

Case Study: Denmark's Achievements With Healthcare Information Exchange

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Through careful use of IT, the Danish health system has saved money, improved efficiency and laid the foundations for improvements in the quality of care. Healthcare organizations in other countries will benefit from learning what Denmark has achieved.

WHAT YOU NEED TO KNOW

Denmark, with 5.3 million citizens, is a leader in national healthcare information exchange. It has successfully developed a healthcare data network, and is now implementing a national health portal and a clinical data repository. Although only financial benefits have been documented thus far, anecdotal evidence suggests that Denmark has also achieved clinical benefits from factors such as improved adherence to care guidelines, faster exchange of test results, fewer duplicate procedures and more time for clinicians to spend with patients. Denmark's success lies in a careful alignment of incentives, the creation of a culture of collaboration, and the maintenance of a correct balance between central and local leadership. Denmark offers many lessons that can help other organizations save time and reduce risk. IT planners at regional and national healthcare organizations, and systems integrators interested in similar projects, are among those who should take note.

CASE STUDY

Introduction

The Danish National Health Service is funded through taxation and has three levels of administration:

1. Central government, which has a coordinating role
2. 15 counties, which own and manage most hospitals
3. 271 local authorities, which deliver home healthcare, child healthcare and care of senior citizens

A reform will go into place in January 2007. The 15 counties will merge into five regions, and the 271 local authorities will consolidate to 98. Responsibility for funding healthcare will be removed from the counties and divided between central government (80 percent) and local authorities (20 percent). Financial support from the county governments has been at the heart of the Danish health system's achievements with IT. The removal of funding from the county governments raises important concerns about Denmark's ability to sustain these achievements.

Danish healthcare providers have a relatively high level of automation. As in most of Western Europe, all hospitals have patient administration systems. Danish patient administration systems contain more clinical content than is the norm in Europe, including a clinical data repository with discharge letters, referrals, laboratory results and notes. Thirty-five percent of Danish hospitals have computer-based patient record (CPR) systems, a figure higher than most of Western Europe. CPR penetration in Denmark is expected to rise to 100 percent during the next two years. Ninety-eight percent of general practitioners (GPs) and a large percentage of specialists use electronic medical record (EMR) systems — a level similar to the U.K., the Netherlands, and the other Nordic countries. Use of EMRs grew substantially during the past 10 years as a result of MedCom's work on standards development. Denmark, like the other Nordic countries, has had a national ID number for decades.

The Challenge

During 1994, an estimated 20 percent to 30 percent of administrative expenditure in the Danish health system was spent on handling paper. The inefficiencies inherent in paper-based communications resulted in errors, duplication, wasted time, and poor service. Many local and regional IT projects had sprung up to address these challenges, but they were uncoordinated.

Approach

MedCom

MedCom, Denmark's coordinating organization for healthcare IT, was founded in 1994 to address these problems. By 2002, it had developed national standards for electronic data interchange (EDI) communication and ensured their widespread adoption in primary care. MedCom is funded 50 percent by the Ministry of Health, 35 percent by the Association of County Councils, with the remainder of the funding coming from municipalities, the Danish Pharmacy Association, and other organizations. MedCom has a staff of approximately 15 and a budget of 3 million euros per year.

MedCom created standard EDI forms for the six principal information flows in primary care for which paper forms were used: lab orders and results; prescriptions ordered by GPs; referrals from GPs to specialists; radiology orders and results; community (home care) messages; and insurance claims submissions and reimbursements. It disseminated these standards through local projects funded by the counties. To encourage adoption, MedCom published on its Web site the number of messages sent in each county, and the progress of vendors in modifying their applications to become compliant with the standards. The main problem was that the standards were too ambiguous. Focus groups involving clinicians, IT professionals and vendors resulted in more-precise versions of the standards.

