education live longer and experience fewer years with reduced quality of life than people with a shorter education.

The main framework for prevention and health promotion are established by the Health Act. The overall division of responsibilities between the state, regions and municipalities is described in the following paragraphs.

The state is responsible for the overall planning. The Ministry of Health and Prevention carries out the main tasks concerning planning, co-ordination, and development of initiatives in health promotion and prevention. Additionally, a number of other ministries carry out prevention tasks because of their field of responsibility. One example is the Ministry of Education, which attends to tasks in prevention and health promotion in the educational system. Concrete examples are instruction in health, lifestyle, and physical activity in municipal primary and lower secondary schools as well as courses such as home economics, health and sexual education, and sport.

The regions focus on patient-oriented prevention. According to the Health Act, the regions are to cooperate with the municipalities in addressing chronically and long-term ill citizens. Municipalities and regions are free to choose their methods in these efforts, but examples could be development

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64 Sundhedsstyrelsen: “Regionernes forebyggelsesopgaver – En vejledning sundhedslovens § 119, stk. 3”
http://www.sst.dk/publ/Publ2009/CFF/Regional_forebyggelse/Regionernes_forebyggelsesopgaver.pdf
65 http://www.sum.dk/Sundhed/Forebyggelse.aspx
66 http://www.sum.dk/Sundhed/Forebyggelse/Forebyggelseskommissionen.aspx
and implementation of programmes for the continuity of care and offering patient education. Furthermore, the regions are to offer guidance etc. in relation to the municipal efforts. The regions also have the responsibility for research and development with a view to educating health professionals to carry out health related tasks at a high professional level. Thereby, considerable activity is spent on integrating tasks carried out in the primary care sector with tasks carried out in the hospitals.

The municipalities' efforts are oriented towards citizens and patients. With the municipal reform and revised health legislation, the 98 municipalities have been assigned responsibility for a number of new tasks in healthcare. These concern responsibility for citizen-oriented health promotion and prevention, and responsibility for the parts of patient-oriented prevention, which does not take place in the hospitals and with the general practitioners. This is based on the idea that the proximity to the citizens gives the municipalities a good opportunity to monitor and influence the health situation of the citizens. Furthermore, the municipalities have the opportunity to arrange a coherent effort across the social area, schools, leisure life, etc.67

2.5 Strategies and Initiatives for the Promotion of Integrated Care

According to a report written in 2011,68 the final goal of promoting interoperability in general, and Personal Health Systems (PHS) in particular, is to contribute to integrated care. This is to be supported through comprehensive, easy, and collaborative access to and sharing of a patient’s health data for all authorised health professionals, family carers, and ultimately the patient. Based on the premise that connecting people, systems, and services is vital for the provision of good healthcare in Europe, the European Commission passed a Recommendation in 2008 on cross-border interoperability of electronic health record systems with the aim of achieving overall European eHealth interoperability by the end of 2015. The following paragraphs will describe selected strategies and initiatives for the promotion of integrated care in Denmark.

2.5.1 Regional Health IT (RSI) and the National Board of E-Health (NSI)

A number of new initiatives form the strategic foundation for the future implementation of integrated personal health systems and remote patient monitoring and treatment in Denmark. The first to be mentioned is Regional Health IT or RSI (Regional Sundheds-it), which was initiated in February 2010. The challenges described in section 2.1 “Socio-Demographic Background” call for a strengthening of inter-sectorial collaboration in the Danish healthcare system. From a citizen perspective, it is expected that the healthcare system is open and includes citizens in the care for their own health at the same time as delivering high quality treatment. The regions regard the use of health IT as crucial in relation to the pressure put on the healthcare system. Thus, health IT is an integrate part of the regions’ work towards continuously being able to treat more patients with fewer staff and fewer means while maintaining high-level quality. In order to meet these challenges, the regions have established 24 indicators (see Fact box 6).69

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67 Forebyggelseskommissionen: “Vi kan leve længere og sundere – Forebyggelseskommissionens anbefalinger til en styrket forebyggende indsats”
http://www.forebyggelseskommissionen.dk/Files/Billeder/betaenkning/Forebyggelseskommissionen_resume.pdf
http://sph.continuaalliance.org/docs/SmartPersonalHealth_publication_web.pdf
69 http://www.regioner.dk/Sundhed/Sundheds-IT/RSI/Pejlem%C3%A6rker.aspx
Fact box 6 – RSI Indicators

RSI Indicators

The 24 indicators formulated by RSI are divided into the four categories listed below:

- 5 indicators for the regional effort relating to the clinical IT workplace.
- 5 indicators for the optimisation of hospital operation.
- 8 indicators for the regional effort relating to IT-based support of coherence and collaboration.
- 6 indicators for patient empowerment.

The second initiative is the National Board of E-Health or NSI (National Sundheds-it). This is a new board under the Ministry of Interior and Health. NSI has two main tasks:

- Managing the national administration of IT in the healthcare sector, including the collaboration with regions and municipalities.
- Managing operation and development of the Ministry’s health related IT systems in agreement with the individual boards, etc.

As part of these tasks, NSI establishes national standards, implements prioritised cross-disciplinary initiatives, and ensures that the development of IT in the healthcare sector takes place in line with the IT strategy for the healthcare system.70

2.5.2 Local Government Denmark and Digitalisation Strategy

Local Government Denmark or LGDK (Kommunernes Landsforening or KL) is behind a number of initiatives targeted at strengthening integrated care and the use of IT on a municipal level. One of these initiatives is the “Municipal Digitalisation Strategy 2010-2015” in which LGDK encourages all municipalities to collaborate for the digitalisation, standardisation, and efficiency improvement of the public services offered by the municipalities. Strategies for the following four areas have been prepared: employment, social services and healthcare, technical and environmental services, and children and culture. Digitalisation in the social services and healthcare area is to serve multiple purposes. For municipalities, the main benefits from developing and investing in digitalisation in the social services and healthcare area are:

1. To create documentation in support of political decisions and financial management while being reasonable for employees requiring evidence for the benefits of digitalisation,
2. All authority decisions are to be supported by IT in order to ensure high quality decisions and effective working procedures,
3. Welfare technology is to be used for decreasing the need for manpower,
4. Citizens are to have access to information, be able to follow their own cases and be able to communicate digitally with the municipality.

The social services and healthcare area is already highly digitalised. This applies for both case management and the delivery of services to citizens. However, the intensity of the digitalisation as well as the maturity of the technology varies:

- In the care for elderly persons, case management is highly digitalised and supported by IT,
- In the care for handicapped persons or marginalised adults, the municipal need for IT in authorities is not sufficiently covered,
- There is an untapped potential for improved electronic communication with especially GPs and hospitals as well as a lack of structuring of health data in the municipalities.

All municipalities’ patient data administration of citizens’ services and registration of health data take place in electronic care records (Elektroniske Omsorgsjournaler or EOJ), and handheld technology is used in the homecare system. Furthermore, a number of assistive technologies are...

[70] http://www.nsi.dk/sitecore/content/Nsi/Om_os.aspx
used in care homes and citizens' own homes for e.g. decreasing the risk related to heavy lifting. For a number of years, MedCom messages have been used for communication between municipalities and hospitals, GP's, and pharmacies. The dissemination of these communication solutions is increasing and a project initiated in 2009 in LGDK aims at further dissemination.71

2.5.3 MedCom – the Danish Health Data Network

MedCom's focus is the national implementation and dissemination of cross-sector communication between the parties in the healthcare sector. Since MedCom started in 1994, the focus has been on the communication requirements of the private practice sector, with the role of the GP as a gatekeeper to the more specialised healthcare sector. Following the structural reform, there has been an increase in focus on the communication requirements of the local authority healthcare sector. MedCom has a strong tradition of close collaboration with IT suppliers, professional companies, and other user groups in terms of the practical implementation of the strategic objectives for the development of healthcare IT. The most frequently used messages are prescriptions, discharge letters, referrals, laboratory results, laboratory requests, and local authority notifications.72 Read more about MedCom in Fact box 7.

Fact box 7 – MedCom – the Danish Health Data Network

MedCom is a co-operative venture between public authorities, organisations and private firms linked to the Danish healthcare sector. In the 1999 financial agreement between the counties and central government, it was decided that MedCom would be made permanent, with the following objective:

"MedCom will contribute to the development, testing, dissemination and quality assurance of electronic communication and information in the healthcare sector with a view to supporting good patient progression".

MedCom is financed by:
- The Ministry of Health and Prevention
- National Board of Health
- Danish Regions
- Local Government Denmark

2.5.4 Telemedicine and Remote Patient Monitoring and Treatment

This section is inspired and translated from Hulbæk (2011). Until recently, the dissemination of telemedicine in the Danish healthcare system has not been given high priority, and typically, telemedicine initiatives have been run by local enthusiasts. However, in “National strategy for digitalisation of the healthcare sector 2008 – 2012” (National strategi for digitalisering af sundhedsvæsenet 2008 – 2012),73 telemedicine solutions are mentioned as a way to foster cooperation and coherence across distances, improve quality of treatment, and enhance the service offered to citizens. Telemedicine will allow for faster and better diagnosis, reduce unnecessary transport, and offer new possibilities for consultations. In 2011, the regions prepared the first ever overall strategy for how telemedicine solutions are to contribute to the optimisation of hospital operation, including telemedicine internally in hospitals and between hospitals, pre-hospital

72 http://www.medcom.dk/wn109991
73 Sammenhængende Digital Sundhed I Danmark http://www.regioner.dk/Sundhed/Sundheds-IT/RSI/-/media/RSI%20media/national%20strategi%20sundheds-it%202008-2012.ashx
telemedicine, and telemedicine between hospital and the patient’s own home. In the municipal social services and healthcare sector, strategies for an improved utilisation of the possibilities in telemedicine are also considered. For example, telemedicine and remote patient monitoring are considered relevant technologies for achieving a strengthened cooperation across sectors in order to ensure greater coherence in the services for each individual citizen. With the integration of telemedicine and remote patient monitoring, a greater proportion of treatment can take place on an outpatient basis or in the citizen’s own home rather than by expensive hospitalisations. Different national funding pools giving a cash injection to the dissemination of telemedicine in the Danish healthcare system reflect the positive strategic statements about the possibilities in telemedicine.

According to Hulbæk (2011), three main problems call for an increased use of telemedicine in Denmark in the coming years: a shrinking labour force in the healthcare sector, a growing number of chronically ill citizens, and the centralisation of healthcare services leaving the “outskirts” of Denmark with long distances to medical services.

2.5.5 Model for Assessment of Telemedicine (MAST)

The final initiative described in this section is MAST. This model was developed as an answer to the request for high quality evidence on the effectiveness of telemedicine in the process of diffusion and large scale implementation of telemedicine. The aim of the model is to provide a structured framework for assessing the effectiveness and contribution to quality of care of telemedicine applications. The model is the result of the project MethoTelemed (2009-2010) during which the development of the model was based on results from workshops with stakeholders and users of telemedicine, a systematic literature review (published in Ekeland et al., 2010), and the EUnetHTA Core Model for interventions. MAST is to be used if the purpose of an assessment is to describe effectiveness and contribution to quality of care of telemedicine applications and to produce a basis for decision-making. In this case MAST defines the relevant assessment as a multi-disciplinary process that summarises and evaluates information about the medical, social, economic, and ethical issues related to the use of telemedicine in a systematic, unbiased, robust manner. Read more about MAST in Fact box 8.

Fact box 8 – Model for Assessment of Telemedicine – MAST

<table>
<thead>
<tr>
<th>MAST includes three elements:</th>
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<tbody>
<tr>
<td>- Prior considerations of issues that should be taken into account before assessment of a telemedicine application is initiated.</td>
</tr>
<tr>
<td>- Multi-disciplinary assessment of the outcomes of telemedicine within seven domains (Health problem, safety, clinical effectiveness, patient perspectives, economic aspects, organisational aspects and socio-cultural, ethical and legal aspects.</td>
</tr>
<tr>
<td>- Assessment of the transferability of the results found.</td>
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</tbody>
</table>

MAST is currently being used in evaluation of 21 telemedicine projects with a total of 5000 patients in RENEWING HEALTH (2010–2012), a project under the CIP programme of DG INFSO, European Commission.

2.6 The PWT Foundation

The Danish government has allocated 3 bn. DKK (about 400 m EUR) to a dedicated programme (2009 to 2015) directed towards developing and improving public sector services through the

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74 Danske Regioner, “Pejlemærker for sundheds IT 2010”
http://www.biopeople.dk/fileadmin/filer/Per/Pejlem%C3%A6rker_for_sundheds_it_2010.pdf

http://www.sm.dk/data/Lists/Publikationer/Attachments/466/Velf%C3%A6rdsteknologi_web_150dpi.pdf

76 Hulbæk, 2011: 74-75.

77 Kidholm, 2011.
The programme funds projects through the so-called Public Welfare Technology (PWT) Foundation. In particular, the programme is intended to enable public services to meet increasing demands in connection with the demographic challenge described in section 2.1 “Socio-Demographic Background”.

Figure 2 – The Patient Briefcase

Public authorities are expected to benefit from a more efficient utilisation of available resources, ultimately being able to deploy freed resources elsewhere. Through the use of innovative, labour-saving technologies and intelligent reorganisation of service delivery processes, the programme aims to:

- Increase productivity and efficiency in the public sector,
- Improve current working conditions of public employees, thus making jobs in the public sector more attractive to a shrinking labour force,
- Provide the choice of more flexible, user-centred services to citizens, empowering them to remain independent for as long as possible and to take responsibility for their own lives.

Thus, ultimately the programme should result in a ‘triple-win situation’ for the public sector. It spans across all public sector activities, and a range of projects are currently funded across different thematic areas including “Telecommunications Solutions and Information and Communication Technology (ICT)”, “Robotics and Automation”, “Digitalisation”, and “Care Technology”.

Across the entire public sector, public authorities can therefore apply for project funding, either alone or in collaboration with private companies. The thought behind this is that the development of welfare technologies is a potentially very important area for growth for Danish trade and industry. A prerequisite for obtaining funding is that the projects must address labour-saving potentials by means of implementing new technologies and/or reorganising current service delivery processes in an intelligent way. Two different types of projects are funded:

- Local demonstration projects where new labour-saving technologies and organisational models are tested in pilot settings,
- National implementation projects where well-proven technologies and practices are implemented at a national scale.

