Electronic Health Records: A Global Perspective

Second Edition

Part I

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EXECUTIVE SUMMARY

The Healthcare Information and Management Systems Society (HIMSS) Global Enterprise Task Force (GETF) was chartered to investigate efforts to implement the electronic health record (EHR) in a host of countries around the world. In this second edition white paper, the Task Force has greatly expanded the number of countries covered, and updated many others from the first white paper and addressed selected related topics such as personal health records (PHR).

Please note that this second edition white paper is divided into two parts (in separate pdf documents). This Executive Summary and Overview of the Task Force and White Paper are included in Part I, along with coverage of Europe and Scandanavia. Asai Pacific, the Middle East, South America and North America are included in Part II.

The GETF looked at a battery of EHR and PHR components within each country, including security, quality, financing sources and barriers to adoption. Four common threads that affect EHR implementation and connect every effort around the globe were identified:

- Funding
- Governance
- Standardization and interoperability
- Communication

Local and nationwide efforts to realize EHR and PHR systems were intermittently reported in all the countries we studied. When analyzing these efforts, the common threads listed above helped to explain the success, barriers or implementation failures experienced in each country.

The need for this analysis is readily apparent. It allows us to harness the strength of the information and then deploy it to key decision makers in any of the countries studied to help in their efforts to build a successful EHR system. The information gathered over three years from some of the each country’s leading experts can be used to foster cross border education, and enhance planning and implementation, whether these efforts are local, regional, national or globally implemented.

As shown in the following chapters, we focused on each nation’s overall healthcare system; their information technology (IT) status and strategies; national or regional approaches; connectivity issues: standards; and stages of implementation. We also reviewed the critical factors of governance, funding, public policy, and legal and regulatory issues that affect the success of EHR adoption in each of these countries. As expected, these are all key indicators that determine where the US stands in comparison with other countries.

Funding

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Funding for healthcare IT can be through national or local governments, the private sector or combinations of both. For example, Canada Health Infoway – an independent not-for-profit corporation – leads the national effort with all 14 federal, provincial and territorial governments as shareholders. To date, Infoway has received 1.6 billion Cdn from the federal government and more is anticipated.

England has led the world in its willingness to invest in IT for healthcare. The National Programme for IT (NPfIT) was initiated in 2003 and was originally budgeted to be £6.0 billion over 10 years, but the National Audit Office estimates the figure to be £12.4 billion over that period of time while other officials have been recently quoted in papers as estimating the figure to be closer to £20.0 billion. The investment is intended to deliver a number of major initiatives that will enable the envisioned EHR (e.g., new network infrastructure) as well as national applications that will utilize the EHR (e.g., electronic transfer of prescriptions, electronic outpatient scheduling). The EHR portion of the program is called the Care Record Service and it includes three components: Personal Demographics Service (PDS), Summary Care Record (SCR – e.g., patient’s clinical information, such as allergies and adverse reactions to medicine), and Secondary Uses Service (SUS), which uses data from patient records to provide anonymous and pseudonymous business reports and statistics for research, planning and public health delivery.

In Wales, funding is highly leveraged through the nationally agreed concept of “common by design.” This enables incremental development of national EHR capabilities and encourages local investment for the national benefit. One Trust has been developing the clinical portal while another is establishing funding programs for local EHR deployment. The “Informing Healthcare Program” (IHC) provides the overarching vision and architecture as well as creating the standards for privacy policy, security and interoperability. By design, these components will converge into a national solution that will be deployed across all Trusts.

EHR funding in Sweden, Germany, France and the Netherlands continues to be an international problem due to the significant cost of implementation. However, each country is moving forward with plans for appropriate funding. All are providing government funding to support committees that are developing EHR strategies for a national system. Sweden and France have already moved toward a government-funded national system while the Netherlands has not yet formally committed to this model and Germany avoids direct government interaction into its healthcare system.

Other countries are at an earlier stage in EHR development and are making progress, despite the lack of a formal national program. Japan, for example, currently does not have a government-centered EHR; however, some local, regional and single hospitals have installed digital patient records and share data between hospitals, clinics and patients. Norway is conducting research that is expected to lead to a national EHR program. The Research Council of Norway awarded Norwegian University of Science and Technology (NTNU) a contract to establish the Norwegian Electronic Health Record Research Centre (NSEP).

Like Japan, Israel does not have a national EHR program. Implementations, however, are widespread in both the public and private sectors, driven by both the need for excellence
in healthcare and competition. In a survey of 26 general hospitals in Israel, 21 of them (91.3 percent) use electronic medical record (EMR) systems.

India depends mainly on funding from the private sectors. The country has one of the fastest-growing IT healthcare sectors in the world. Much of it, however, is for export and there is still great disparity in healthcare delivery and use of IT systems between wealthy cities and poor rural communities. India’s private sector is driving EHR implementation as large healthcare providers build separate systems (i.e., the silo approach).

**Governance**

Strategic national leadership and governance leads to better plans for interoperability. Yet even with these national attempts in place, barriers are difficult to surmount. Germany, for example, has a distributed strategy model, but their hospitals compete against each other for patients and services. This does not lend itself to an organized integrated solution. Historically the US has been slow to direct EHR development through a federal structure. This has changed, however, as the Office of the National Coordinator for Health Information Technology (ONC) in the Department of Health and Human Services has assumed a leadership role.

**Standards and Interoperability**

All countries suffer from a lack of healthcare IT standards creating interoperability barriers for healthcare IT adoption at local and national levels.

France, Sweden, the Netherlands and other countries are attempting to standardize EHRs either through their own national standards or by using a variation of the Health Level Seven (HL7) standard so that interoperability can also occur between their countries. Denmark, Norway and Sweden already collaborate in the exchange of electronic health information.

Israel has at least 27 different types of systems in use in Israeli hospitals, with more than one type generally used in any given hospital. In more than 98 percent of hospital departments, physicians now use EHR systems. In addition, more than 90 percent of hospital departments use EHR systems for clinical admissions and discharges and 45 percent of them use it daily for follow-up and progress notes.

Hospitals in Japan started to utilize computerized practitioner order entry (CPOE) systems in the early 1980s and it is now widely used. The installation of EHR systems, including medical digital imaging reference functions, continues to increase within hospitals and clinics. However, data is still not easily shared between hospitals.