Since 2002, MedCom has:

- Formed a health data network by linking existing local and regional secure healthcare networks and the value-added network services of counties, hospitals, vendors and other organizations to a central hub via a virtual private network (VPN). The VPN is used for transferring messages, as well as for videoconferencing, conducting teledermatology, accessing digital images, and accessing the Standardized Extracts of Patient Data (SUP) system and the national portal.
- Developed a tool to convert EDI messages to XML. One of the goals is to facilitate the transition from existing administrative and clinical applications to applications based on the new CPR data model.
- Developed standards for hospital-to-hospital discharge letters, patient referrals, correspondence messages and clinical biochemistry laboratory results. MedCom paid vendors to modify their applications to incorporate these standards.
- Developed messages for GPs and hospitals to communicate with local authorities and home care providers. This is particularly important in the care of senior citizens, who are frequently transferred between hospital and home care.

In addition to the MedCom standards, Denmark has several other important healthcare IT initiatives.

Danish Medicines Agency: Medicine Profile

All purchases of prescription medicines in Denmark are recorded in a central database. A Web-based application, accessible through the national portal, maintains a medicine profile for each patient. The profile shows all prescription drugs purchased by the patient during the previous two years, which doctor prescribed them, which pharmacy dispensed them, and how they were reimbursed. The database and application were developed by IBM Acure and are managed by the Danish Medicines Agency.

National Board Of Health: CPR Data Model and Terminology Server

The Danish central government contributes to healthcare IT through the National Board of Health. The board has created a CPR data model known as the Basic Structure for Electronic Health Records. The board plans to bring the data model into compliance with the Health Level Seven (HL7) version 3 Reference Information Model (RIM) during the next few years. The data model specifies the functionality that every CPR system in Denmark should contain. It is being used as the basis for the tenders that counties are issuing for CPR systems. The board is also completing the development of a national terminology server, including a translation of Systematized Nomenclature of Human Medicine (SNOMED) into Danish.

SUP: A Viewer for Hospital Data

The purpose of the SUP project, which was designed by two counties and three vendors and was implemented by MedCom, is to make data held by Danish hospitals available to clinicians and patients across the country. SUP is currently supplied with data on 16 percent of the population. Three counties are contributing data. SUP is a Java-based system running on an IBM WebSphere application server and DB2 database. The SUP metadata model contains the data common to the main administrative and clinical applications used in Danish hospitals. Every 24 hours, the data from local applications is copied into an XML file, which is transferred to the SUP database. Clinicians can only view the data; they cannot download it into their own applications.

Once vendors adopt the CPR data model and hospitals implement upgraded CPR applications, the SUP metadata model will be updated, which is expected to enable data extracts every one to two hours. We expect that, over time, SUP will become an electronic health record (EHR) covering the entire country.

Sundhed.dk: A National Healthcare Portal

Since year-end 2003, Denmark has had a healthcare portal, Sundhed.dk, which is funded by the same organizations as MedCom. The portal was developed by IBM Acure and runs on an IBM WebSphere portal server, WebSphere application server and DB2 database. The portal cost 15 million euros to set up. Its annual cost is 4.5 million euros: 3 million euros for IT operations and 1.5 million euros for administration. The content is contributed by the stakeholders (principally the counties and local authorities).

The portal enables patients to

- View their data from the SUP database (to go into effect in August 2006).
- View their medicine profiles.
- Renew prescriptions.
- View summaries of their medical histories (as of September 2005).
- View a shared care pregnancy record.
- Purchase prescription drugs from pharmacies.
- View information on medical conditions, preventive medicine, and health laws and regulations.
- Specify their organ donation preferences.

- Book appointments with GPs, view a calendar containing their appointments and set up appointment reminders.
- Have electronic consultations with GPs, which are reimbursed according to nationally agreed fees. The Danish GP association has agreed that, by year-end 2007, all GPs will offer electronic consultations.
- View a directory of healthcare organizations, with information on waiting times, quality and accessibility.

Clinicians can view the same information as patients. In addition, they can view clinical knowledge (the Cochrane Library), job listings, laboratory test results (a pilot project) and guidelines for referring patients to hospitals.