A number of projects are currently supported across different thematic areas, one of which is focusing on “Care Technologies” in particular. Here, current projects aim for instance at testing/deploying age-friendly toilets, electronic bath/shower chairs, electronic tools supporting people with autism, alarm/tracking systems for people with dementia, medication reminders for...

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78 [www.abtfonden.dk](http://www.abtfonden.dk)
people with mental disorders, electronic tools for self-activation of retarded adults, solutions for lifting/moving frail elderly people, electronic door locking systems, and fall management.

The programme is located in and administered by the Danish Agency for Governmental Management (a governmental agency under the Ministry of Finance). This agency supports and develops efficiency and good financial management within the area of public administration. To this end, the agency engages (among other things) in the implementation of cross-government sector digitalisation projects, where the projects under the PWT-programme are but a few of the many focus areas.

**Key learning points**

- The potential for developing the public sector is great, and throughout the public sector there are many public employees who care strongly for their work and are passionate about driving innovative processes resulting in a better public sector. Also, there is a great market potential for new technological solutions aimed at improving the service for the elderly population.

- The establishment of a dedicated programme on a national level that can gather the best new ideas and projects, fund them, evaluate them, and communicate key learning points to all involved partners has great potential. This programme should coordinate and help facilitate sharing of knowledge between different initiatives (e.g. in different parts of the public sector) in order to generate synergy effects and reap benefits on a larger scale.

- Access to the right decision-making arenas on a national level is a key to success. The best solutions must become more than just good examples – they need to be implemented on a greater scale as soon as the evidence is gathered and a viable business case can be established. And this needs to be linked to budget negotiations on a national level. These decision-making arenas will differ from country to country. Denmark is a relatively decentralised country when it comes to providing welfare. Every year, the government (via the Ministry of Finance) engages in budget negotiations with the municipalities and the regions (the latter of which are responsible for the health care sector). In this way, by linking budgets with the use of new technologies and more efficient ways of working, the state will be able to steer the development of the public sector in a clear direction.

The interview with Ms Duus revealed several interesting issues related to the scope of this study.

Ms Duus has an academic background in political sciences from Copenhagen University. She has been working across different sectors in the municipalities, the regions, and is now working for the State at the Danish Agency for Governmental Management, where she is a chief consultant for the PWT Foundation. The PWT foundation covers all public areas, but some are more predominant than others, especially the elderly, rehabilitation, and health areas.

The foundation budget is defined in the Danish Finance Act and aim at supporting technologies that would otherwise not be bought due to a perception of high risk. The foundation funds projects with 75% funding and thereby gain knowledge through fixed evaluations about several aspects such as labour saving potential, economic savings, and patient and staff satisfaction. The projects’ results will show whether it is economically viable to roll out the pilot projects into national projects. The goal is to lower the perceived risk through very clear business cases. Consequently, the foundation only funds projects with potential for a strong business case. The foundation has funded 11 projects within telemedicine and remote patient monitoring with a total funding of around 130 m DKK (17.5 m EUR) to this date. The foundation collects results from the pilot projects and sums them up into descriptions and analyses of the funds needed for a national roll out as well as the potential for saved resources, typically calculated in terms of saved number of man-years.

IPHS is an area supported by the foundation and it will continue to be supported in the coming years. For instance, the foundation will use its funding to support cross-sector collaboration that normally is not achieved due to a perceived risk in sharing data and digital infrastructures. With regard to the DRG reimbursement rates, Ms Duus recommends a rethinking of the incentive
structure to promote the use of telemedicine and remote patient monitoring and treatment across sector boundaries to overcome the existing barriers related to lacking incentive structures. The foundation does not however focus on policy work, so it can only influence such a development through its analyses of the benefits the projects would gain from incentivising across sectors.

When implementing new technologies into existing workflows and organisational routines, Ms Duus points to the proper level of training and plan of implementation as well as managerial support when setting up the projects. She promotes a quite extensive use of change management to guide such implementations as well as project management. With regard to standardisation, Ms Duus describes how the foundation supports a broad arena of suppliers while supporting infrastructure initiatives following the standards set up by standardisation organs like MedCom and Continua Alliance. In this, it is very important that in the future (and in the clinically integrated home monitoring project) the foundation does not support so many proprietary platforms, but mostly platforms that adhere to existing or coming standards so as to ensure a future-proof and easy-to-consolidate project base. The foundation does not focus on or fund clinical studies, but mostly focuses on economic evaluations.

With regard to leadership, Ms Duus argues that traditionally most projects have been run by enthusiasts, but that they have now experienced a policy breakthrough as many stakeholders including ministers and ministries talk about the issue. IPHS and RMT are certainly hot topics in Denmark right now. The landscape of the supplier side is, according to Ms Duus, quite healthy. As a representative of the projects, she has experienced many different suppliers offering their solutions, indicating a healthy state of competition in the market place. However, there are still some products in the market with too little evidence of cost/benefits. The fund supports this market driven approach and not specific companies or industries.

Fact box 9 – DRG and DAGS rates

<table>
<thead>
<tr>
<th>DRG and DAGS rates</th>
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<tbody>
<tr>
<td>The DRG system is applied for the utilisation of the national activity funds, calculation of the municipal co-financing, settlement of inter-regional patients at basis level, in connection with rate financing, and as a tool for the analysis of costs and activities in Danish hospitals.</td>
</tr>
<tr>
<td>The DRG system consists of two parallel systems:</td>
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<tr>
<td>- DRG (diagnosis related groups), used for admitted patients in hospitals</td>
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<tr>
<td>- DAGS (Danish ambulant grouping system) used for ambulant patients in hospitals</td>
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</table>
3. Selected Danish Cases Studies

From the secondary data collection, it is clear that Denmark faces many of the same challenges as the rest of EU27. However, Denmark is far ahead in terms of Health Impact Assessment (HIA), funding, governance and related issues. In the following sections, four different projects all related to the relevant chronic diseases will be described.

3.1 COPD Project no. 1: The Patient Briefcase

**Figure 3 – The Patient Briefcase**

Duration
The Patient Briefcase project started as an implementation project in 2009 on the basis of several years of development in various development and pilot projects. It is set to finish as a project in 2012 after one year in full operation at Odense University Hospital (OUH). The hospital has decided to implement the Patient Briefcase at the end of the project and entered a service agreement with the producer MediSat A/S.

Financing
In earlier stages, the project received 1.2 m DKK (161.000 EUR) EC funding for the EU pilot project Better Breathing. The estimated remaining cost of approx. 10 m DKK (1.3 m EUR) for the implementation project was funded by OUH and the manufacturer, MediSat A/S.80

Project Participants
Odense University Hospital, Svendborg Hospital, MediSat A/S, and MedCom (as project advisor).

Patients and Studies
In total, the patient briefcase has been tested with approximately 800 patients.

A final clinical study for the implementation project is currently under development. Likewise, a MAST report is currently being developed.81 Both reports are expected in the spring of 2012. 133 patients have been involved in the MAST and the clinical study.

3.1.1 Background
Admissions related to Chronic Obstructive Pulmonary Disease (COPD) is the most frequent single diagnosis in medical departments, and patients with COPD experience frequent readmissions.82 83

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81  http://www.mast-model.info/
Annually, COPD accounts for approximately 90,000 bed days and 20,000-25,000 ambulant surveys. The hospitalisation rate and the number of deaths related to COPD have been increasing over the last 30 years. This means that besides the direct costs related to hospitalisations, patients suffer a loss of quality of life and of life expectancy. As mentioned in section 2.2 "Chronic Diseases, Prevalence and Costs", it is estimated that approximately 430,000 Danes suffer from COPD, of which 270,000 are considered to have clinically significant COPD and of which 40,000 have severe COPD. COPD contributes significantly to increased mortality rates as well as economic costs to hospitals and the home care system.

Due to the high number of hospital admissions, ambulant visits, and visits to GPs, the socio-demographic costs are very significant. The main part of this cost is caused by hospital admissions and ambulatory visits and to a lesser extent costs for visiting the GP.

In 2007, there were a total of 1,546 hospital discharges with COPD as action diagnosis or as contributing bi-diagnosis at the University Hospital of Odense and Svendborg Hospital. The average number of bed days was 6.46 for this patient group resulting in a total number of 9,980 bed days. The readmission rate after 28 days were 15.3% and after one year 31.3%.

3.1.2 Project Description and Objectives

This implementation project has been set up by the medical department at OUH and Svendborg Hospital, together with the company MediSat A/S as product manufacturer and MedCom as a project advisor. The project aims to bring ICT tools into healthcare and, in a cost-efficient manner, facilitates high-quality care for chronic patients by offering remote patient monitoring in the COPD patient’s own home.

The objective is to compare traditional hospitalisations with remote patient monitoring under the surveillance of a “patient briefcase” (see image above) that enables the hospital to be in contact with the patient from the patient’s own home. The project focuses on COPD patients and the overall goal is to reduce the length of hospital stays for this patient group, to reduce costs and, more importantly, to improve the quality of life for the patients.

The ICT equipment allows live transmission of images / sound as well as data measurements from medical equipment (e.g. Spirometer and devices to measure oxygen saturation) to be quickly transferred to the hospital either via the Internet or a satellite connection. At the hospital, the doctor can evaluate and guide the patient as if the patient was present at the hospital. The data transmitted from the patient’s home enables the hospital to perform a systematic monitoring and control the quality of treatment.

3.1.3 Basic Principles, Organisation, and Technology

COPD patients account for an increasingly higher share of healthcare resource use compared with a similar population group of same age without COPD. The patient suitcase gives the hospital a possibility to rapidly discharge COPD patients, following an emergency admission to the hospital, with continuation of treatment in their own home.

87 http://www.asianhhm.com/information_technology/telemedicine_remote_monitoring.htm
Thereby, expensive bed days in the hospitals can be given to patients with greater needs or alternatively be closed down so that the use of resources for COPD patients is reduced while patients receive a better follow-up on their illness.

To establish this new model of care the following ground principles must be met:

- Early discharge (<48 hours). Severe cases of COPD, e.g. patients who have been using a breathing machine should be discharged only when it is medically justifiable.
- Establishment of a telemedicine solution in the patient’s home as early as possible (<4 hours on working days) that ensure the transfer of relevant clinical data between the patient’s home and the hospital as well as access to video conferencing.
- Establishment of a telemedicine call-centre functionality.
- Establishment of an acute response function covering acute calls from patients 7 days a week from 8-15 (in the long term this could be with twenty-four-hour operation. So far the 8-15 solution has proved sufficient).
- Agreements with the local home care system about acute calls.
- Economic incentives should be regarded as a part of the solutions, i.e. it should be economically attractive for the separate hospital wards to re-organise traditional admissions to telemedicine admissions.
- The home care staff should be educated to solve situations likely to occur with an early discharged COPD patient. Besides this, it must be decided how the GP should be involved in the course of treatment and/or how the transfer to the GPs practice should take place.

The current implementation takes its starting point from the experiences already drawn from the pilot project Better Breathing at the medical department at OUH and Svendborg Hospital. The model has then been expanded to all relevant COPD patients at OUH and Svendborg Hospital. The model of treatment was established by enhancing the currently existing call centre at Svendborg Hospital with a similar one in Odense at OUH.

Finally, a common access to the two Danish electronic patient records MediCare and Cosmic has been ensured. In relation to the establishment of the telemedicine model of treatment, agreements were made with MediSat A/S on providing the setup of the technical connection as well as the necessary telemedicine equipment.

Within four hours after the patient is discharged, on the condition of acceptance from the patient, the patient briefcase is established in the patient’s own home. A technician sets up the briefcase and the patient is educated by the technician, who also supports the first call to the hospital (potentially together with the home care nurse). After this, the patient undertakes calls to the hospital. The technician retrieves the patient briefcase after approximately one week (or when the course of treatment is over).

The patients’ equipment is a “briefcase” with an on/off switch, a button for volume and an alarm button with an SMS function where the patient can contact the tele-nurse 7 days a week during working hours (8-15). The patient briefcase is developed in collaboration with the telemedicine unit at OUH, Svendborg Hospital and the company MediSat A/S and it serves as a lifeline between patient and treatment provider during treatment in the patient’s own home. The briefcase comprises a web camera, a microphone, and various forms of measuring equipment such as a spirometer and a pulseoxymeter. The telemedicine nurse’s equipment consists of a laptop with webcam, microphone, extra screens for reading measurements, and a computer for the electronic patient record.

Communication is facilitated through an Internet connection (ADSL), wireless network, or satellite and measurements are transferred from patient to telemedicine nurse in a secure closed system. The nurse makes respiratory nursing observations of the patient in the patient’s own home and can, if necessary, start treatment quickly in coordination with the respiratory medicine specialists or the patient’s GP. The patient is guided about treatment, prevention of worsening of the illness, and in
dealing with the disease e.g. in relation to breathing difficulties and social and physical activity. After every consultation, the nurse produces a record note. The nurse is referring directly to the respiratory medicine specialists.

The home nurses are informed about the patient’s discharge with a patient briefcase and collaboration between all healthcare professionals happens in accordance with a specific co-operation agreement made for the course of treatment. The home nurse gets a standardised status report by inclusion of the patient and four weeks after the ambulatory control the patient is transferred to regular home nursing. The GP is informed about the patient’s participation and status of health. The patient has the briefcase for approximately one week depending of the status of the patient. After removal of the equipment, the patient is offered as a minimum one phone follow-up as well as a standard ambulatory follow-up for all COPD patients at the hospital approximately four weeks after discharge.

3.1.4 Description of ICT and Integration

The IT solution consists of a so-called COPD briefcase, which is placed in the patient’s own home. Through a secure internet connection, the briefcase can create a high quality video conference connection between the patient’s home and a remote monitoring call centre at the hospital. Through this connection and the clinical measuring equipment connected to the briefcase it is possible to handle many of the relevant clinical examinations the patient would have undergone had he/she been hospitalised in the medical department.

At this stage, there is, due to little relevance and fear of data-overload, no integration between the medical data collected by means of the briefcase in the patient’s home and the electronic patient records. There is, however, integration to EHR when it is used at the medical department. In the workflow, the medical specialists hold a remote conference and consultation with the patients and enter relevant observations directly in the EHR.

3.1.5 Costs

MediSat A/S and OUH have signed a contract of operation wherein the costs of the briefcase have been settled to be approximately 4-6,000 DKK (530-800 EUR) per month, i.e. a leasing agreement for 40 briefcases (the exact amount is classified). The contract has gone through the National Procurement Ltd. Denmark – an organisation funded and run by the Ministry of Finance and the National Association of Local Authorities in Denmark.