Interoperability of NPfIT, England’s EHR program is based on messaging services using HL7 v3 RIM and enabled by standards such as Systematized Nomenclature of Medicine-Clinical Terms (SNOMED CT) and Clinical Document Architecture (CDA).

Canada created a national framework, the EHR Solution Blueprint, to guide the development of an interoperable EHR across all jurisdictions, with each jurisdiction allowed to determine its own implementation strategy. Like Germany, Canada developed national consensus for a distributed model approach; health data comes from different
operational applications in any given jurisdiction. In Canada, data is replicated into the interoperable Electronic Health Record (iEHR) via the Electronic Health Record Infostructure (EHRi). In this model, the pan-Canadian EHR consists of many EHRs resulting in a peer-to-peer network of message-based interoperable EHRs deployed across the country.

To maintain its focus on interoperability and standardization, Canada Health Infoway uses the EHR Solution Blueprint to define how standards, including nomenclature and messaging, are used to ensure semantic interoperability. The Blueprint is a flexible business and technical design framework that allows solutions, components and best practices developed in one jurisdiction to be reused in another. It ensures that all EHR solutions can seamlessly and securely exchange patient health information. Infoway has also created a Canada-wide effort, the Infoway Standards Collaborative, to support and sustain health information standards. Nine specific pan-Canadian Standards Groups contribute, review, validate and harmonize standards in support of the nine Infoway Programs (Registries, Infostructure, Laboratory Information Systems, Diagnostic Imaging Systems and Picture Archiving and Communications Systems (PACS), Drug Information Systems, Interoperable EHR Systems, Telehealth, Public Health Surveillance, and Innovation and Adoption). The predominate standards used to support semantic interoperability between the EHRs, and between EHRs and point-of-service systems are HL7 v3, Digital Imaging and Communications in Medicine (DICOM), Logical Observation Identifiers Names and Codes (LOINC) and SNOMED CT.

Denmark has evolved to one of the most interoperable national EHR systems in the world. Despite the fact that Denmark’s PHR acts more like a patient portal for scheduling and communication than as a true source for patient data entry, it is the first step in a comprehensive healthcare IT system for modern times.

In the US, regional and jurisdictional efforts to promote EHRs have emerged in the form of Regional Health Information Organizations (RHIOs). Unlike Canada’s coordination on a national scale, America’s RHIOs have struggled to achieve government and other stakeholder support and funding as independent organizations. Of the more than one hundred RHIOs started across the country, only a handful has succeeded in exchanging electronic data.

**Communication**

Perhaps the greatest barrier to creating interoperable standards in healthcare IT is the gap in communication that exists between and within countries. Whether coordinated and funded by the national government or “boot-strapped” by local agencies, a failure to communicate activities within a country can lead to implementation failures. Some countries have focused their efforts on thorough and continual communications to guide EHR implementation. For example, the Canadian effort emphasizes communication with stakeholders and inter-jurisdictional collaboration enhanced by knowledge sharing. To this end, Infoway created the E-Health Knowledge Way – a gateway to English and French language resources for all topics related to the implementation of the EHR. This includes pan-Canadian forums and toolkits for implementation with most of the information available worldwide.
HIMSS, as the world’s leading organization in healthcare IT, can be instrumental in linking communication and promoting EHR efforts within and between the countries of the world.

Major Lessons Learned

While studying the leading country implementation addressed in our paper, GETF members concluded there were overarching lessons across the countries. They are as follows:

Lesson #1. Recognize that national EHR programs are industry-wide transformations developing within relatively immature healthcare IT environments. A key success factor is a critical mass and core leadership from various levels in the healthcare industry to not only sponsor, but also actively promote fundamental change industry-wide.

Lesson #2. Building and maintaining genuine physician and clinician involvement in the political and implementation process is absolutely essential to program success.

Lesson #3. Developing support from all stakeholders in the healthcare enterprise (i.e., national, regional or provincial governments, institutional and private providers) is a recognized success component. The active engagement and management of the vendor community are critical to the success of a national initiative, a factor that is overlooked in some countries.

Lesson #4. Adoption and adherence to data exchange standards must be achieved early in the program planning process so that inter-operative systems can be embedded into the overall system technical architecture.

Lesson #5. Developing initial momentum among stakeholders is essential for building a critical mass of medical consumer and healthcare provider users of the system.

Lesson #6. Achievement of national legal and regulatory agreement on privacy and consent issues of electronic records is an essential enabling component of national programs.

Lesson #7. Substantial efforts must be applied to stakeholder communication to ensure successful participation and continued financial support for the program.

Lesson #8. IT investment, deployment strategies and programs must be customizable. Each healthcare sector and the various healthcare delivery regions/organizations may be at a different point in their use of IT.

The Future

Driven by the internal need for better and more cost-effective healthcare, EHRs will become standard in all developed and developing countries of the world.

In nearly every nation, government mandates, initiatives, incentives and funding drive the adoption of a national healthcare IT system. In the US, EHR adoption will depend on government support via funds made available by American Recovery and Reinvestment Act of 2009, the Obama plan that should address the cost obstacle.
A major barrier to global EHR adoption from the top government level down to the private sector has been cost. Most healthcare organizations struggle with the high cost of hardware, software and communications systems. While not likely to disappear completely, a “software-as-a-service” model, wider use of IT, new entrants into the market and improved technology will drive down the costs associated with implementing EHR systems. In addition, OpenSource EHR software has a growing foothold in the industry and it may have a significant impact in the long term.

In addition to cost, fear of technology and change will continue to hamper EHR adoption at the clinical user level. Over time, continued education, trust, security, standardization, improved functionality and usability, and growing familiarity with healthcare IT will ameliorate these fears.

In some countries, a national approach to EHR adoption has been from the top-down, an approach that works best in a system where there is a single payer such as the federal government. In countries where the federal government takes a more passive role in healthcare IT, grass roots promotion from multiple stakeholders will be necessary. In either case, providing incentives to healthcare organizations and providers will be of paramount importance in their adoption of EHR systems.