The portal uses a public-key infrastructure (PKI) for security. Access by patients requires a digital signature; 650,000 have been issued to date. Patients store the digital signatures on their personal PCs and can also transfer them onto thumb drives if they wish to access the portal from another PC. There are approximately 175,000 unique patient visits to the portal per month. Access by clinicians or pharmacies requires special security certificates. Patients can view the name of the person viewing their data, the date and time of the access, and the action taken.

In theory, Danish patients have to give explicit consent each time data is shared, they are allowed to choose which clinicians can access their medical records, and they are allowed to restrict access to data on mental and sexual health. In reality, patients are encouraged not to exercise these powers. Consent to share data is requested only when the patient changes physicians or hospitals.

Results

According to MedCom, Denmark has achieved these results as of May 2006:

- Use of EDI communications has reached 98 percent of Denmark's 3,500 GPs, the majority of specialists, all 73 hospitals, all 331 pharmacies and half of the 271 local authorities.
- The Danish Health Data Network transmits 3.5 million messages per month — about 80 percent of messages in the health system.
- The network transmits approximately 100 percent of discharge letters, 95 percent of lab results, 80 percent of reimbursements, 77 percent of prescriptions, 52 percent of referrals and 15 percent of lab requests.

Studies have concluded that MedCom has produced financial benefits. A cost-benefit analysis conducted in 2006 by the market research firm Empirica estimated that the cumulative present-value cost of MedCom prior to year-end 2005 was 536 million euros, and the benefit was 872 million euros. Empirica estimated that a typical GP, serving 1,300 patients, saves 30 hours per week of secretarial work by using the MedCom standards.

It is disappointing that there is no hard evidence of clinical benefits. Soft evidence includes more-effective communications (clear, accurate, complete and consistent), more-efficient communications (rapid and lower-cost), and more widespread communications. GPs and hospitals spend less on administrative processing and get reimbursed faster. Local authorities spend less on handling transfers of patients between hospital and home care. Patients benefit from more-efficient delivery of health services, better and more rapid communication of patient data, and access to information about their health.

Critical Success Factors

- *Support to adopt MedCom standards paid for by counties.* Project coordinators at hospitals involved staff in determining the data to be communicated electronically and developed new procedures for handling electronic messages. Data consultants trained physicians and their staff on how to use electronic communications. Physicians were paid to help hospitals communicate better with physician practices.
- *Precise standards.* MedCom did not just create standards; it worked with clinicians to define the precise content of the standards. This process, though time-consuming, resulted in more-accurate communications and was critical in educating clinicians about the value of IT.
- *Peer pressure through public monitoring of participation.* The MedCom Web site displayed a running total of electronic messages sent, participating counties and compliant vendors.
- *Gradual approach with realistic time frames.* There was an acceptance by all parties that the adoption of electronic communication would take many years and should not be rushed.
- *Financial incentives to physicians to adopt EMR systems.* Physicians in Denmark are independent contractors who make independent decisions about IT. Physicians who adopted EMR systems and used the MedCom standards received faster reimbursement. Also, MedCom gave physicians 1,500 euros per year to spend on EMR systems.
- *Incentives to vendors.* No one required healthcare organizations to use a particular vendor. Counties encouraged vendors to upgrade their hospital applications to the MedCom standards by committing to purchase the upgraded applications.
- *Culture of consensus.* MedCom is funded by many different stakeholders and is viewed as an impartial organization.
- *Project-based approach.* Approximately half of MedCom's budget is spent on permanent employees and overhead. The rest is devoted to projects. MedCom believes that this approach has given it more flexibility.

Lessons Learned

- Start with basic needs; then add other things.
- Establish a process for continual monitoring and evaluation. This must include the measurement of improvements in the quality of care.
- Align the incentives of providers, payer organizations and vendors.
- Develop an approach to privacy and security that satisfies the demands of clinicians and patients, and then implement it consistently.
- Keep an appropriate balance between central coordination and local leadership.
- Devote plenty of resources to local implementation and training to ensure clinician adoption.

- Start simple and keep the program as simple as possible. It is tempting to take on many projects at once, but increasing the level of complexity does not bring a corresponding increase in benefits.

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