3.1.6 Mainstreaming Plans

The implementation project has run since 2009 with real operation implementation in focus. More recently, a procurement agreement has been settled between the hospital and the manufacturer of the Patient Briefcase. In other words, the Patient Briefcase is no longer a pilot or demonstration project, but actually a successfully implemented project running in daily operation.

The hospital and provider is currently considering expanding the service delivery into other areas than COPD, such as diabetes and to early discharge of parents with new-born babies to their own home.

3.1.7 Analysis of Governance and Policy

The Patient Briefcase project was initiated when the Chief Physician, Michael Hansen Nord one day met and talked with his neighbour Kurt Christensen over their common hedge. Michael Hansen Nord wanted to try out a new way of delivering care to his patients, suffering from COPD and asked Mr. Christensen if that was technically viable. Mr. Christensen is the owner of the company Global IT Solutions (GITS), located in Odense, and offered Mr. Nord to investigate the matter further.

On the basis of this first contact, the two men took contact to MedCom, which found a European call for proposals that could be used for further developing the concept. This project was called Better Breathing and helped to further develop, test and evaluate the project.
This project is in other words a bottom-up project with a clinical champion and an entrepreneurial partner uniting to develop a product that they saw a need for (Mr. Christensen and GITS is now the co-owner of MediSat A/S who produces and sells the briefcase). It is worth noting that MediSat A/S has developed the project from an idea to a fully implementable product over the last 6 years (in Better Breathing and in this and similar projects). They are using the project to gain a reference to sell the product elsewhere, e.g. in Norway. Furthermore, their investment in this project has given way to a 4 year long implementation contract with OUH. Their level of sponsorship was 50% (they paid half of their man-hours and the products themselves).

The project manager of the Patient Briefcase Project Claus Duedal Pedersen does on the other hand indicate another angle or opinion. The Patient Briefcase project (the current project and not the briefcase development in itself) is according to him driven by the top-level leaders and the clinicians at OUH and by the manufacturer MediSat A/S. In other words, the project started out as a bottom-up project and is now a top-down project. Mr. Duedal furthermore says that Denmark has come very far with regard to such governance. The Danish digital infrastructure is very unique and centrally governed through e.g. the standardisation organisation MedCom, the Regional Health IT and the National Board of eHealth.

Mr Duedal Pedersen is currently involved in the National Board of E-Health’s writing of a national strategy for eHealth and he has been heavily involved in eHealth since 1997. From 2000 to 2003, he was involved as project manager in the establishment of the Danish Health Care Data Network. From 2003 to 2008, he was the project manager of several international eHealth projects, among others Better Breathing and R-bay. Since 2009, he has been in charge of clinical innovation at Odense University Hospital.

According to the co-owner and operational manager of the company behind the Patient Briefcase, Jørgen Thomsen, enthusiasts are still a major driver and are still involved in the project – but also the clinicians have embraced the technologies. They have learned that it is a technology with great potentials that can actually support them in enhancing the services they offer to their patients. This is an argument supported by qualitative studies done by MediSat A/S where up to 90% of the patients who have had the briefcase would like to have it again and would recommend it to others.88

Furthermore, Mr Thomsen argues that the regional and the national agenda have changed since the beginning of the project. Today, almost all regions have their own strategy. However, Mr Thomsen argues that there is sometimes too much politics and too little action in those strategies. He thinks that a more visionary and at the same time more specific strategy is needed for remote patient monitoring and integration. Here, Mr Thomsen highlights the new LGDK plan of action; described in section 2.5 “Strategies and Initiatives for the Promotion of Integrated Care” is a much needed and welcomed initiative by the industry.

3.1.8 Analysis of Innovation and Drivers and Barriers

With regard to drivers and innovation, Mr. Duedal stresses that in Denmark we have developed a common procedure for creating new and updating existing standards through the standards organisation MedCom, which in his opinion is a key driver of innovation. With regard to the Patient Briefcase project, he claims that it at this stage is only lack of leadership that is missing from national implementation. The MedCom standards and the digital infrastructure are in place together with international standards on the device side (Continua standards) and DRG reimbursement rates. However, there are still issues when it comes to remote patient monitoring in general. On this note, Mr Duedal Pedersen highlights more general DRG reimbursement rates for compensating different layers across the healthcare sectors when they implement remote patient monitoring. He also points attention to the lack of good or proper clinical evidence from randomised controlled trials,

88 http://www.dagensmedicin.dk/nyheder/patientkuffert-med-potentiale/
and lack of knowledge on organisational challenges in changing the workflows to cope with remote patient monitoring.

Mr Thomsen argues that standards are still needed in order for them to see a benefit in transferring medical data directly from the briefcase to the EHR. As described in the case above, the medical specialists only enter data relevant to the consultation into the EHR when running a remote consultation with the patients. According to Mr Thomsen, the next step is to transfer data directly from the briefcase into the EHR. Mr Thomsen argues that there are too many different EHR providers and thereby different systems across the country (and internationally) for them to cope with without MedCom standards. Integration from the briefcase and directly into the EPR at OUH is planned to be established during 2012.

Mr Thomsen also mentions an interesting observation, namely that simplicity is of the essence for projects to be successful. In other words, at this stage Denmark is still not ready for complex solutions, but merely simple services that can easily be incorporated into existing workflows and organisational routines.

Mr Thomsen also argues that interoperability is still lacking concerning devices. There are not enough standards for medical equipment. Today, the patient briefcase only uses equipment approved by the hospital, which is often equipment already in use. About this, he also notes that proper device standards would ensure a proper quality standard. MediSat has not used Continua Alliance-supported devices at this stage, but is planning to use products supported by Alliance at a later stage.

The lack of proper DRG reimbursement rates is, according to Mr Thomsen, a clear and very important barrier for the primary care sector as they have no reimbursement rates. They have to take the money for such investments as the patient briefcase from their block grants or daily operational budget, which is currently already under big pressure from public cut-backs and zero growth. The municipalities and primary care sector can thereby only monitor cost-benefit effects through time-measurements, which in projects like this often take a long time to benefit from (as the organisation has to change before real time savings can be reaped). The municipalities will therefore often only benefit economically when there is long distance to cover to the patients (and much time would have been spent on transportation). The new DRG reimbursement rates per 1/1 2011 for hospitals did significantly lower the barrier for that sector, and Mr Thomsen argues that it would do the same for the primary care sector and the GPs as it is not possible for the GPs to receive reimbursement rates for these remote services, which is a significant barrier for them as they are private entities. When it comes to the hospitals, Mr Thomsen does however argue that the economic incentives are now in place due to the new DRG reimbursement rates and the fact that hospitals can actually save money by using the product through a limitation of admission days in the hospital.

### 3.2 COPD Project no. 2: The TeleKAT Project

**Duration**

January 2nd 2008 to June 30th 2011

- Phase IV (July 2010–June 2011): Testing the programme in a new context with other healthcare professionals.

Findings and results from phases III and IV are now being prepared for publication.

**Financing**

Aalborg University, Center of Health Technology (43,622 EUR).

Danish Enterprise and Construction Authority (776,650 EUR).
Co-Funding from all partners.

**Project Participants**

Tunstall (RTX) Healthcare A/S; Rambøll Informatik A/S; KMD A/S; Health Centre Aalborg; Visiting nurses from Aalborg Municipality; Respiratory Clinic, Medical Centre Aalborg Hospital, Århus University Hospital; Aalborg Municipality; GPs in Aalborg and Hjørring Municipality; Visiting nurses from Hjørring Municipality; COPD-ambulatory, Medical Centre, Vendsyssel Hospital, Hjørring; University College Nordjylland; Institute for Healthcare Research, University of Southern Denmark; Institute for Business Studies, Aalborg University (AAU); Institute for Sociology, Social Labour and Organisation, AAU and Institute for Healthcare Science and Technology, AAU.

The project has been approved by the Danish National Committee on Biomedical Research Ethics and by the Danish Data Protection Agency.

**3.2.1 Background**

The research and innovation project TeleKAT focuses on developing new prevention, nursing, and treatment methods for chronically ill patients in their own home through the use of remote patient monitoring technology.

Patients with severe COPD suffer from several limitations in their everyday life due to difficulties in breathing. The effect of medical treatment is limited and a large part of the patients live with a lowered level of functioning, as well as inactivity, frustration, and social isolation. It is very important to break this negative spiral to improve the patients’ quality of life. Today, this group of patients is offered rehabilitation when the clinical symptoms limit the patients’ level of functionality and quality of life. Rehabilitation includes physical training, education in the illness, in nutrition, lung therapy, smoking rehabilitation, etc. and often consists of courses of a few weeks duration away from home. Available evidence proves that such rehabilitation has a positive effect on patients (SST, 2007).

**3.2.2 Project Description, Organisations, Patients, Technology and Purpose**

The target group for the TeleKAT project is citizens with COPD in stage 3 and 4 of the disease. The project tries to prevent readmissions of citizens suffering from COPD by encouraging help to self-help in rehabilitation in the patient’s own home. The rehabilitation happens by offering the COPD patients tele-homecare (remote patient monitoring and treatment) technology.

Healthcare professionals, such as district nurses, GPs, nurses, doctors, and physiotherapists at the health care centre or hospital, can assess the patient’s data, monitor the patient’s disease and training inputs, and provide advice to the patient. The patients and relatives can also view the data on the web portal, and they can also decide with whom they want to share their data. A tele-rehabilitation team consisting of health care professionals from the primary and secondary care sector meet virtually to coordinate and discuss the individual rehabilitation programme for the COPD patients.

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89 [http://www.sst.dk/KOL-projekt](http://www.sst.dk/KOL-projekt)

90 [http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3107090/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3107090/)
In the project, patients suffering from COPD will receive an eHealth-monitoring box in their home. The box can collect and transmit vital values wirelessly such as blood pressure, pulse, weight, oxygen saturation, etc. The data is transmitted via the Internet to healthcare staff. Hereby, the health professionals are able to follow the course of disease and training efforts and guide the patient in relation to this.

Through remote patient monitoring, the purpose of the project is:

- To prevent readmissions of COPD patients by improving rehabilitation in the patient’s own home
- To map the patients’ and their relatives’ wishes for following their training effort and course of illness
- To develop and test new methods and technologies for how COPD patients can observe their own training effort and illness
- To develop and test new preventing forms of nursing and treatment for COPD patients together with the healthcare professional parties
- To survey the COPD patients’ and their relatives’ experiences and attitudes towards using remote patient monitoring in their everyday lives
- To investigate economic aspects of the use of remote patient monitoring technologies for patients suffering from COPD

### 3.2.3 Project Method and Timeline

Through a randomisation process, patients have been separated in a control group and a test group. The purpose of having two groups is to be able to compare differences between the groups and thereby to see if the use of remote patient monitoring has a measurable effect on the illness and on the motivation for training at home.

In total, 132 patients with COPD participated in the study with 66 in each group.

Data was gathered at workshops with patients and their relatives through questionnaires and interviews on the patients’ perception of their own health and quality of life.

The project ran in four phases from January 2008 to June 2011. Phase 1-3 was between Health Center Aalborg; Respiratory Department, Aalborg Hospital, Aarhus University Hospital; GPs and home
nursing in Aalborg Municipality. Phase 4 went on between Health Center Hjørring; Respiratory Department, Hospital Vendsyssel, Hjørring; GPs and home nursing in Hjørring Municipality.

In every phase, researchers from Aalborg University mapped wishes and needs for the use of remote patient monitoring had treatment for patients with COPD, relatives, and healthcare professionals. This mapping creates a background for developing new methods for nursing and treatment through using RMT, and it enables development of new communication channels.

As only approved medical equipment was used for the project, no risk was perceived in participating. If the patients felt uneasy with the equipment, a workflow was created so the patient could contact the home nurse 24/7. If the patient experienced a worsening of their condition, they were informed to contact their own GP, emergency service, or emergency room in acute cases.

3.2.4 Costs, Mainstreaming Plans, and Integration

With regards to costs and benefits, the project is still working on the results. However, it is clear from a press release published on the website of the project that it does indeed have significant effects.

“Earlier surveys have shown that 14% of these patients (severe COPD patients) are readmitted within one month and that 46% is readmitted within one year. However, the project has taught the patients to handle their own illness, which is why they have far less bed days. When comparing, we can see that the preventive remote patient monitoring lowers the number of admissions with over 50%. Even in the cases where admission happens, the number of bed days is lowered with over five days compared to the control group, which follows traditional rehabilitation” says Project Manager Birthe Dinesen. She hopes that these experiences will play their part in the coming action plan for telemedicine in NSI.

With regard to mainstreaming, the TeleKAT project will be the basis of a new large-scale project focused on remote patient monitoring and treatment in the North Denmark Region. This project will comprise approximately 2,000 patients and most likely start in the spring of 2012 as a day-to-day running implementation project. As mentioned, the project will most likely also be a part of the work on action plans and strategies on eHealth in the coming years.

Figure 5 – TeleKAT

As shown in Figure 5 above, integration is developed so all stakeholders have access to relevant data. The Danish company KMD, which has ensured that it is integrated to all relevant electronic patient and care record systems, develops the digital infrastructure. A big and very important part of the project is that the patients can also see their own data and thereby be motivated for
improving their condition. From the patient’s home in the figure above, all relevant data is collected (e.g. blood pressure, pulse, weight, spirometry, saturation, and questions for the patient) by a monitor and sent via the Internet to the district nurse, the healthcare centre, and the general practitioner (in their own systems – just like if the measurements had come from an ambulatory). Everything is also sent to the online portal, where all relevant health professionals and the patient can gain access via a password. Data can finally also be sent to and from hospitals on demand from specialists.

3.2.5 Analysis of Governance/Policy

Health professionals from the municipalities, researchers from Aalborg University and other enthusiasts initiated the TeleKAT project. They recognized a need for a home-based treatment of their patients, and therefore went together with a small company called RTX Healthcare. RTX Healthcare thereafter developed their product in collaboration with these nurses, researchers and patients. This product and the project were so successful that the big company Tunstall Healthcare decided to buy RTX Healthcare and continue the project and product development.