References


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OVERVIEW OF TASK FORCE AND WHITE PAPER

Please note that this second edition white paper is divided into two parts (in separate pdf documents). The Executive Summary and this Overview of Task Force and White Paper are included in Part I, along with coverage of Europe and Scandanavia. Asia Pacific, the Middle East, South America and North America are included in Part II.

Audience

The intended audience for this white paper includes all industry leaders and other stakeholders in the healthcare industry, including:

- Chief information officers, chief technology officers, chief architects, procurement executives and chief medical officers
- Pharmacy benefits managers and mail order pharmacy organizations
- Researchers and scientists for patient safety, privacy and research
- Software developers
- Clinicians
- Payers from both the private and public sectors of healthcare
- Patients

HIMSS Global Enterprise Task Force

Chartered in 2006 under the auspices of the HIMSS Enterprise Information Steering Committee, industry leaders from around the world joined the GETF to examine global electronic record programs and to promote knowledge sharing across borders.

The objectives of the GETF are:

1. To identify and describe significant healthcare information solution efforts being pursued in one or more industrialized nations;
2. To identify those aspects of a solution that differs from one nation to another and to determine, through return on investment (ROI) in finance and quality, which represent best practices;
3. To identify the common threads in national EHR adoptions that led to success or failure and then open communications between all stakeholders;
4. To incorporate best practices into a road map for the development of a successful solution in the US and to avoid the pitfalls that have had negative impact in other countries; and
5. To understand the funding, architecture and delivery systems of solutions in other countries, including network models and central versus local data repositories, and then determine their US applicability.

While many geographies are of interest, this edition is focused on the geographies where participating members live and work, or locations where members previously worked on
Collectively, the membership has expert knowledge of the design, implementation, maintenance and support of EHR systems in numerous countries around the globe. They represent various stakeholder groups from government as well as the public and private sectors, including healthcare payers and clinical caregivers. Wherever possible, findings in each country were validated by third parties.

In order to identify the commonalities, best practices and barriers within and between countries, the GETF examined each of the following topics.

National EHR Program

National IT/ICT Status & Strategy

This section describes existing IT/Information and Communications Technology (ICT) status and strategy for the future implementation of a national EHR system. It addresses the extent to which primary care providers (PCPs) have access to and utilize patient information systems (IS), the availability of broadband and high-speed Internet services to assist those systems, the current deployment of IT across all healthcare provider communities, the current connectivity between healthcare providers and payers (national and private), and what standards have been implemented to promote the exchange of data.

National/Regional EHR Approach

This section describes how the country approached acceptance, adoption, deployment, operation and support of a national EHR and health information exchange (HIE) system. We have explored a variety of architectural models for the delivery of EMR/EHR and data warehouse solutions in healthcare business around the world. The following diagrams and descriptions provide a categorization of those models:

#1 Fully Federated
- Patient data resides with source facility
- Data remains in the source systems
- EHR is a process which pulls patient data from carer systems
  - Real time: Google or Napster models
  - Batch extracts
  - DWHS not clear

#2 Federated
- Patient data resides with source facility
- Patient data consolidated in facility CDR
- EHR is a process which pulls from local CDRs for updates to central CDR as needed (e.g., dbMotion)
- DWHS works off CDR

#3 Service Oriented
- Patient data sent to EHR by message at end of care event
- Local systems message enabled
- EHR is a process which manages flow of messages
- CDR holds care events within patient ‘record’

#4 Integrated EPR
- Single integrated hospital system
- Embedded EHR capabilities

Capgemini

This section describes the information and messaging models (clinical and transport), service-oriented architecture (SOA), and user authentication and access controls employed by a country. It attempts to identify the ownership of patient records and whether or not a country allows for PHR to be accessed by patients.

**EHR Governance**

**Legal/Regulatory**
This section describes the legal and/or regulatory mechanisms that either enable or hinder the implementation and deployment of EHRs and HIE. Patient privacy, security and other issues such as kick backs and self-interest referrals are also addressed.

**Healthcare Policy**
This section describes the policies and procedures in place to enable or hinder the implementation and deployment of an EHR and HIE. This includes governance of data quality; data usage; storage; messaging standards; provider/payer participation; patient participation; participation by non-traditional health organizations (e.g., clinics in retail stores, retail shops); implications for IT/ICT industry; use of offshore resources/services; and other aspects related to technology usage.

**Technology**
The architecture of the EHR system is addressed in reference to patient demographics; provider demographics and identification; health record services; interoperability/ontology services; messaging/integration services; security services; presentation/portal services; patient/clinician alert services; secondary use/reporting services; and population surveillance services. This section also explores health community application services such as booking, referrals, assessments, orders/results, e-prescribing and patient transfers. Patient/individual services such as PHR and telemonitoring are discussed along with integration to other non-health communities such as social services, education and prisons. Finally, any integration beyond country borders is referenced.

**Adoption**

This section attempts to describe the progress made in the adoption of EHR, PHR and HIE services among secondary/tertiary providers; PCPs; diagnostic facilities such as labs and radiology; other care providers such as long-term care, home care, ambulance and retail store-based clinics; patients/individuals; public health services; and others. Where systems are mature, examples of success and how adoption was enabled are presented.

**Outcomes**

Where known, all metrics regarding the EHR/PHR/HIE implementation are described. If full implementation has not been completed, then the components of the EHR system that have been implemented are reported.

**Benefits**
Where it can be reported, the total time to implementation is described along with any financial ROI; qualified benefits such as healthcare quality, data quality and preventive health; and quantified benefits including immunizations, medical errors, utilization and length of stay.

**Implementation Experiences**

Insight is provided to the implementation programs that are either complete or ongoing including the pitfalls encountered, best practices uncovered and project/program management.

**Next Steps**

This section describes the next steps to be taken within the EHR/PHR/HIE program.
EUROPE

ENGLAND

Overview of Country Healthcare System

Britain’s National Health Service (NHS) was established after the Second World War amid a broad public and political consensus that healthcare should be made available to all. A new system of healthcare, based on social insurance, was thus introduced and the previously split private and public hospital structure was nationalized into a unified NHS. The basic principles of this government-funded system remain in place today, while some charging of related services such as dentistry and prescriptions does occur. Today, the private healthcare market occupies only five percent of the total healthcare business, although the target is to raise this to 15 percent over the next five years.

The NHS supports a population in England of approximately 51 million, with approximately seven million of those residing in London. The empowered authorities that deliver healthcare into the primary care sector are known as Primary Care Trusts (PCT). They play a central role in the local community and regulate general practitioners (GPs), pharmacists, dentists and midwives. Every citizen is expected to have the best possible access to these primary care services.

Secondary care services are provided by a broad range of providers, focusing on the delivery of acute care. The care is regulated by NHS England Trusts and includes a full range of inpatient, emergency and outpatient hospital services.

Over the last three years, England has been moving further towards a payer/provider split – with PCTs divesting themselves of their care provider functions and focusing on purchasing care, acting effectively as a nationalized health insurer for their local population. The process of planning, paying and performance managing the delivery of care is called “commissioning” in England, with the new PCTs acting as commissioners. Commissioning is being implemented with the aim of allowing market forces to improve care provision, create an incentive for preventative care at the payer end and to enable greater patient choice.

Management and integration of this system are provided through Strategic Health Authorities (SHA) whose role is to ensure that these new market forces do not lead to perverse incentives or to the destabilization of the local health economy. Jointly with PCTs, they are also responsible for partnerships with other local providers such as the local authorities and councils that provide social care. In 2004, the NHS England controlled approximately 145,000 acute beds.1

Statistics

Within the following section, figures contained in brackets [ ] represent figures from the 2008 HIMSS report to act as a comparator to the latest reported figure. Where no figure in brackets is provided, the figure remains the same as 2008.

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NHS England Funding

- NHS England net expenditure has increased from £34.66 billion in 1997-1998 to £90.70 billion in 2007-2008. Expenditures for 2010 are forecast to be £110 billion.
- The money spent in England by the Department of Health on health services per person has risen from £1170.30 in 2003-2004 to a planned £1,624.30 in 2007-2008.
- In 2006-2007, the NHS England ended the financial year with a net surplus of £515 million. The NHS England reported a surplus of £1.8 billion for following financial year, after a gross deficit for the second quarter of the year of £201 million.
- While official figures have still to be released for 2008 – 2009, the NHS in England is again expecting a large (though smaller) budget surplus due to cost-cutting and efficiency activities across the organization.
- Of the extra NHS England funding in 2005-2006, 52 percent was spent on higher pay costs; 17 percent on extra drug costs; 7 percent on capital costs; and 13 percent on more activity and improvements.
- Further analysis from the King's Fund – a charitable organization – for 2006-2007 has estimated that 40 percent of the additional funding was used for pay and 32 percent was consumed by higher prices and costs associated with National Institute for Health and Clinical Excellence (NICE) recommendations, clinical negligence and capital costs.

NHS England Organizations

In the NHS England, there are:

- 172 [171] Acute Trusts (including 82 [65] Foundation Trusts)
- 152 Primary Care Trusts
- 74 Mental Health Trusts (including 32 [18] Foundation Trusts and 16 PCTs providing MH services)
- 12 Ambulance Trusts (including 1 PCT)
- 10 Strategic Health Authorities
- 10 [11] Care Trusts (including 2 [1] PCT and 3 MH Trusts) - Care Trusts work in both health and social services and are established when the NHS England agrees to work in partnership with local authorities to provide services
- 10,500 GPs practices in the UK

NHS England Staff

- The number of doctors employed by the NHS England has increased by an annual average of 3.9 percent since 1997.
- There were almost 40,000 more doctors employed in the NHS England in 2006 as compared to 1996.
- There were 82,500 more NHS England nurses in 2006 as compared to ten years earlier.
• 3,950 more practice nurses were employed by GPs in 2006 than in 2001.
• 84 percent of NHS England staff is directly involved in patient care.
• Since 2000, the number of frontline staff within the NHS England has risen by 20 percent. This rise includes a 29 percent increase in doctors; a 19 percent rise in the number of nurses; and 10 percent more ambulance staff.
• Medical school intake rose from 3,749 in 1999-2000 to 6,326 in 2004-2005, representing a rise of 69 percent.
• Between 1999-2000 and 2005-2006, the number of NHS England commissions of pre-registration nurses training increased by 31 percent.

National EHR Program

National IT/ICT Status and Strategy

There is a wide range of maturity in the implementation of IT/CT across different organizations throughout England, most of them governmental. While ICT is used in every organization, the ways that it is used vary from minimal to highly capable and innovative.

Across organizational boundaries, the level of integration of clinical IS ranges from near-zero to well-developed IT support for extensive collaboration. The latter, however, is still in its early stages of development and is rarely sustained beyond specific projects and initiatives.

Some national IT initiatives such as digital imaging (PACS) are nationally deployed, but not fully integrated; others (e.g., national and regional care record management) are still in the very early stages of adoption and are not yet embedded in routine practice.

In the primary care sector, provider/payer integration is well established and it is increasing in importance in other areas as well. Indeed, integration will continue to be critical as the role of private institutions in the delivery of care and in supporting functions appears set to grow.²

Through a combination of incentives and regulation, many elements of strategy and policy are set on a UK-wide basis in order to raise general standards of IT implementation and information governance. Other elements are set by the Home Countries themselves (i.e., England, Scotland, Wales and Northern Ireland).

In England, the availability of broadband and high-speed Internet services to healthcare practitioners is managed as a single national private network (“N3”). The availability of high-speed networking is a key enabler in the active exchange of healthcare information. Standardization as a policy remains a key tenet to underpin the program, but it is also a causal factor in explaining the slower than expected rate of benefits realization. There is an increasing realization that interoperability is not just a technical consideration, but vital in coordinating clinical and IT implementation.

As NHS England continues with the NPfIT, a number of IT systems and services will be further deployed. The services are being implemented with the use of external suppliers in four categories of programs: National Infrastructure Service Providers (NISP), National Application Service Providers (NASP), Local Service Providers (LSPs) and GP Systems of Choice (GPSoC). In addition, a new framework contract called the Additional Supply Capability and Capacity (ASCC) was let in January 2008 to provide an alternative procurement route for the NHS. The most notable contract let under that agreement to date was a portal called “NHS Choices” in late 2008.

The NISPs are delivering NHSmail and N3, the latter to provide improved connectivity across the NHS by replacing the existing network infrastructure. This effort will provide IT infrastructure and broadband connections to link IT systems reliably.