One of the main drivers was Ms Dinesen, the project manager of the TeleKAT project and a former nurse, master in administration, PhD in tele-homecare with nine years of experience in this area. She is a lector at Aalborg University and a research assistant in the digital hospital. Ms Dinesen is in the advisory board in the Danish firm Linak, that has developed an intelligent bed and in Vicenta, which develops technologies for elderly and handicapped people. Ms Dinesen has been the project manager in six large tele-homecare projects. TeleKAT is the biggest one of them.

Ms Dinesen has been very much focused on driving a bottom-up project with what she calls "user driven innovation" with an iterative approach, i.e. continuous involvement of the end users. Being a big success, the project ended up gaining very much attention from a higher policy level with politicians directly mentioning this project as a good practice whose example others were to follow. However, according to Ms Dinesen, the project has kept its user-driven approach to research and development despite this increasing attention.

With regard to PHS, the project decided from the beginning to include the company KMD A/S to handle integration to the local EPR and electronic care journal. Again, the focus was local and iterative, continuously improving a developing this infrastructure in close collaboration between the company, the health professional users and the university researchers.

With regard to the policy level, Ms Dinesen finds the strategies and cross sector initiatives supported by NSI and RSI very positive, at least when they remember to consider economic incentives to support the strategies. Furthermore, Ms Dinesen takes a stand for more objective evaluation, and economic as well as clinically randomised controlled trials.

With regard to EHR and sundhed.dk, we have come very far in Denmark, but we could have gone even farther. Ms Dinesen argues that the organisational structures and the lack of proper education are to blame together with an unreasonable multi supplier strategy. She argues that there are still certain discourses like these that have to be challenged before we pick up even more speed on the digital agenda. Ms Dinesen highlights MedCom as a very important party that take care of national issues in the area of health informatics and communication in and across the Danish healthcare sector. Finally, she argues that the SST should implement quality standards for remote patient monitoring, which should be integrated into their existing quality programmes to avoid unforeseen events.

91 See: http://www.detdigitalenordjylland.dk/dk/info_og_baggrund/projekter/digital_forvaltning/det_digitale_sygehus.htm
3.2.6 Analysis of Innovation and Drivers and Barriers

Innovation-wise, we are still at the pilot level in Denmark. According to Ms Dinesen, things are moving too slow and we are not innovative enough. The Municipal Reform from 2007\(^92\)\(^93\) and cost savings are to blame together with the current economic crisis.

The necessary incentive structure should be in place to support a change away from this picture and towards a more innovative society and organisations. Ms Dinesen argues that the evidence for the positive effects of remote patient monitoring and treatment is of a sufficient quality, but that the incentives are not yet there to promote it (economically and treatment wise). Funding for innovative projects today primarily comes from the PWT foundation, and Ms Dinesen argues that some money could have been spent on the mentioned incentive structures instead or as a supplement to the general project funding.

Ms Dinesen thinks that we are still too fragmented in terms of integrating personal health systems; a thing she claims has not changed for the last ten years. She does however admit that Denmark is moving closer to a holistic view of the patient, where we focus less on our own silo and more on seeing the patient as a whole and complex individual, herein treating the patient across sectors. She challenges the current separation between the primary and secondary care sectors. She wonders why this separation is needed when it is not present in other healthcare systems, e.g. the US. She argues that a merging of these sectors would bring down cross-sector barriers significantly. Also the programmes for the continuity of care are not sufficient in their current form as they have too little technical focus on e.g. data sharing, video meetings, etc.

The TeleKAT project is a cross-sector project, and has experienced certain barriers in bridging the traditional silos. However, the project has managed to move from silo thinking to cross functional courses of treatment successfully. One of the key elements in this positive development was the possibility to share data. Moreover, video meetings among staff were one of the main drivers of the success. Data sharing was conducted through an online record as well as direct transmission into the EOJ and EPJ.

Ms Dinesen states that infrastructural standards are still needed in the remote patient monitoring area. Continua Alliance is the way to go on the device level, and in the project data sharing as described above is available for all medical specialists. The company KMD has taken care of this data sharing and integrated through existing MedCom standards. The GPs have received the data directly in their system. When opening the file, they received the results just like if they had come from the ambulatory.

DRG reimbursement rates are currently only present for hospitals, but according to Ms Dinesen also needed for the municipalities. However, these rates have not yet been implemented for municipalities because the municipalities have not been good enough in documenting their efforts to be reimbursed. Furthermore, the GPs collective agreement does not support reimbursement for remote patient monitoring and treatment. Ms Dinesen argues that RMT equipment and services will be a service commonly offered through the Danish public system, however most likely with a certain level of user payment.

In the next five years, Denmark will experience a greater focus on large-scale implementation rather than pilot projects. Furthermore, comorbidity will be a challenge in these coming projects, where programmes for the continuity of care should take a more holistic view on the patient.

When it comes to legal barriers, Ms Dinesen refers to the researcher Richard Wootton\(^94\) who claims that there simply are no barriers. Also ethical boundaries are no longer an issue if you ask Ms

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\(^{92}\) This reform replaced the 13 existing counties with 5 regions and the number of municipalities was lowered from 275 to 98.

\(^{93}\) [http://www.sm.dk/data/Lists/Publikationer/Attachments/271/kommunalreformen_kort_fortalt.pdf](http://www.sm.dk/data/Lists/Publikationer/Attachments/271/kommunalreformen_kort_fortalt.pdf)
Dinesen who states that “Big brother” is no longer watching you. She does however argue that directions are needed for data sharing through the Danish Act on Processing of Personal Data.

3.3 Diabetes project: The Diabetic Foot Ulcer Project

3.3.1 Background

Figure 6 – The Diabetic Foot Ulcer Project

The Danish Centre for Health Technology Assessment defines diabetic foot ulcers as ‘lesions of the skin on the foot of a person who has diabetes mellitus’. Diabetic foot ulcers typically arise on a foot with poor nerve signalling and poor blood circulation, often caused by harmful pressure on parts of the foot. Diabetic foot ulcers result from the late complications of diabetes, especially diabetes-related neuropathy and angiopathy. Parallel to the development of these late complications, many people with diabetes develop diseases related to the circulatory system such as heart disease, brain damage, and kidney disease. People who have had diabetes for many years often have diabetic foot ulcers in a combination with other chronic diseases.

As mentioned in section 2.2 “Chronic Diseases, Prevalence and Costs”, the number of patients suffering from diabetes is increasing sharply these years and diabetic foot ulcers often lead to a decrease in quality of life for the patients, who have to spend time in waiting rooms and on transportation to ambulatories. In the worst case, these wounds can even result in amputations due to too late or poor treatment. Furthermore, due to current plans of merging small hospitals into much larger “super-hospitals”, many patients will experience a longer distance to the nearest hospital.

The fact that the proportion of the elderly population is growing also puts pressure on nurses and other health professionals. As patients suffering with diabetic foot ulcers are primarily found within this growing group of patients, the demographic challenge not only means more elderly persons, but also more diabetic foot ulcer patients in the coming years. This picture is further worsened when considering the rise in diabetic patients mentioned in section 2.2 “Chronic Diseases, Prevalence and Costs”, 2.2.3 “Key Figures: Diabetes”. Consequently, there is a clear need for alternative and supplementing means of treatment, in this case offered through remote patient monitoring.

Data from the Danish National Patient Registry and the Danish National Diabetes Registry show that the number of new cases of diabetic foot ulcers was 3,010 in 2009, and the total number of people with diabetes who had foot ulcers was 22,195 (including all degrees of severity). In 2008, 1.2% of the people with diabetes developed foot ulcers for the first time (incidence), and 8.7% of

95 Diabetic Foot Ulcers – A health technology assessment. Summary, p.4.
96 www.regionsyddanmark.dk/dwn132663
all people with diabetes had diabetic foot ulcers (prevalence). The prevalence in Denmark is thereby similar to the prevalence in other Scandinavian countries. The number of people with severe diabetic foot ulcers was 3,984 in 2008, equivalent to 1.6% of the people with diabetes. The calculations only include people with diabetes who were treated in a hospital; the people treated in private practices are not included because of limitations in registration. This means that the figures are underestimated and do not include people who complete treatment in private practices, which especially indicates foot ulcers that are not severe.

This trend together with an increased need for recruitment in the social and healthcare sector makes it necessary to find new ways of delivering care. In this recognition, remote patient monitoring is seen as a decisive element if the traditionally high Danish quality of care is to be maintained.

### 3.3.2 Project Description, Organisation, and Technology

The diabetic foot ulcer project will test an internet based ulcer record in connection with treatment of ulcers in the patients’ own homes. The visiting nurses are given the chance to have continuous collaboration and dialogue with specialist expertise through a common ulcer record with pictures and documentation. The ulcer record gives a more efficient treatment of the wound as treatment can be initiated instantly. Meanwhile, health professionals can save time.

**Figure 7 – The Ulcer Record and Infrastructure**

The dialogue pictured above shows how the communication is run via the Internet through a common ulcer record and a mobile phone with a camera.

From top-left, the visiting nurse takes pictures of the ulcer with a camera phone and a digital pen at every visit in the elderly patient’s home and then sends the pictures to the Internet-based ulcer record and database, depicted in the grey box above. Data is secured through HTM and a firewall maintained by the company Danish Telemedicine A/S who also operates the record.

The record is used for continuous assessment of the ulcer performed by a specialist doctor or nurse looking at the development of the ulcer. The ulcer record thereby provides the health professionals with a better basis for decisions about necessary treatment.
Also ulcer specialists can gain access to the pictures and thereby support decision-making processes made at the hospital. This is done through sending the images through the GSM net (by use of SMS/MMS messaging) and use of a web browser with access to the images and medical assessments done by non-specialists.

Lastly, other groups of relevant health or care professionals can gain access to the images and specialist assessments. This is done by allowing the sending of images and assessments through the Danish Health Data Network (by use of EDI and XML). This is of particular relevance to the general practitioner, other hospitals or hospital wards, and municipal electronic care systems and records (EOJ).

**Figure 8 – Foot ulcer**

The decision about whether or not an ulcer patient must participate in remote patient monitoring treatment is made at the respective ward at the hospital. Patients participating in remote diabetic ulcer treatment can be referred in two ways:

1. The patients can be referred with a diabetic foot ulcer for the respective ward at the hospital and enter an ambulant course of treatment
2. The patients can be referred with a foot ulcer after surgical treatment of an infection in the foot.97

In traditional ulcer treatment, physicians from several medical specialties, including orthopaedic surgery, vascular surgery, internal medicine, endocrinology, diagnostic radiology, and family medicine participate in treating people with diabetic foot ulcers in Denmark. In addition, other health care professionals participate, such as podiatrists, physical therapists, and nurses. People with diabetic foot ulcers in Denmark are thus cared for in collaboration between several medical specialties and other health professionals across primary and secondary health care and the public and private sectors. This poses great demands on the organisation and on the communication needed to achieve positive outcomes for each person. This also puts great demands on the people with diabetic foot ulcers and how they manage their own ulcers. Thus, patients must not only deal with the foot ulcer but also relate to a complex system of therapists and a course of disease that is often long term simultaneously with managing and mastering the underlying chronic disease: diabetes.

### 3.3.3 Timeline, Funding, and Patients

The Diabetic Foot Ulcer project was originally running from January 2010 to April 2011 and is now prolonged until March 2012 with national implementation in mind.98 The project is a demonstration project with participation from Region Zealand and the Region of Southern Denmark and project management from MedCom. The project is financed by the Public Welfare Technology (PWT)

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97 [www.regionsyddanmark.dk/dwn59828](http://www.regionsyddanmark.dk/dwn59828)
98 [http://medcom.dk/wm111510](http://medcom.dk/wm111510)
Foundation with 1.213 m EUR. Tests are conducted in eight municipalities: Guldborgsund, Kalundborg, Næstved, Søø, Faaborg-Midtfyn, Nordfyns, Odense, and Svendborg.

With regards to the number of participants, the aim was to reach 50 users. However, due to several reasons which will be discussed in the analysis sections below, the project only had participation of 23 patients over the first 16 months.

### 3.3.4 Expected Results

The project is expected to:

- Increase the quality of course of treatment
- Increase the patients' perceived quality of life through a reduction of waiting and transportation time
- Free resources and reduce the need of resources in the municipalities and the hospitals
- Achieve a direct collaboration between the municipalities and the hospitals dealing with a patient
- Increase the visiting nurses' work satisfaction through new responsibilities and a lift of competences

The project is conducted in close collaboration with Aarhus Municipality’s "Common Online Record Gives Better Treatment of Ulcers", which also is a PWT Foundation funded project.

### 3.3.5 Costs, Mainstreaming Plans, and Integration

The expenditure for treating people with diabetic foot ulcers comprises a considerable proportion of the money used in Denmark for treating people with diabetes. Studies from comparable countries indicate that expenditure for treating people with foot ulcers comprises about 25-50% of the total inpatient expenditure for people with diabetes. The treatment costs vary, however, and depend on the process of treatment and the complexity of the foot ulcer, but amputating part or all of the foot or leg is quite expensive.\(^9\)

A study in Sweden by Apelqvist et al. was used as a basis for the costs per person in the following. They estimated the cost of treating people with diabetic foot ulcers that heal to be 152,800-252,800 DKK (20,500-33,900 EUR) and the costs of treating people with diabetic foot ulcers that require amputation to be 407,900-597,300 DKK (54,800-80,200 EUR). These estimates include the costs of treating any new foot ulcers these patients get afterwards. The incidence of people treated for diabetic foot ulcers in Denmark was 3173 in 2006 and 3010 in 2009. For 2006, data are available for the distribution of the degree of treatment; among the people treated for diabetic foot ulcers, 9.7% required minor amputation in the course of the following 3 years and 13.2% major amputation. Based on this, the annual cost of treating people with diabetic foot ulcers in Denmark in 2006 is estimated to be 793 m DKK (106 m EUR) in 2009 prices. The costs for home help are the largest portion of this at about 44%, inpatient treatment 36% and outpatient patient treatment 20%. These are minimum estimates for the actual costs, since only the costs for the first 3 years after the foot ulcers are detected are included. Further, the loss of income of the person with the foot ulcers is not included.