The NASP services cover a broad range of business applications (e.g., e-prescribing) and infrastructure services (e.g., directory services).

- The EHR initiative is called the NHS Care Records Service (NHS CRS). It is a secure service that electronically links patient information from NHS care settings across England (e.g., GPs, hospitals, clinics) so authorized NHS staff and patients have the information they need to make care decisions.³

- Patients will eventually be able to access a summary of their own health and care information on their SCR via a patient portal service known as Healthspace.⁴

- The Choose and Book Service has been deployed as an electronic referral service intended to offer patients greater choices of hospitals/clinics and more convenience in scheduling their first outpatient appointment.⁵

- Another service that has been contracted for implementation is the Electronic Prescription Service (EPS) that will allow a patient’s prescription to be sent electronically from their GP to the pharmacy that will make prescribing and dispensing safer and more convenient.⁶

- One of the more successful endeavors has been the PACS that enables sharing of digital x-rays and scans.⁷

Underpinning these business applications is the backbone infrastructure known as ‘Spine’ and its associated services. These provide messaging, security and information governance controls, demographic, reporting and other enterprise level capabilities for

LSPs have been responsible for the implementation of new application services within the local care settings. These applications include new solutions such as GP systems, new hospital systems and a new diagnostic application. These applications must conform to NHS NPfIT interoperability standards and the LSPs are accountable for the implementation as well as integration to the services provided by the NISPs and NASPs, most importantly the NHS CRS.

The GPSoC program was introduced to provide a greater level of choice to the primary care sector in selecting the products to run within a practice and funded as part of the NPfIT. Increasing the degree of local choice in their systems provider has generally been received as a positive step. There are currently approximately 6,000\(^8\) GP practices using products supplied under the GPSoC contract.

Early 2008 saw the award of the Additional Services and Consultancy Framework (ASCC) contracts. It provides a sourcing capability for a very broad range of service categories from a host of pre-awarded suppliers. In principle, it allowed the work currently undertaken within the programs above to be also sourced through the ASCC route.

**National/Regional EHR Approach**

A single NHS England procurement covered the provision of national infrastructure (the Spine) to support interoperability, together with a number of national applications and services. The Spine is a national, central database where summary patient records are stored. It comprises a central health record repository, access control, messaging hub and a portal for clinical users. The summary clinical record aspect of this central provision is one of the last aspects to be implemented. When fully implemented, local systems will automatically upload a defined profile of important information to the summary patient record on the Spine, after an initial upload. The earliest systems to upload records are GP (primary care) systems in regions selected as implementation pilots. One negative aspect of this implementation is that it is taking longer than expected to reach consensus on the scope and usage of the central clinical record between the commissioning authority and suppliers as well as between adopting organizations and clinicians.

Stakeholders (including the UK Government) are finding that their optimistic visions in the beginning of the program have been tempered by the realities of trying to implement a very large and complex system engineering and deployment project in a relatively short period of time. Despite the problems, however, some elements of the deployment have already achieved success, including implementing critical prerequisite facilities for managing patient identity and demographic information; controlling access to identified patient information; and then integrating them with a national electronic prescription system and other administrative services.

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The SCR – a healthcare repository used by the EHR systems to deposit and retrieve patient information – is being implemented in phases to support different user groups and go-live clinical usage planned to increase gradually from 2007 forward. This central summary EHR has a service architecture implemented using messaging specifications based on HL7v3. Developed by the NHS England agency Connecting for Health, this specification, called the “Messaging Implementation Manual,” is published directly to the contracted supplier community of the NPfIT and HL7 membership.

Business-level and technical protocols for the central summary record have been developed alongside clinical content models and corresponding message wire formats for a wide range of clinical communications relevant to primary and secondary healthcare. The most advanced of these implementation processes is the “GP Summary,” an extract from the patient’s primary care record. At the time of writing, these GP Summary records are in the early adopter pilot stage of go-live clinical usage.

Currently, England’s national EHR most closely resembles category #4 as shown on the chart above—the “Integrated Electronic Patient Record (EPR)”–a single integrated system. The NHS CRS stores and maintains ownership of a summary record. The usefulness of that record is directly tied to the maturity and utility of the local health IT infrastructure that has been developed at care provider locations (e.g., hospitals, GPs, mental health, ambulance, prisons) as they must be able to provide the data. To bridge the gap between the NHS CRS and local clinical systems, regional EHRs are beginning to develop.

In England, two-factor user authentication is used along with smartcards that are issued to all users. While there has been some concern about ease of use, there is general acceptance of the process. Access to patient data is handled by a combination of simple role-based access and the concept of a “legitimate relationship” between a patient and the clinicians or workgroups (e.g., ward staff or multi-disciplinary team members) involved in their care. Patients’ may access their own health record summaries through the Healthspace portal, not unlike some of the proposals submitted in the US for the development of provider-led PHRs.
EHR Governance

Legal/Regulatory

The principal regulatory authority over EHR in England is the Department of Health (DoH). Authority is then delegated through various regulatory mechanisms, some that are managed through agencies of the NHS Connecting for Health such as the Care Record Development Board\(^9\) and the Information Governance Board.

Kick backs and self-interest referrals do not appear to be an issue in the UK because such opportunities are limited in a largely public-funded system. Abuse, when it occurs, is dealt with through disciplinary procedures for employed staff and the disciplinary powers of the professional licensing bodies.

Privacy and security are governed by DoH regulation and policy and European data protection legislation. Fear of liability has not been a factor in inhibiting the use and sharing of electronic records. The use of secondary data for aggregated reporting is governed by a separate regulatory framework and resides in a separate sub-system on the Spine.

Protecting Privacy

Considerable numbers of policies in the NHS England and DoH govern how providers, health insurers, public health authorities and researchers participate in HIEs. Additional protocols about sharing electronic information are specified as needed, especially when it comes to using existing data in new and/or innovative ways. Policy in the UK is published as “The Care Record Guarantee: Our Guarantee for NHS Care Records in England” ([http://www.connectingforhealth.nhs.uk/crdb/docs/crs_guarantee.pdf](http://www.connectingforhealth.nhs.uk/crdb/docs/crs_guarantee.pdf)). This is in addition to the national Data Protection legislation.