The National Board of Health’s analysis department Danish Centre of Health Technology Assessment (DACEHTA) performed the health technology assessment study. DACEHTA is a department under the National Board of Health that often (but not always) aids projects with Health Technology Assessments (HTA). This study revealed for the first time the costs of diagnosing and treating people with diabetic foot ulcers in both primary and secondary health care in Denmark. Costs for home help are the largest portion of this at about 44%, hospitalisation 36% and outpatient treatment 20%. These are minimum estimates for the actual costs, since only the costs for the first three years after the ulcer is detected are included. Further, the loss of income of the

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\(^9\) Diabetic Foot Ulcers – A health technology assessment. Summary.
person with the foot ulcers is not included. The considerable costs associated with diagnosing and treating the people with diabetic foot ulcers continue to require great focus on the organisational model in this field, since appropriate organisation is expected to lead to earlier diagnosis and improved treatment.

With regards to the economic aspects related to a national rollout of this project, Danish Telemedicine A/S has developed a model that specifies the costs depending on the number of patients that should be covered by the ulcer record and database. If the number of patients surpasses 45,000, the company will take 0.97 DKK (0.129333 EUR) per patient. In that way, if a hospital and a number of municipalities with an accumulated patient number of 250,000 ready to use remote treatment, the total cost would be 242,500 DKK ex VAT + 10,200 DKK (In total 33,693 EUR) in hosting costs. Beside this, there will be costs in implementing the system and in educating staff to use the new system. However, due to cross-sectorial collaboration, a cross-sectorial reimbursement system is most likely needed prior to national rollout. To this date, there are no plans of establishing DRG reimbursement rates for telemedicine services in relation to diabetic foot ulcers.

At this stage, the electronic ulcer record is not integrated to the traditional IT working tools of the home nursing or the hospital like:

- Electronic Care Records (EOJ)
- Electronic Patient Records (EPJ)
- Patient administrative systems
- Picture archives

To ensure a relevant data exchange between the ulcer record and the mentioned systems, a technology group is established. This group’s members represent the different regions and municipalities and will, through a close collaboration with the IT providers, secure the development of national standards necessary for the systems to communicate independently between several providers. Digital Health’s unit for IT architecture and security was involved in this task to ensure the standards’ national validity until its closure in 2010. The National Board of eHealth (NSI) now carries out these tasks.

3.3.6 Analysis of Governance

This project started with a bottom-up approach which like the other aforementioned projects was so successful that the political level gained an interest in it. Consequently, it has also, like the other projects evolved into a top-down governed project, primarily driven by hospital managers, government officers and paced by politicians and strategists. In the following, this will be described through the eyes and indeed the career of the former nurse and project initiator, Ms. Jane Clemensen.

Ms. Clemensen is director in her own company Commed, an assistant professor at the University of Southern Denmark, and is working for MedCom as the project manager of the Diabetic Foot Ulcer project. She is the former Health Director in the Danish magazine “Monday Morning” and has been the Head of Innovation at the Alexandra Institute at Aarhus University. She was also the vice director in the Centre for Pervasive Healthcare at the same university.

Ms Clemensen has a past as a head nurse, as a management consultant at the company Lisbjerg, and as a medical advisor for MedCom. She is an educated nurse, candidatus curationis, and she has a PhD in pervasive healthcare. Besides her work in this project, she is now functioning as a national expert on RMT for the National Board of eHealth’s upcoming eHealth strategy.

Ms Clemensen started working in the ulcer field in 1998 where, as a management consultant, she was responsible for a large study on diabetic foot ulcers. This study gave way to a PhD in eHealth where diabetic patients should receive treatment in their own home. From a very comprehensive solution with live interaction, the project ended up with quite simple technologies, i.e. a camera
phone and an online record. At this stage, the project was definitely driven with a bottom-up approach with her and other researchers and nurses as enthusiasts.

Today, Ms Clemensen is one of the most influential experts in eHealth in Denmark, working on the National Board of eHealth’s coming eHealth strategy. She has over 12 years of experience with RMT and IPHS.

During the interview, it was very clear that Jane sees Denmark as a country that has changed over the last decade. When she started her career in eHealth and remote ulcer treatment 12 years ago, the area was far from high-profiled and many colleagues wondered why she would spend her time on this strange new area of eHealth and diabetic foot ulcer treatment with no apparent promising prestige or future. However, she saw a need to help the group of ulcer patients, and eHealth was a way to do that. As indicated here, it was indeed a market situation where other frontrunners and first-movers lead the way. With Ms Clemesen’s position as a project manager of the diabetic foot ulcer project in the national project and standardisation organisation MedCom ten years later in mind, this picture has clearly changed. Now, due to the success of this project and all her consequent experiences, she is acting on behalf of several main players such as Danish Regions, the State, and Danish municipalities – and she is a key constituent of the work on a new telemedicine strategy in the National Board of eHealth.

One can thereby easily conclude that RMT and IPHS have gone from areas driven by enthusiasts and first-movers to areas governed from a national, regional, and municipal level. Also policy-wise, things have changed. As visible from the section 2.5 “Strategies and Initiatives for the Promotion of Integrated Care”, several strategies are today driving technological development in the way of RMT and indeed IPHS – a picture confirmed by Ms Clemensen. In this scope, she mentions NSI, RSI, MedCom, and LGDK as the key policy makers (see fact boxes throughout the study for further detail). From a political level, all Danish parties support IPHS and RMT, clearly indicated by the establishment of NSI and RSI – who indeed are also the current driving forces behind the plans for national roll out of this remote ulcer treatment.

3.3.7 Analysis of Innovation

As indicated in the previous section, the Danish market is indeed very well developed when it comes to uptake of innovation. Ms Clemensen argues that we have moved from a pilot-focused orientation with little focus on implementation to an orientation towards national implementation projects, building on successful pilots. Here, she is specifically mentioning the PWT Foundation (together with other funds, like regional development funds, state funds, and others), which in many ways has facilitated this development. You can read more about the PWT Foundation in section 2.6 under the secondary data collection.

When Ms Clemensen started her career in eHealth, she was one of a very few enthusiasts dedicated to developing the area. Today, she argued, there is much more readiness for innovation – and even funding available. Furthermore, she argues that no real ethical or juridical barriers are present anymore.

Here, she is referring to the chronic care programme publication published by the National Board of Health (SST) called "Guidance concerning responsibilities in doctors’ use of telemedicine" (c.f. VEJ nr. 9719 of 09.11.2005). The following is a summary of the main conclusions from that guidance.

- Use of telemedicine does not change conditions of responsibilities in connection with medical treatment.
- A GP is responsible for his own medical assessment/treatment, that is, both the specialist and the one initiating treatment on the basis of specialist assessments.
- A GP must perform an autonomous assessment of whether the information about the patient, which the GP in question has received, is relevant and sufficient.
- As soon as the specialist or treating doctor does not feel capable of conducting a proper and sound assessment/treatment on the basis of the data available, or has a suspicion about mistakes or other elements of uncertainty, he or she must call attention to it.
• By the use of telemedicine, the premises should be specified in advance – especially the role of the specialist.
• For the use of telemedicine, specific local instructions and procedures must be developed to ensure a safe and sound course of treatment for the patients.

The most important legal foundation for these recommendations i.e. for health professionals’ use of telemedicine is in particular the Authorisation Act, the Health Act (especially section III about patients’ legal position), the Danish Act on Processing of Personal Data and the administrative regulations set under these laws.

In her interview, Ms Clemensen revealed that even though much has been achieved, we are still far from the perfect situation with regard to innovation aspects of integrated personal health systems and remote patient monitoring. The diabetic ulcer project was one of the first RMT projects in Denmark and is, despite several good lessons learned, not ready for national implementation yet – even though this is the goal of the demonstration project funded by the PWT Foundation. This will be discussed in more detail in Section 3.3.8 “Analysis of Drivers and Barriers”.

With regard to IPHS, the diabetic foot ulcer project is also going very far, but not all the way just yet. As described in the integration section above, the project is not integrated to the systems yet. However, as clear from the description of the technologies and the figure above, integration is planned for the projects and its constituents. Furthermore, the project helps MedCom develop national standards for this particular purpose, which makes it a significant driver in IPHS.

The case study represents one of the first telemedicine projects in Denmark – one that will most likely be nationally implemented during 2012. Ms Clemensen revealed that even though this is a highly favourable situation to be in, it has been a hard and long way to this point. This will be further elaborated in the following section.

3.3.8 Analysis of Drivers and Barriers

With regard to the project, Ms Clemensen cannot give away any official figures at this stage. The project will finish in March 2012 and then present its results considering national implementation. She does however admit that a positive business case is very unlikely due to the research design adopted and the small number of expected users.

As mentioned in the sections above, there are indeed many drivers to the success of this project. The project has become such an important project policy-wise that even though it has not been able to show a positive business case or attract nearly enough patients for its pilot trials, it is at this stage still planned to go national by the spring of 2012. This is quite remarkable in a world frantically focused on positive business cases, return of investment (ROI), and streamlining. Ms Clemensen, who is certainly not a supporter of business cases as the only tool for assessing success in projects, also admits that the project, at its current stage, cannot show a positive business case or ROI. However, she states, this project has so many qualitative and long-term obvious positive effects that she expects it to go national despite these missing key performance indicators.

Several times, Ms Clemensen expresses great concern with the extensive use of business cases, often solely focussing on the cost/benefits of RMT and IPHS instead of also encompassing and stressing the more qualitative aspects such as quality of care, quality of work for professionals, and the higher level of flexibility such new eHealth activities give way to.

With regard to interoperability, she highlights the aspect in the case of co-morbidity. Many patients today have more than one chronic condition and will therefore potentially need many different kinds of RMT devices in their homes. On this note, she considers the Continua Alliance’s work on standardising on the device-side as a necessary standardisation organisation. As a representative of MedCom, she also highlights its high importance in ensuring cross-sector communication within the healthcare sector.
Ms Clemensen points out that, at this stage, there is no DRG reimbursement rate for the remote treatment of diabetic ulcer patients. She sees this as a very big barrier for national implementation as this in her opinion is a prerequisite for cross-sector cooperation between the primary and secondary care sector. Without reimbursement mechanisms, further innovation and national implementation will be significantly hindered.

Ms Clemensen expressed frustrations with an, according to her, reoccurring problem in such RMT projects, i.e. the medical specialists and their high level of power on decision-making processes in hospitals. According to her, this has been a problem also in this project where medical specialists have been the main bottleneck in referring patients to the project. Despite the fact that decisions have been made about testing the remote patient monitoring and treatment in all organisational layers – from policy level decisions to acceptance from the ulcer nurses – a few specialist doctors involved in the project, due to their position as ulcer specialists, refused to refer patients to the project. The reasons for this attitude, she guesses, are general negative presumptions towards RMT and lacking documentation from e.g. clinical studies or randomised controlled trials, and maybe most importantly that telemedicine requires a new role of the involved staff – and that cultural changes take time to implement.

3.4   CHF Project: The Anti Coagulant (AC) Treatment Project

3.4.1   Background

WEB-AC is a solution where self-governed anticoagulant treatment is supported by means of modern information and communication technologies.

In Denmark, approximately 70,000 patients are at risk of getting blood clots and are therefore being treated with anticoagulant medication. Some patients are treated in shorter periods (months) but an increasing share of the patients requires a longer or lifelong treatment. The quantitatively most important indication for AC treatment is atrial fibrillation, but AC treatment is also used for cardiac valve patients and for other heart conditions with heightened risk of thrombosis. Classic indications for AC treatment are moreover blood clots in the deep veins (DV) and pulmonary embolism that, in case of relapse, requires life-long AC treatment.

A part of that treatment requires support on a running basis from professionally educated personnel to regulate ingestion of medication and supervision of the course of the disease. Since 1999, it has been possible for properly trained patients to take blood measurements and thereby control their own treatment.

There are, however, still barriers as to the number of patients wanting to take this responsibility at their own risk and this is perhaps why this treatment is not as broadly offered in the Nordic countries as it is in countries like Germany where more than 120,000 patients use the possibility of controlling their own treatment. Doubts about one’s own capabilities in making the correct choices can be such a barrier. Another barrier might be the missed opportunity to have a dialogue with experts as in the case of personally controlled AC treatment it would be normal to only meet with them once or twice a year.

The patients under AC treatment have to get regular blood samples that show the degree of haemodilution (the INR value). A particular difficulty associated with the treatment occurs for patients who have to remain within a narrow interval of treatment, as there is a risk for haemorrhages in case of overtreatment and a risk for blood clots in case of under treatment. These issues mean that to a greater extent patients are bound to fixed controls at a hospital or at the GPs office.

Control of treatment is usually repeated between 3 to 6 weeks with patients in long-term AC treatment. Patients in autonomous or self-controlled AC treatment are tested once a week on average. This treatment control is valid for all types of AC treatment and can be divided into three elements:

- Lab control where the patient’s INR value is measured through a blood sample.
- Therapeutic control where the INR value is assessed in relation to the chosen therapeutic target and interval. Changes of medicine dosing is assessed and the next control of INR is settled.
- Clinical control where elements of risk factors, control indications, side effects, and complications are assessed and where it is assessed if AC treatment is to continue.

### 3.4.2 Project Description, Organisation, and Funding

This case description refers to two projects:

1. “Web-Based Decision Support for Patients in Treatment with Anticoagulant Medicine” is a pilot project that ended in 2007. The descriptions in this section are mainly translations and summaries from a Medical Technological Assessment (MAST survey) conducted by OUH in 2007.100
2. “The WEB-AC Project” is an on-going project from OUH.

The purpose of the WEB-AC project is to investigate the following factors:

- Is it possible to develop a web-based functionality to an existing system?
- Can such a system work in practice?
- Are the dosing suggestions reasonable?
- Is it safe?
- Is web-based decision support helping?
- Does it improve the quality of treatment?
- Is data storage and presentation useful?
- Can the system be used by less knowledgeable patients?
- Is the system usable for skilled autonomous patients?
- Economic considerations for a roll-out of the system.
- Organisational consequences.

Department B at the University Hospital of Odense (OUH) participates in the currently ongoing project WEB-AC, funded by the Ministry of Health. As mentioned, the WEB-AC project builds on the above-mentioned pilot project that developed the remote patient monitoring solution. The pilot project was conducted in collaboration between OUH and the AC centre at Skejby Hospital.

### 3.4.3 Technology and Integration

The project received funding to develop further the decision support component for supporting remotely self-monitored AC patients’ treatment. The project was set up as a pilot project with the aim of developing a technical solution integrated to sundhed.dk. It also foresees the calculation of the impact of a general rollout with special attention to patient, economic and organisational issues.

On that basis, a web-based interface was developed, available for AC patients on sundhed.dk through which they can enter their INR values and get suggestions to medication dosing. This goes through the regular Internet with a digital signature. Furthermore, the interface allows access to information about AC treatment and about self-control of treatment through sundhed.dk. The INR values are found using the Coagucheck CS System from Roche.