The rights of patients whose information is stored in EHRs are governed by NHS England policy and data protection legislation. There continues to be lively public debate over patient privacy: can an individual prevent the government from keeping his or her data in the centralized EHR database? Liability for providers who are using EHR has not surfaced as an issue. In all cases, general professional standards still apply. Each physician is obligated to perform under a commercial contract with the NHS England as a “National Service Provider.” The major obligation of the NHS England is to act as the prime contractor of the consortium providing the Spine, infrastructure and associated services of the EHR system. Under the general NHS England contract with physicians, there are numerous additional contracts. Some are regionally based and some provide special services that cover different aspects of the National Programme.

The major controls that govern access to the medical record encompass restricting access to only where a “legitimate relationship” exists between the patient and a clinician, as well as the ability to “seal” elements of the record from general view. This is in conjunction with role (activity)-based access and the use of the smart card and passphrase.

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**EHR Financing**

Funding of the EHR is provided by the DoH. This is allocated to the legal organizations created by the NHS in the form of the SHA and Care Trusts. Funding covers the entire deployment with the exception of local implementation costs (staff time). As an agency of the DoH, NHS CFH is funded by directly by the department.

Suppliers are paid based on delivery and acceptance of clinical systems by the clinical user community. Control of this rests with the Local Ownership programmes, where the trusts and SHAs agree sign-off. This model has been a cause of pain for the supplier communities, where longstanding disagreements arise over the deployed system mean suppliers simply don’t get paid. Intended to foster a collaborative, “can do” attitude in the suppliers, it has had the opposite effect in many cases.

The second report from the National Audit Office,\(^\text{10}\) published in 2008 and recording progress of the programme since 2006, concluded that despite rumor and conjecture to the contrary, financial control within the programme remained strong and the overall objectives were still achievable.

> The estimated total cost of the Programme is broadly unchanged. The cost increases that have occurred are mainly due to the purchase of increased functionality. It remains difficult to produce a reliable estimate of local costs. Expenditure to date has been less than was profiled.

The forecast budget increased from an estimated £12.3 billion to £12.7 billion, though the rate of expenditure was lower than estimated – primarily due to the slower than anticipated rate of delivery.

**Technology**

The Spine provides the central SCR that contains only a small percentage of the information held in primary and secondary care systems. These systems in turn hold what is referred to as the Detailed Care Record. While not in itself an EHR system, it is commonly referred to as England’s EHR. The role of regional repositories has yet to emerge, though they are beginning to be scoped and implemented on a large scale and are appearing as a procurement model in reaction to the lapse in the SPfIT (Southern cluster).

The information model of the SCR is a fully conformant NHS England specialization of HL7v3 Clinical Document Architecture (CDA), except for the GP Summary that is based on the HL7v3 Clinical Statement Pattern. All Spine messaging is HL7v3 based, though the timing of its development means that it does not all align exactly with normative versions from HL7.org.

Following substantive completion of these HL7v3-based messaging specifications in 2008, a new cycle of EHR design work has been initiated called the “Logical Record...

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Architecture.” This is taking the experience gained with the HL7v3-based Spine messaging, together with the results of research projects on alignment between HL7v3 and European standards (in particular EN 13606) and building a design basis for future sharing of electronic records. Alongside this generic work, early examples of specific shared record designs are being developed (e.g., for maternity).

In England, EHR user authentication uses the Sun Identity Server along with smart cards for single sign on and Security Assertion Markup Language (SAML) for exchange of user credentials. Patient and provider identity verifications as well as access to the Care Record Repository are deployed as services. At the present time, record update only occurs when the entire clinical documentation or GP Summaries are replaced in total, although a full archive and audit record is kept of all transactions.

Services along the NHS EHR Spine are provided through a single virtual endpoint and are supported by a message handling service that employs ebXML dependability patterns and Web services within a service-oriented system architecture. All clinical data on the Spine uses SNOMED CT coding modified proactively by the NHS England as it introduces new codes and subsets to enable health coverage.

National integration with non-health communities such as Social Care is still in its infancy. Pilot programs commenced in 2009 with a small number of trusts and technology partners. These are natural successors to pilots in broader scope multi-agency information sharing that have already been underway for a number of years, some that are now beginning to bear fruit in terms of sustainable, legislation-backed interoperation.

Adoption

The adoption status of the National SCR has been described above. While moving forward at a steady pace, regional and local organizations vary in their IT maturity and adoption of EHR/EMR systems. Primary care has been, and continues to be, a leader in the adoption of EHR as the result of many years of policy requirements and financial incentives from the NHS England (as the single payer source in the UK) and GP practices (as independent businesses). Successful adoption has also been attributed to leadership by highly committed physician champions and carefully targeted communication, regulation, assistance and incentives on the part of the NHS.

Outcomes

The core EHR element of the NPfIT (the SCR in the Personal Spine Information Service (PSIS) system) is the aspect that is proving the most complex to deliver. For it to be of benefit to clinicians in their day-to-day activities, there has to be a sufficient critical mass of data available. To make this data available, compliant systems need to be deployed. To upload the data, GPs have to seek permission from their patients. The rate of deployment has restricted the effectiveness of the SCR; until the critical mass is reached, it will offer little benefit. According to the PAC report, this remains at least four years away on current projections.

Reported metrics on the implementation of the programme are relatively limited. They primarily concern deployment statistics and, in most cases, do not directly link to a measured benefit.
Current reported statistics from NHS *Connecting for Health*\(^{11}\) include:

**Choose and Book**

- More than 14 million (14,055,358) bookings have been made to date.
- Choose and Book is being used for around 50 percent of NHS referral activity from GP surgery to first outpatient appointment.
- Over 90 percent of all GP practices have used Choose and Book to refer their patients to hospital in the last week.

**E-Prescription Service**

- Over 175 million (175,895,718) prescription messages have now been transmitted electronically.
- 7,958 GP practices have had technical upgrades to the new system; 6,441 of these practices are actively operating the Electronic Prescription Service (EPS).
- 9,523 pharmacy systems have had technical upgrades to the new system and 8,393 are actively operating EPS.
- EPS is being used for over 24 percent of daily prescription messages.

**National Network for the NHS (N3)**

- Approximately 1.2 million NHS employees now have access to the new broadband network, N3.
- N3 can save the NHS an estimated £900m over seven years, relative to previous NHSnet contracts.
- By the end of April 2008, there were over 32,000 connections to N3, including approximately 11,000 delivered through aggregators (mostly pharmacies).

**Care Records Service (National EHR)**

- 248,542 SCR have now been uploaded to the Spine.
- There are 576,328 Smartcard holders who are registered and approved for access to the Spine.

The current situation is that there have been several successful programs, such as Choose and Book, delivering benefits in a relatively narrowly defined area. However, the National EHR (PSIS) remains some years away, certainly in a manner as originally envisioned, providing the critical mass of data to make it regionally and nationally relevant.

**Benefits**

The NHS Spine Project began in 2003. Live use of supporting systems is currently well established and clinical records started to phase in from 2007.

Total cost and ROI are difficult to measure. While some hard figures are publicly available, the ancillary costs of implementation at non-Spine endpoints as well as the nature and extent of any savings associated with using the new infrastructure are not widely known.

Software cost is split between framework services such as the Spine Directory and Demographics Services, the Summary Care Record (SCR) and the many adaptations necessary to local systems such as EMR/EPR. There are no published costs available for software, hardware, implementation, training or attempts to establish interoperability across disparate systems. Contracts call for payment based on results and all costs are met by the NHS England, either directly (via central funding) or indirectly (via individual organization budgets). Some integration costs have been absorbed by vendors as a cost of continuing participation in the market.

The Public Accounts Committee report from HM Government in January 2009 was highly critical of the rate that benefits are being released by the programme. In particular, concerns were raised about the National EPR aspect, estimated as being four years behind schedule.

**Implementation Experiences**

There have been widely reported failures and somewhat less widely reported successes in the last year and in the overall life of the programme. With 2008 seeing the withdrawal of Fujitsu in their capacity as an LSP, only two of the original four LSP contractors remain (with Accenture having previously withdrawn). This illustrates the difficulties experienced in planning and managing a “national” health transformation programme, where a multitude of factors can each compound to create an untenable relationship for both the supplier and the NHS.

It could be argued that implementing a small set of products has proven (based on the progress to date) to be unsuccessful in England. However, this model has been successful elsewhere, though deployments have been of a smaller scale than the NPfIT. Where choice has been offered, there has generally been a greater willingness to adopt and consequently benefits have been more readily released. This can be seen through the GPSoC programme, but may also reflect the simpler transformation experience for a GP practice and primary care as a whole as compared to a secondary care setting and the variety of specialty systems within it.

The “end-to-end” elements also remain elusive. Much of the work currently being done is still on laying the foundations, rather than building the first or subsequent stories.

It is also clear that the technology may not meet the expectations of its users. In some areas, a particular product may be widely accepted, but the same product may be seen as deficient in another. This has been particularly evidenced by the deployment experiences with some of the secondary care PAS and clinical applications. Local autonomy in terms of ways of working and protocols do not sit well with nationally prescribed applications, however configurable they may be. The effort involved in transforming a setting should not be underestimated. The organizational, staff and working level changes introduced or supported by the technology need to be broadly and actively communicated to the users.
of the new systems. Their engagement, and more importantly, ownership of the success is a critical factor.

Some of the controls to manage information governance have proved particularly difficult for suppliers to meet. These may represent a fundamental re-working of the internal operation of a supplier system. While no-one would argue the need to protect patient data, the range of controls specified are argued as being overly complex and too granular.

The programme set out to transform healthcare in England in some very aggressive timescales. It isn’t surprising that it has faced difficulties and criticism along its journey to date.

Next Steps

The NPfIT has been a long time coming. It has achieved some notable successes, and despite popular reporting, spending appears to be controlled. The biggest challenge in the deployment of the UK EPR remains the rate of implementation. This has arisen through a variety of factors – reductions in supplier capacity to deliver due to increased workload, product development cycles, deployment and clinical sign-off taking longer than expected. The loss of Fujitsu from the Southern cluster has temporarily frozen deployment in that area, effectively placing on hold the programme; while this is untenable for many trusts, the rate of deployment elsewhere (particularly for core PAS applications) is little better. Addressing the rate of deployment will be the number one priority for the programme in the current year.

For the National EPR (PSIS) to be of value, there needs to be a critical mass of records uploaded. For that to happen, there needs to be sufficient products deployed capable of uploading the data. And for that to happen, there needs to be a step change in the implementation cycle. This dependency chain retains a stranglehold on the EPR, and alternatives and possible accelerators will be examined.

Once the foundations are in place, there will be greater emphasis in joining up care both regionally and nationally. This is already underway in some areas such as PACS, health and social care integration, but again it is on a long curve for deployment and implementation. Messaging and systems will be targeted to offer increasing support for multi-disciplinary team working and the integration of the health and social care communities. Patient-centric care needs patient-centric systems, and these – whether internally or externally integrated – will be the next big step forward, providing whole lifecycle and pathway views rather than encounter and setting-based snapshots.

New policies and strategies continue to place additional loads on the programme and the services it provides. Both the “Next Stage Review” and the “Informatics Review” published in 2008 point to an evolving model for healthcare delivery in England. These documents place “informatics” at the core of the NHS and its activities. Accurate, timely and secured data underpins everything. This will take time to deliver and will impact on existing suppliers who already are challenged by the change requirements presented by the national programme. One way to deal with this challenge may be through a portfolio management approach that ties programmes and benefits more tightly together, allowing
the NHS to prioritise its spending and effort. The recently announced Informatics Directorate within the DoH may be responsible for this – inferred from the creation of a new business architect role.

This is likely to be a critical 12 months for the National Programme. The House of Commons Public Accounts Committee, the national Audit Office and the chief executive of the NHS have all criticized the programme in the last 12 months on the rate of delivery.

References


About the Contributors

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FRANCE

Overview of Country Healthcare System

Located in Western Europe, France has a population of 60 million people distributed over an area of 550,000 km2. The population density is slightly above 110 inhabitants per square kilometer. In 2007, 78 percent of the population lived in the cities with 12 million people in metropolitan Paris alone. Three other cities had populations with more than one million inhabitants, while 40 cities in 2007 were over the 100,000 person mark.