Data processing is based on an ACURE® AC schema, used at the ambulatory at OUH. Data from the web-based decision support is thereby collected automatically through electronic filing and stored locally as well as transmitted to THROMBOBASE (an online database). All transmission of data from sundhed.dk and to the local database as well as to THROMBOBASE goes through the Danish Health Data Network. In that way, these systems can monitor unintended consequences of remote-treatment such as risk of subsequent bleedings or blood clots allowing for early detection and prevention.

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100 Web-baseret beslutningsstøtte til patienter i behandling med blodfortyndende medicin, 2007:1
The WEB-AC supports patients in controlling their own treatment by allowing them to report their blood test values through a special programme at sundhed.dk. The programme collects and assesses the values and gives answers to the patients about any changes in the daily doses of medication. At the same time, the health professional can also monitor the patients' filings.

3.4.4 Patients and Method

The web-based interface for patients was developed in the period 2005-2006 and was available on sundhed.dk in October 2006. In the first iteration, it was tested with a very small group of 7 experienced AC patients from Funen. In the spring of 2007, approximately 100 patients went through a final test of the web-based ICT support of remote patient monitoring of AC patients. At this stage, there are around 300 patients using the system.

The project was presented to the Danish National Committee on Biomedical Research Ethics, which assessed that it was not a clinical trial or an intervention-trial. The project was referred to the Danish Data Protection Agency and a decision was made that the project should follow the declarations described in the Department of Justice’s announcement on Security Measures for Protection of Personal Data no. 528 from 15 June 2000 chapter 1, 2 and 3.

Sundhed.dk is designed to handle patient sensitive data and by using the personal digital signature, only the patient has direct access to enter data into the portal. With the digital signature, it is also possible to log every movement of not only patients but also health professionals, thereby avoiding potential risk of misuse.

3.4.5 Costs

As the central application at sundhed.dk is used as originally developed in the pilot project, there will be no additional costs for this part of rollout. Every AC health clinic will have to pay for the AC Schema application that makes it possible to give access to dosing-information through sundhed.dk and monitor the patients in remote treatment. Furthermore, an annual subscription has to be signed up to for maintenance and support.

The costs for purchase, maintenance, and support depend on the number of active patients in the clinic in question. According to information from the supplier of AC, the following prices apply:

- 400 patients: 50,000 DKK (6,700 EUR)
- 401-800 patients: 100,000 DKK (13,400 EUR)
- 801-1200 patients: 150,000 DKK (20,100 EUR)
- 1201-1600 patients: 200,000 DKK (26,800 EUR)
- 1601-2000 patients: 250,000 DKK (33,500 EUR)
- 2001-2500 patients: 300,000 DKK (40,300 EUR)

When beginning to use the application, a certain number of hours must be calculated for:

- Guidance about buying equipment
- Installing the software programme “AC schema” in the clinic
- Establishment of filing to THROMBOBASE
- Setup of the clinic and patients at sundhed.dk

This assistance for setup, installation, etc. will on average cost 25,000-40,000 DKK (3,300-5,300 EUR) per location.

The annual costs for maintenance and support are divided into the costs for the central application for web-based decision support in sundhed.dk and for the software programme “AC schema” used in the clinic respectively amounting to a cost of 130,000 DKK (17,400 EUR) and 262,000 DKK (35,200 EUR) per year. These costs are independent of the number of patients.
3.4.6 Mainstreaming Plans

With the new DRG and DAGS Reimbursement rates for web-based anticoagulant treatment, there is now a basis for the implementation of remote AC treatment in all Danish hospitals and AC clinics, when needed.101

The WEB-AC project is still running at OUH with integrated operation in mind and Vejle Hospital is currently offering remote AC treatment as a part of its service to AC patients.

3.4.7 Analysis of Governance and Innovation

This project was primarily driven from a bottom-up approach with the hospital and its specialists in charge of development. In other words, they saw a need and possibility for a new way of delivering remote care to their patients. This is actually still the case today, where the hospital is trying to promote its successful results through medical journals, through new projects and through policy contacts.

One of such policy contacts is Mr Lars Hulbæk. Mr Hulbæk is the Deputy Manager at MedCom where he is also the Programme Manager of the National Telemedicine Programme. He is a board member of the International Society for Telemedicine and eHealth (ISfTeH) and a board member of the Danish Society for Clinical Telemedicine.

As the Deputy Manager of MedCom, Mr Hulbæk introduced the National Programme for Telemedicine representing a broad range of projects focused on telemedicine, eHealth, remote patient monitoring and treatment, communication standards and digital infrastructure. He is a much-respected national expert on eHealth, RMT, IPHS, and standards and consequently more than qualified to give his view on the Danish situation within IPHS and RMT.

According to Mr Hulbæk, Denmark is at a stage where many pilot projects have run their course with only a few of them actually being successful in bridging the barrier from pilot to real implementation. On the other hand, there are also very positive stories in between. Especially the projects described in this study, namely the WEB-AC project, the Foot Ulcer Project, and the COPD projects have run for several years and have actually had a significant influence on strategies and policy decisions on RMT and IPHS.

According to the chief physician and M.D, Ivan Branslund from Vejle hospital, Denmark has come a long way with regard to integration between relevant electronic systems. However, there are still problems across regional boundaries due to different electronic systems. Here, MedCom standards are developed to ensure flow of communication across these boundaries.

According to Mr Branslund, Vejle Hospital is, to this date, the only hospital that offers its patients remote AC treatment as an implemented service (the WEB-AC is still in a project stage). Here, the innovation has achieved an improvement of the average time that the patients' INR values lie within the recommended therapeutic interval from 72 to 80%, when comparing with conventional treatment, where the patients go to the hospital once a month. Currently, 250-300 out of the ward's 750 patients followed by Mr Branslund receives AC treatment with remote self-monitoring. By using remote monitoring, the hospital has increased its productivity, treating 85 patients instead of 30 with the same number of staff.

Mr Hulbæk mentioned that most projects today are not a result of top decisions, but more driven from the bottom and up, i.e. from enthusiasts and first movers keen on testing the new possibilities offered through the various ICT tools available. Due to the positive effects and lessons learned by such projects, telemedicine, RMT, and IPHS have become high profiled areas, receiving not only policy support, but also substantial funding from the PWT Foundation together with many other funding mechanisms in Denmark such as regional development, government support, and European funding.

On the policy level, top-level leaders on IPHS & RMT are NSI that will publish a new RMT and IPHS strategy around November this year. NSI coordinates national health IT and thereby also the use of health IT across sectors. RSI deals with regional issues and their indicators. MedCom and Sundhed.dk are operational organisations acting on behalf of NSI and RSI. In the coming MedCom 8 period, RMT will play a substantial role and most likely have its own project line in MedCom.

3.4.8 Analysis of Drivers and Barriers

Strategies and the PWT Foundation as Drivers
To this date, national strategies specifically dealing with RMT and IPHS are very new – and they are only mentioned briefly (mostly in the shape of the commonly used term telemedicine) in strategy documents. These strategies do not contain any actual decisions nor do they provide any guidelines. However, relevant strategies and specific funding for IPHS and RMT are starting to emerge – especially from NSI, which produced a national telemedicine strategy and RSI’s indicators - albeit mostly related to hospitals. The PWT Foundation will present an action plan for RMT and IPHS in the autumn of 2011, based on an agreement made with the Ministry of Finance over the summer. The Clinically Integrated Home Monitoring Project will be a part of that plan. The new government does not plan to change this.

The PWT started by funding many pilots / demonstration projects and is now launching a programme more focused on national implementation building on their most successful pilots. Thus they are seeking to bridge the gap between pilot projects and national implementation, by consolidating success stories. One could therefore clearly argue that while the projects in this study started from enthusiasts and a bottom-up approach, today’s IPHS and RMT development follows a middle course solution in which policy level support and funding meets a consolidation of the experiences learned from so far in the successful pilots.

Standardisation and Infrastructure as Drivers
With the new IPHS and RMT projects in mind, the PWT Foundation puts itself in the forefront of supporting the building of a national infrastructure and architecture with a clear focus on standards and indexing, i.e. how data is collected, stored, and transferred and in what format. On this note, Mr Hulbæk argues that integration should primarily deal with routine situations (e.g. identifying standard datasets necessary for the medical specialist). With the current development of RMT and sharing of data through IPHS, a very high quantity of data is stored, whereas relatively few items are actually relevant to the medical specialists in the hospital – and yet other data is relevant to the GP. Therefore, when dealing with integration and data sharing across sectors and systems, it is very important to find the right mechanisms for standardising the relevant information actually needed in a clinical setting. This is also highly related to the course of care programmes originating from the SST which addresses the way stakeholders from the various health care sector have to deal with cross sector care for chronically ill patients.

Another issue related to this, is the way the medical data is to be presented to the medical specialist. Currently, the CONTINUA alliance gives a standardised way to collect data from devices to a hub. The upcoming projects about sending data from the hub to the national IT infrastructure, like EPR systems, health record, sundhed.dk, etc. will give you the next step of a necessary standardised way of collecting and transferring data. We do however still miss a good answer as to how to show the medical specialists the data in a way that makes sense clinically (especially in the case of co-morbidity). The data collection and handling of chronic patient’s data should therefore, according to Mr Hulbæk, at least be matched with general quality measures about treatment of chronic patients in general – normally handled by SST.

The National Patient Index will be where data is stored and collected. Here, health professionals will be able to ask for data and certain data capture mechanisms will be available. The regional project “the health record” will be the place where the health professionals can draw data and this record will most likely be available through the online portal sundhed.dk. More info about these different
Integration
In general terms, Denmark has gone very far when it comes to data sharing across sectors (e.g. between hospitals, pharmacies, GPs, municipalities). On the other hand, there are still areas for improvement. As each region has chosen their own EPR (almost only one per region), data sharing between the five regions’ EPRs is especially difficult. The health record should be a cross reference between these different EPRs. Denmark did however start on national standards for communication within the healthcare sector and its different stakeholders almost 15 years ago. Thus the role of MedCom is important here, bridging the barriers.

However, Mr Branslund states that this development has been too slow. According to him, there are still big issues in creating a system where the hospital administrations take leadership in bringing remote patient monitoring and treatment to higher levels, this taking place through buying the available solutions, and in opening up for solutions from other regions. Mr Branslund indicated that the “not invented here” (NIH) syndrome is still very dominant across regions and even across different systems. This aforementioned lack of ability to make decisions is according to Mr Branslund a general problem in the Danish public system. He furthermore underlines that Denmark is too small to attract good competition between key industry players – the big players are simply too strong compared with Danish buyers.

DRG Reimbursement Rates as Driver and Barrier
In the beginning of 2011, national DRG levels were implemented for certain telemedicine treatments. However, incentives are still a barrier when investments have to be made in one sector while the benefits are found in others. As such, the DRG levels available for the healthcare sector today are only in place for the replacement of direct ambulatory visits by telemedicine. In general, documentation is needed about the effects of RMT and IPHS across the sector boundaries. When this documentation is in place, it will form a better foundation for creating a fair incentive system across traditional sector boundaries.

The PWT Foundation’s projects dealing with IPHS and RMT focus very much on how to deal with incentivising through DRGs across the different sectors in a fair way. The SST handles the evaluation of these projects’ effect on investments versus savings across the sector boundaries and potential national implementation projects await such results.

Business Cases
According to Mr Hulbæk, there has always been a big focus on cost/benefits and business cases. However, where there used to be a high level of common sense about what is good for the patient, staff and the socio-economic situation, most projects today undergo a quite rigid analysis not always matching a real need for documentation. Mr Hulbæk furthermore misses a dimension in business cases that would deal with more operational economics for the health care sector. On this note, the PWT Foundation focuses a lot on workflows and on how digitalisation e.g. can delimit time spent on driving in cars, administration, etc.

Legal and Ethical Issues
According to Mr Hulbæk, legal issues are still important for the development and deployment of IPHS and RMT in Denmark, especially as regards responsibility during RMT use. However, the SST has published several recommendations towards how to deal with such issues – and refers to current legislation, which it sees as adequate for RMT and IPHS. Ethical issues are almost non-existing. Patient organisations are very positive towards RMT and IPHS and some even complain about development moving too slowly.
3.5 ePatch for Monitoring Heart Arrhythmia of Patients at Home

Figure 9 – ePatch

3.5.1 Background

In Denmark, annually 12,000 to 20,000 people are struck with an apoplectic stroke every year. One patient is estimated to cost approx. 13,333 EUR in acute costs whereby the total cost for the Danish society amounts to 266 m EUR a year. When including the indirect costs for rehabilitation, extra home assistance, etc. the amount is estimated to be around 1 bn. EUR.

DELTA has with the support of the German company Apoplex Medical received support from the Renewal fund for testing and customizing the product ePatch, an electronic patch. The patch is based on a wireless sensor system for measurements of specific heart rate disturbances, which typically predicts a stroke. The purpose of the patch is therefore to screen people in the group of risk and thereby initiate a preventing treatment in due time.

3.5.2 Project participants

DELTA, Odense University Hospital (OUH), Apoplex Medical Technologies GmbH (APM), and Glostrup Hospital

3.5.3 Funding and Project Period

Funding from the Renewal Fund: 1,428,087 EUR
Total project budget: 3,180,886 EUR
Project period: 1 March 2011 – 1 September 2013

3.5.4 Purpose

The purpose of the project is to overcome crucial barriers for the market introduction of the first product generation of DELTA’s ePatches for patient monitoring. The activities are focused on developing a heart ePatch that records electro cardio signals in a quality better than or equal to the existing technology and to demonstrate the ease-of-use-and-wear of the ePatches on heart patients in the hospital. The next step is to monitor patients at home wearing ePatch for up to three days. An intuitive gateway transmits the recorded signals back to the cardiology department at OUH, who monitors the patients at home along with patients monitored on the cardiology wards at the hospital.

When the technology has been successfully demonstrated, APM will improve its existing service for screening of citizens with risk of atrium fibrillation by implementing an ePatch developed by DELTA for this specific application.
3.5.5 Technology

ePatch by DELTA serves as a device for early detection of atrial fibrillation and thus prevention of stroke. It is easy to use for clinical personnel and easy to wear for patients, as it is a wireless solution for recording and analysing electro cardio signals.

The ePatch was developed and demonstrated for screening of:

- Atrial Fibrillation
- General screening for arrhythmia
- Monitoring of heart-patients in their home during initial term on medication

In concrete terms, the ePatch consists of a wireless sensor system embedded in a skin-friendly patch to be put directly on the skin. The patch measures and stores the heart signal, which is then transferred to an analysis programme automatically identifying any heart rate irregularities with the patient that could increase the risk of stroke.

3.5.6 Results

In the last two years the first prototypes have been developed and optimised in close collaboration with OUH under another project called “Better Ward Round at Home”. Cardiologists have examined the recordings and are concluding that the quality is better or equal to the reference equipment in current use in the hospital wards. The nurses are pleased with how easy it is to handle the ePatches and the patients are grading use of the ePatches as either “satisfying” or “very satisfying”.

The hospital solution for recording with ePatches at home was to be developed during the 2nd half of 2011. In 2012 the first German clinics will test the new screening service using ePatches.

3.5.7 Estimated Cost Savings

By introducing monitoring with heart ePatches and automatic analysis identifying persons who should be receiving preventive treatment for strokes, it is expected that approx 1500 strokes can be prevented. According to DELTA, this could amount to potential annual cost savings in the healthcare system of 500–750 m DKR (67–100 m EUR) in Denmark.

At the same time, the product enables patients to move around freely while being monitored and a lower acquisition price allows for screening more patients in the risk group. Also, quality of the clinical analysis is increased and handling, maintenance and hygiene is made easier.

3.5.8 Mainstreaming Plans

The ePatch will be ready for business to business sales within one year. To achieve proof of concept, it will be further tested and developed in this and other new projects. At this point there are no concrete mainstreaming plans.

3.5.9 Analysis of Governance and Innovation

With regard to governance, the senior consultant, Claus Nielsen from DELTA tells that the ePatch project has been a project driven by what he calls high innovation in DELTA. DELTA is commonly known for their competences within microelectronics, light and optics, as well as tests and consultancy and has through their emerging business units department developed the ePatch.

Mr Nielsen tells that the ePatch in its development phase received top level support and funding from the PWT foundation as well as from the Renewal Fund. The PWT foundation is a dominant player on the Danish market, and is further described in section 2.6 “The PWT Foundation”. The project has thereby been funded and driven by external funds and a performance contract with DELTA. According to Mr Nielsen, the ePatch represents what he calls serious and deep innovation supported by public innovation with the aim of future export.

The ePatch was originally made for epileptic patients and designed to monitor epileptic attacks and send warnings to the epileptic patients just before an attack struck them. According to the project manager from DELTA, Jens Branebjerg this was a blue ocean technology, i.e. a novel technology in a
marketplace with few or no competitors. As clear from the case description above, this initial technology gave way to another use, namely for the heart ePatch. As opposed to the epileptic use, this innovation is according to Mr Branebjerg located in a red ocean, that is, an existing market with many competitors. He states that the ePatch for heart patients function wise is very similar to the traditional Holter recorder used for monitoring heart patients, monitoring ECG signals for arrhythmia in 1-3 days. The ePatch is however much more user-friendly and has more compliance than traditional wearable ECG measuring equipment. The service concept is developed so that DELTA provides the ePatch technology, whereas APM provides the analysis of the ECG measurements to the hospital wards. Besides simple Holter recordings, the ePatch can also be used as an event recorder, used to measuring irregular heart rhythm and sending these directly to the health professionals.

According to Mr Branebjerg, the final product will be available for business to business sales in the real market, i.e. outside pilot testing within one year. When asked about what is still missing, Mr Branebjerg notes that some further development is still needed on quality assurance, service, production and regulatory demands.

With regard to the potential to use the technology for other purposes, Mr Branebjerg sees several possibilities. As already mentioned, the ePatch can be used for monitoring of epileptic patients. Besides this, he notes that the ePatch can potentially substitute many other types of treatments, such as treatment of Asthma, COPD, sleep apnoea, or heart problems. In its current form, the ePatch is solely used for measurements of heart arrhythmia, whereas Mr Branebjerg says that it would also make sense to use the technology for patients recovering from a heart attack and taking part in rehabilitation. Most recently the ePatch has been included in a very big Danish project called SPIR. Here it will be involved as part of a qualitative study, where the clinical quality and compliance is further tested.

### 3.5.10 Analysis of Drivers and Barriers

As noted above, Mr Branebjerg sees several possibilities to expand the focus of the ePatch. There are however still some barriers to this end. According to Mr Branebjerg there are several regulatory demands that need to be addressed before the technology can be sold in the marketplace. He does however argue that since the ePatch basically fall under the same category as the Holter device, there should not be too many troubles in gaining the same approval level as the Holter recorder. He furthermore tells that the device will come to belong to the class 2a or 2b medical regulation, wherefore the Danish Medicines Agency have to approve the device. This was according to Mr Branebjerg a very big barrier due to a lack of experience that DELTA by now has learnt to overcome.

When implementing the novel technologies, Mr Branebjerg notes that new work routines must be implemented as part of the technical implementation. The health professionals must in other words learn how to use the new technologies in existing routines, or adapt their workflow to fit with these new technologies.
4. The Future of IPHS and RMT

This section will in short describe the most recent developments and two important upcoming projects setting the scene for integrated personal health systems and remote patient monitoring in the future: “The Integrated Clinical Home Monitoring Project” and “The Common Dataset for Chronically Ill Patients Project”. Furthermore, the section will bring an exclusive interview with the Director of Telemedicine in CSC, Marianne Rosager who gives her view on the Danish RMT market from the perspective of an international key industry player.

4.1 Common Dataset for Chronically Ill Patients Project

The purpose of MedCom’s national Common Dataset (CD) for chronically ill patients is to support implementation of the National Board of Health’s generic model of continuity of care programs for chronically ill patients through ICT. The dataset serves as an overview of the chronically ill patients and can be used as a common reference base for general practitioners, hospitals, municipalities, and citizens going through a long-term chronic course of treatment.

The dataset shall, within the boundaries of NSI’s coordinating standardising committee, support cross-sectorial communication between existing IT systems and new solutions for chronically ill patients, and is planned to be implemented in regions, municipalities, and on sundhed.dk. The standard is developed by MedCom in several steps to ensure consensus with healthcare professionals as well as proper experience with the dataset before the content is related technically to the nationally chosen technical standards under the scope of NSI.

The CD will support a united effort towards treatment of chronically ill patients and thereby support potential future platforms dedicated to this area. It will, as mentioned, ensure a proper usability in daily operation, to be introduced and validated through four regional large-scale projects. These are in turn RSI’s Projects for Chronically Ill and the Clinically Integrated Home Monitoring Project. The first RSI project builds on the already discussed large scale extension project TeleKAT, wherein up to 2000 patients suffering from COPD will be involved. The second RSI project is an extension of an existing diabetes platform called ‘Dialogue’ whereas the third project is the development of a cross sectorial ICT system for chronically ill patients in the Region of Southern Denmark. The fourth project, Integrated Clinical Home Monitoring Project (ICHM) is described in the following section 4.2 “Integrated Clinical Home Monitoring Project”.

The CD standard will be developed in three steps:

1. A first draft of the common dataset is delivered (version 0)
2. The draft is fine-tuned in cooperation with the project and SST where after it is tested in RSI’s chronic dataset project(s) (version 1)
3. The final dataset is thereafter tested in the project ICHM focusing especially on remote patient monitoring and booking. The dataset is technically adjusted in accordance with NSI’s choice of standards for cross-sectorial sharing of patient data. On the basis of this testing, the final clinically and technically validated chronic dataset is developed (version 2)

The CD will be developed in line with and to support the programmes for the continuity of care from SST, where the collaboration across traditional sector boundaries makes it possible to initiate healthcare and prevention efforts early in the course of treatment. The following Figure 9 shows how the data is shared and organised.
After diagnosing, the GP develops an annual plan for the patient, which can entail 2-4 control visits at the GP as well as referral to municipal rehabilitation offers, e.g. like a smoking cessation course, physical training, and other follow-ups. In some situations, the patient is treated through ambulatory visits at the hospital, and in the future, the hospital will be able to follow the effort in the home through remote patient monitoring of weight, blood pressure, blood glucose, etc.

The CD consists of 15 different data-segments that will be updated individually:

1. The patient’s particular data with the patient’s name, address, and phone number
2. GPs name, address, and phone number
3. Relatives’ name, address, and phone number
4. The patient’s consent to give access to data for municipality, GP, and hospital
5. The patient’s diary for his or her personal experiences with the disease
6. GPs diagnosing with diagnosis, health history, stratification, and referrals to health and prevention offers. Many patients will have more diagnoses (co-morbidity)
7. Municipality and hospital contact persons
8. Relevant diagnoses from hospital and GP
9. Relevant laboratory answers from hospitals and GP
10. Present medication (Common Medication Card (see Fact box 10))
11. Relevant SKL notes from hospitals, municipalities, and GP
12. The patient’s calendar containing data and time for upcoming visits to the GP, to ambulatories as well as health promotion and rehabilitation offers
13. Booking of treatment, prevention, and rehabilitation services
14. Monitoring data about e.g. weight, blood sugar, blood pressure, and future data about level of functionality in connection to municipal rehabilitation
15. The patient’s goal for the future rehabilitation
Fact box 10 – The Common Medication Card

The Common Medication Card (FMK)

The Common Medication Card (Fælles Medicinskort or FMK) is a central database under the auspices of the Danish Medicines Agency containing information about all medicine bought by Danish citizens in the last two years, as well as an updated list of citizens’ current medicine prescriptions.

4.2 Integrated Clinical Home Monitoring Project (ICHM)\textsuperscript{102}

Funding

The Danish PWT Foundation funds the ICHM project, as already described under section 2.6 “The PWT Foundation”. With a consolidated budget of 65 m DKK (8.7 m EUR) out of which 33 m DKK (4.4 m EUR) originate from the PWT Foundation and 32 m DKK (4.3 m EUR) originate from the participating regions.

Duration

The clinically integrated home monitoring project which was announced by the Danish government 14 December 2011 the government started in the beginning of 2012 and is scheduled to run for approximately two years.

Partners

The final project now consists of the Capital Region of Denmark, the Central Denmark Region as well as a number of municipalities and general practices from both regions. The programme leadership has been delegated to the standardisation organisation MedCom while the role of evaluating the project and its outcomes has been chosen to be delegated to the National Board of Health’s department for HTA, namely DACEHTA together with University of Southern Denmark’s evaluation department CAST. The PWT Foundation will work as a close discussion partner in guiding the project towards its goals and milestones and furthermore evaluate the potential cost/benefits of the project.

4.2.1 Project Description

The ICHM project is an IPHS and RMT project that aims to test the use of home monitoring on various chronic illnesses, share data and communicate across traditional sector boundaries, while developing common electronic communication standards. It is a cross-sectorial, technical, and organisational project focusing on implementation from the outset, consolidated from five quite similar IPHS and RMT projects planned across Denmark, all applying for funding from the PWT Foundation. The foundation saw the projects’ similarities and decided to set them together under a joint project description and with a joint programme leader, MedCom. MedCom will steer the project’s technical work and make the standards needed for the cross sector collaboration.

The project will handle different chronic illnesses in the participating regions and share data with municipalities and general practices. Together with its municipalities and private practices, the Central Region Denmark will test the developed RMT and IPHS systems with diabetes patients and pregnant women with complications. Likewise the Capital Region of Denmark will test RMT and IPHS systems with patients suffering from COPD, with pregnant women without complications, and with patients with gastrointestinal diseases. Apart from remote patient monitoring and treatment for mainly COPD and diabetes patients, the project is dealing with patient administration tools such as an online patient plan and online booking, inspired by positive experiences from a pilot project at

\textsuperscript{102} The information in this section originates from the interview with Ms Susanne Duus from the PWT Foundation and from conversations with Project Manager of the ICHM project, Mr Jan Petersen from MedCom. The project awaits its formal approval that is to come after the delivery of this study wherefore the descriptions might be slightly inaccurate from the final project details.
Herlev Hospital. Finally, the project will include use of videoconference through the Danish Health Data Network. The goal is to reach a number of approximately 2000 patients.

All project partners have expressed a need for collaborating with the Danish standards organisation MedCom in developing and testing a common standard for sharing of electronic communication about chronic patients. To this end, RSI has decided that MedCom, in cooperation with the regions, will initiate a process that ensures that the regions’ and other parties’ wishes for standardised exchange of chronic patient data are further clarified. This will give way to the Common Dataset as described in section 4.1 “Common Dataset for Chronically Ill Patients Project”. In that way, the ICHM project will serve to support the Common Dataset Project’s vision of cross-sectorial collaboration between the municipalities, the hospitals, ambulatories, GPs, and the patients.

4.2.2 Costs/Benefits

Cross sector collaboration between the primary and secondary care sector players is foreseen for the COPD and diabetes patient groups. The project will most likely redistribute some traditional sector separations across e.g. the hospitals, the GPs, and the municipal care organisations. The project will investigate the collected socio-economic business cases across sectors to ensure its report goes across sector boundaries and thereby contributes to promoting financial reimbursement across traditional sector boundaries. What is atypical about this project is therefore that it monitors cost/benefit impacts across sector boundaries, whereas most projects today only monitor such effects at hospital level.

4.3 Interview with CSC

This section brings an exclusive interview with the Director of Telemedicine in CSC, Ms Marianne Rosager. Ms Rosager gives her opinion about the current status of IPHS and RMT in Denmark from her business’ perspective and reveals her foresight on the current developments, barriers, and how to overcome them.

Ms Rosager is an educated nurse and Master in Business Administration. She was the founder and owner of the RMT company eMedLink, bought by CSC two years ago. She represents a company with over 110,000 employees worldwide. In other words, she represents a company that can draw on competences from a wide range of different countries, including typical frontiers like the UK, the US, and Australasian countries. CSC has been working within IPHS and RMT for several years, and has departments in Denmark and UK specialising in the area. The company is also currently considering expanding this part of its portfolio in the coming years.

Within the market area of RMT and IPHS, CSC started working primarily with COPD and is expanding to diabetes and CHF, driven by a current and growing customer demand and its software platform is integrated to all available Danish EPRs. Ms Rosager stated that this issue of integration was a prerequisite for the company when it decided to enter this market. It did and still does not have a stand-alone model available, but prefers to have systems that are integrated into existing EPRs.

CSC primarily provides EPR systems for hospitals and municipalities and sees this RMT area as a module to supplement them with integration. The service concept is thereby built up around the existing services and solutions already offered by the company, while providing terminals and setting up the systems at patients’ houses, changing batteries, etc. is delivered by third party players. From the beginning, responsibilities are clarified through clear contracts, even though Ms Rosager argues that there are still some grey areas with regards to clear legislation in the area. The company does, for instance, not have any alarm-setup implemented in its system to avoid being placed in the medical device class 2 or 3 on a European level, which would mean radical changes to their legal obligations.

Ms Rosager argues that there are still a number of barriers in Denmark:

1) Organisational readiness: Pilot projects today are too much rooted in existing ways of working within the healthcare sector. If they are to reap the real benefits, Ms Rosager argues that the organisation of the system should be changed much more significantly into e.g. RMT call centres or similar organisational changes leveraging some of the real potentials in RMT and IPHS.

2) In terms of market Denmark is still in an early stage with primarily early adopters. In other words, it is not the regular nurse that takes the lead in bringing innovation to the sector; it is enthusiasts. According to Ms Rosager, this is a typical problem when transcending from a traditional healthcare sector to a new way of delivering care.

3) The healthcare sector itself is not ready. On this, Ms Rosager argued that both competences and organisational adaptation is lacking, therefore significant training and education is needed. Furthermore, she brought up the concept of “Fear of New Things”, which in her opinion is quite natural or normal when introducing changes to existing workflows and routines.

To overcome these barriers, she states that

- It is necessary to change the organisations into being much more RMT and IPHS ready. On this she notes that the patients are in fact ready.
- It is necessary to adapt the traditional incentive structures of DRG reimbursement rates to new payment structures promoting the use of RMT and IPHS.
- It is necessary with different incentive structures for the staff as they are not directly affected by the DRG reimbursement rates. They should, she argues, be able to see clear benefits and relevance to their daily work and activities when using such services and systems.
- Large-scale projects are needed – together with a bit of boldness and support from the political side. Ms Rosager does see a very positive attitude from the political side currently and she supports the initiatives taken from PWT, NSI, RSI, SST, and MedCom – especially on the large-scale ICHM project, which is described in section 4.2 “Integrated Clinical Home Monitoring Project”.
- Denmark has come a long way with regards to standards, and as a big player CSC has no issues with them. However, Ms Rosager argues that small companies might suffer from having to learn to live up to the standards. It is therefore very important that the standards are quite generic to encourage innovation and space to develop market solutions.
- Selected geographical areas and diseases must move faster than others, and there must be an organic growth of the market through demand from the clients, i.e. the healthcare sector players such as hospitals, municipalities and GPs.

To conclude, Ms Rosager argued that this area could become one of theirs and Denmark’s big export areas. She still thinks that we have some way to go before we move out of the early adopters stage, but states that she thinks that Denmark is moving in the right direction.
5. Findings, Conclusions, and Policy Implications

This study set out to present and discuss the Danish status for integrated personal health systems (IPHS) and remote patient monitoring and treatment (RMT). The first part of the study, the secondary data collection, provided an overview of the current socio-demographic background in Denmark, including the composition of the population, age structure, housing, socio-economics, urbanisation, education, and the use of IT and Internet. Furthermore, this section presented key figures for the prevalence and costs of diabetes, COPD, and chronic heart failure in Denmark. Subsequently, an insight into the organisation of the Danish social and healthcare system was provided, including the main players on the different levels as well as recent developments and trends. It also gave an overview of Danish disease and prevention management programmes, including programmes for the continuity of care. Finally, the section presented a number of Danish strategies and initiatives for the promotion of integrated care, including RSI, NSI, and the digitalisation strategy of LGDK, MedCom, and MAST. As a supplement to this final point, a description of the PWT Foundation was given. By looking into these issues, the secondary data collection showed how the Danish healthcare system is facing the same demographic challenge as many other European countries and how steps in IPHS and RMT are taken in order to meet this challenge.

To support this point, the second part of the study, the selected Danish case studies, gave concrete examples of projects working towards further implementation of integrated healthcare. Two projects in COPD were presented (The Patient Briefcase and The TeleKAT Project) together with one project for diabetes (The Diabetic Foot Ulcer Project) and one for CHF (The Anti Coagulant Treatment Project) to give concrete examples of good practices from Denmark within RMT. These good practices gave way to analyses of e.g. governance and policy as well as of drivers and barriers, herein including insights from relevant stakeholders.

Finally, the third part gave a qualified insight into the future of IPHS and RMT in Denmark by describing two projects specifically dealing with these issues. An interview with the company CSC also gave way to insights to the market for IPHS and RMT in Denmark now and in the coming years.

The conclusions on trends identified across the study are too many to be fully mentioned in this section. With this in mind, we have focused on some common indicators from all stakeholders, also supported by the secondary data presented earlier.

In many ways, Denmark has been a pioneer in the use of electronic communication in and across the healthcare sectors. As described in the study, MedCom has been established as a joint project organisation to provide common standards for communication and infrastructure in and across the primary and secondary care sector. Also, more recent initiatives such as sundhed.dk have given way to a common infrastructure and have served to construct health related content in a way so that both health professionals and citizens have a common access to data. Furthermore, the continuity of care programmes from SST has provided a common way of delivering care for chronically ill patients across traditional sector boundaries. Policy-wise, Danish IPHS and RMT are somewhat supported by basic legislation already in place and strategic support from all main players such as LGDK, RSI, NSI, as well as the new government platform. This, together with funding support programmes like the PWT Foundation and incentives like the DRG reimbursement rates for telemedicine helps to bring down barriers and speed up the development of IPHS and RMT in Denmark. It is thereby becoming increasingly beneficial to take part in development and implementation projects in Denmark. This is also evident for the two coming IPHS and RMT projects that are planned to be the first large scale implementation projects within these areas in Denmark. These projects will most likely become very influential for further deployment of IPHS and RMT in Denmark, and possibly for other EU countries.

In other areas, such as data security, use of professional access-cards (and ID management in general), interoperability between systems and different EPR providers, further DRG reimbursement rates and connection between clinically usable e-records, Denmark is not doing as well as it could.
This makes room for improvements and optimisation of the already existing and very progressive situation in Denmark. Clear leadership is needed here to guide and govern the innovation processes that often cross professional and sector boundaries. Furthermore, as indicated by the health professionals interviewed in the study, clear plans for evaluating clinical and economic outcomes are needed in order to ensure a broad acceptance within and across the healthcare sectors.

Remote patient monitoring and treatment and integrated personal health systems are thereby on the verge of getting from the project stage into more mainstreamed solutions. To embrace this, the Danish eHealth governance model has slightly been changing in recent years, shaping new responsibilities for different actors. Taking into consideration the declining workforce, the increasing number of chronically ill and the increasing distance to proper treatment in the "outer areas" this trend is very welcome. It will be very interesting to see how all these initiatives already set in play will influence the coming years’ progress on IPHS and RMT in Denmark.
Appendix 1 – Expert Interviews Section

Methodologies Used

Semi-structured Interview\(^{104}\)

This technique is used to collect qualitative data by setting up a situation (the interview) that allows a respondent the time and scope to talk about their opinions on a particular subject. The focus of the interview is decided by the researcher and there may be areas the researcher is interested in exploring.

The objective is to understand the respondent's point of view rather than make generalizations about behaviour. It uses open-ended questions, some suggested by the researcher (“Tell me about...”) and some arise naturally during the interview (“You said a moment ago...can you tell me more?”).

The researcher tries to build a rapport with the respondent and the interview is like a conversation. Questions are asked when the interviewer feels it is appropriate to ask them. They may be prepared questions or questions that occur to the researcher during the interview. The wording of questions will not necessarily be the same for all respondents.

Semi-structured interviews compared to logging and questionnaires: strengths and weaknesses

Semi-structured interviews have inherent several characteristics, which can be categorized as weaknesses and strengths when compared to questionnaires and logging:

Strengths

1. High Validity. People are able to talk about something in detail and depth and things that can’t be easily observed (feelings and emotions, for example). The meanings behind an action may be revealed as the interviewee is able to speak for themselves with little direction from interviewer.
2. Complex questions and issues can be discussed / clarified. The interviewer can probe areas suggested by the respondent’s answers, picking-up information that had either not occurred to the interviewer or of which the interviewer had no prior knowledge.
3. Pre-Judgment is minimized compared to questionnaires: Problem of researcher predetermining what will or will not be discussed in the interview is resolved. With few “pre-set questions” involved, the interviewer is not “pre-judging” what is and is not important information.

Weaknesses and limitations

1. Depends on the skill of the interviewer (the ability to think of questions during the interview, for example) and articulacy of respondent.
2. Interviewer may give out unconscious signals / cues that guide respondent to give answers expected by interviewer. A software program generates loggings and the respondents can administer questionnaires.
3. Interviews are time-consuming compared questionnaires and logging.
4. Not reliable in an objectivist manner – it is difficult to exactly repeat a focused interview. Respondents may be asked different questions. When using a questionnaire the questions are repeated in the same way.

\(^{104}\) [http://www.sociology.org.uk/methfi.pdf](http://www.sociology.org.uk/methfi.pdf)
5. Depth of qualitative information may be difficult to analyse. The answer to what is relevant resides with the user, and not with the interviewer. Data from questionnaires and loggings can be organized in tables and analysed using statistical programs.

6. The personal nature of interviews makes findings impossible to generalize in an objective manner, but this is not the purpose. It will be possible to generalize patterns of answers among the respondents, but not easy to export them to groups beyond the interviewees.

The question about true information and generalizing answers aligns with objectivist approaches. It is less relevant in a responsive illuminative approach where it in principle is of no interest. The interest is to understand what the meaning, objectives and attitudes of the interviewed persons are, in order to grasp their motivation and energy for decisions about use. If a person says, ‘I do not like this service’, but nevertheless decides to use it, the intention of this approach is to understand why. The underlying meaning of decision making from users perspectives has often been underrated. In this evaluation we therefore triangulate approaches in order to both obtain objectivist information and understand subjectivist meaning and motivation.

**Questioning guide**

Start with a brief introduction to the study and purpose of interview. Explain the concepts IPHS and RMT and explain why you think they could provide the study with valuable inputs.

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<thead>
<tr>
<th>Name of the person interviewed</th>
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<td>Position</td>
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<td>interviewers</td>
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<td>Date and Duration of the interview</td>
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<tr>
<th>Question</th>
<th>Description</th>
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<tr>
<td>Background</td>
<td>The expert’s background for participating</td>
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<tr>
<td>- Profile</td>
<td>Age, sex, position, CV, expert role</td>
</tr>
<tr>
<td>- Context</td>
<td>Description of the expert’s context, i.e. how he or she is relevant to the study</td>
</tr>
<tr>
<td>Case Study + Macro level</td>
<td>The case study in question and macro level discussions</td>
</tr>
<tr>
<td>- General description</td>
<td>Of case study or other topic, e.g. programme, strategy, ... Chronic care system: The ultimate objective is to gather data on ICT applications (mainly through RMT) for chronic disease management, in particular: Diabetes, COPD and CHF.</td>
</tr>
<tr>
<td>- Barriers / Deployment level</td>
<td>Interoperability Standardization</td>
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<td>Product certification</td>
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<td>Incentive system - DRG</td>
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<td>Reimbursement system</td>
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<td>Uptake of innovation</td>
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- **Cost/benefit**
  - Describe the C/B – and the documentation available

- **Leaders of IPHS / RMT**
  - Who are the other relevant leaders?
    - People
    - Organizations
    - Governmental
    - Others

- **Technology description**
  - Innovation aspects in the technology
  - Interoperability
  - Link to chronic care systems
  - Link to IPHS / RMT

- **Policy/governance**
  - How the case study is governed (micro & macro)?
  - Where are the responsibilities (e.g. for bridging barriers, deploying, paying for it, etc.)
  - Policy level in DK in relation to case study / IPHS&RMT?
  - How is it related to the governance models and policy recommendations offered by NSI, RSI, MedCom standards, ABT, Continua, HL7, integration to EPJ/EOJ, etc.)
  - ... And can these actually bridge the gap between many pilots and few deployments/mainstreamed solutions?

- **What next**
  - What happens next in Denmark?
  - What are the trends, rumours, agreements, etc.

- **Any other business**
  - AOB

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**List of Interviewees**

- Jane Clemensen
  - Nurse, Ph.D in eHealth, Project Manager of the Diabetic Foot Ulcer Project.

- Lars Hulbæk
  - Deputy Manager in MedCom and Board Member in ISfTeH and Danish Society for Clinical Telemedicine.

- Niels Rosing
  - M.D., former consultant in WHO, ESA, and Chief Informatics Officer at Copenhagen Hospital.

- Marianne Rosager
  - Manager of Telemedicine in CSC and former CEO in eMedLink, educated nurse and MBA.

- Birthe Dinesen
  - Nurse, Ph.D in eHealth, and Project Manager of the TeleKAT project.
• Claus Duedal Pedersen
  o Project Manager and Head of the Department for Clinical Innovation at Odense University Hospital. He is in charge of development, testing and implementation of telemedicine and eHealth solutions.

• Susanne Duus
  o Chief Advisor at the PWT Foundation and Chief Advisor at the Danish Agency for Governmental Management.

• Jørgen Thomsen
  o Co-owner of MediSAT A/S – the Patient Briefcase.

• Ivan Brandslund
  o Chief Physician, M.D. Professor at the Department for Biochemistry
Appendix 2 - References


Literature


Abstract
This study presents and discusses the status for integrated personal health systems (IPHS) in Denmark. It aims to illustrate through case studies the patient and health monitoring systems that are available, the level of implementation of these systems, the impact they have on the general socio-economic context, as well as their cost-effectiveness where applicable. The analysis presented in this report is based on interviews with key experts and stakeholders from Denmark and a substantial secondary data collection.
As the Commission’s in-house science service, the Joint Research Centre's mission is to provide EU policies with independent, evidence-based scientific and technical support throughout the whole policy cycle.

Working in close cooperation with policy Directorates-General, the JRC addresses key societal challenges while stimulating innovation through developing new standards, methods and tools, and sharing and transferring its know-how to the Member States and international community.

Key policy areas include: environment and climate change; energy and transport; agriculture and food security; health and consumer protection; information society and digital agenda; safety and security including nuclear; all supported through a cross-cutting and multi-disciplinary approach.