In 2007, the French GDP was US $2.3 billion (€1.8 billion). Healthcare expenses represented 11 percent of the GDP, equivalent to €3300 per person per annum.

Eighty percent of healthcare expenses come from the public sector, financed by employer and employee taxes on salaries. More than 99 percent of the population is covered by health insurance, regardless of income.

Primary care through GPs is essentially private and reimbursed on a fixed price basis by national insurance, Caisse Nationale d’Assurance Maladie (CNAM), plus private insurance when applicable. Private insurance allows beneficiaries to be better reimbursed than the CNAM floor price, but does not change the direct access rights to healthcare providers. Changing the reimbursement rate, however, can indirectly affect access.

Most ambulatory acute care, professional services, drugs and treatments are not fully reimbursed with the exception of inpatient episodes or chronic disease. Otherwise, ambulatory reimbursement varies from 35 to 70 percent, with a 50 percent discount penalty if not referred by a GP.

The French hospital system is comprised of 2,700 public and semi public hospitals and 1400 private ones, representing 450,000 beds and treating 13 million inpatient episodes in 2008.

The number of beds has regularly decreased for 20 years, due to reduction in length of stay (LOS) for most conditions, with many inpatient treatments replaced by daycare.

There are 800,000 healthcare professionals, of whom 215,000 are physicians and 480,000 nurses. By 2025, the number of MDs is expected to decrease to 186,000.

National EHR Program

National IT/ICT Status & Strategy

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In recent years, healthcare information technology (HIT) has become more popular, with 70 percent of GPs and 90 percent of hospitals reportedly having installed computer systems. However, only 30 percent of hospitals report using HIT to record patient medical information while others indicate using HIT only for administration purposes, including payment by results.

Paperless smart card technology is being used for reimbursement through National Insurance in 90 percent of cases – all patients are issued smart cards but some providers have not implemented them yet. When a smart card is used, the patient is responsible only for a co-payment, the National Insurance reimbursing the provider the remainder directly. Otherwise, the patient is responsible for the entire fee and may not be reimbursed until a month later -- a clear incentive to use the smart card. Smart cards are also used in pharmacies for direct payment to the pharmacist under the National Insurance. Such direct payment through the smart card system serves as a strong incentive for smart card adoption and use. Since 2007, French law makes smart cards the mandatory access control for electronic medical information.

CNAM has developed and maintains a national database of total reimbursement history by patient.

France has outlined four challenges that are expected to be addressed with expansion of its HIT capabilities:

1. **Patient Engagement:** As in most other places in the industrialized world, French patients are demanding a larger role in decisions affecting his/her own health. Information to the patient is believed to be a key element in such engagement, as well as directing patients for a more capable role in prevention and simple routine care.

2. **Broader Clinical Communications:** Users of the National Shared Patient Record system (NSPR, or in French, Dossier Medical Personnel/Partagé, or DMP) have advocated that HIT begin providing clear directives during treatment episodes such as clinical reminders, care alerts and process requirements such as notification that a second opinion evaluation is indicated.

3. **Promote Provider Collaboration:** When patients have several providers, HIT will ensure that relevant information is shared and communication between them is facilitated to achieve optimal continuity and quality-of-care.

4. **Improve Healthcare Efficiency:** When properly deployed, the HIT system should improve the monitoring and analysis of healthcare services and result in the maximization of the resources involved in healthcare production. Beginning in 2009, a specific governmental agency, the ANAP, will begin monitoring hospital performance alongside another recently created national agency, the ASIP, responsible for information exchange within national HIT systems.

As mentioned previously, only 70 percent of GPs currently use HIT systems to store and access medical information in their offices. Some healthcare networks are being developed to support record sharing between hospitals and private GPs, primarily within France's 22 regional authorities. Information exchange between healthcare providers and
payers is more widely developed; however, the information transmitted is typically limited to coding utilized for reimbursement purposes, rather than the actual medical information.

International data standards are used throughout, including CDA (for pharmaceutical files), HPRIM, HL7, LOINC and DICOM 3.

The initial purpose of the French national project, NSPR, was to provide citizens with access to personal computerized medical records as required by law as of August 13, 2004. However, this objective proved to be too limited and was broadened to providing all healthcare stakeholders with needed information and services. The newly created agency, ASIP, with over 140 employees, is dedicated to that task. ASIP also carries the responsibility for establishing national standards for interoperability of healthcare systems and security of healthcare data.

**National/Regional EHR Approach**

A few principles are helpful for understanding how France intends to develop a national EHR:

- No double data entry (i.e., there will be connectivity between local systems and the national repository – NSPR/DMP)
- Permanent availability of information (meaning that dynamic healthcare transaction data is constantly pushed from local systems to the national repository, where it can be safely stored).

While ASIP does not want to interfere with local systems, and in some cases, local authorities may decide to limit the information pushed to the national repository (NR) to reduce duplication, ASIP will promulgate a national coordination framework for mandatory minimum information exchange.

This implies a national discussion among the regulators, users and vendors of healthcare systems and data to develop appropriate standards and expectations.

In the following schematic diagram, France’s HIT system has elements corresponding to both category #2 – Federated (patient data residing locally) and category #3 – Service Oriented (local data being pushed to a centrally maintained EHR).
NOTE: EHR is a service not just a data repository i.e. does processing; further details provided in the next slides.

EHR Governance

Legal/Regulatory

Patient privacy is a serious issue. The law gives the national agency, ASIP, the duty and responsibility for patient data protection. This is considered a state responsibility, not a local or regional one.

Providers allowed to access patient data must be authorized by the patient. Record access is monitored and must eventually be justified by the user. While not all patient information is be pushed to the DMP, specified minimum information is legally required. It is expected that as additional added-value services are delivered as part of patient care, that stakeholders will be willing to add them to the DMP HIT system.

Healthcare Policy

France is at a very early stage of development in terms of national HIT. A dedicated identification number (INS) has been created to access health records. It is requested by law that the INS be used to access patient records and not any other identifier; although every French resident has had a social security number for decades, it was found to be inadequate in terms of providing insufficient anonymity for health information purposes.

A special agency, Commission Nationale Informatique et Liberté, (CNIL), delivers policy advice on whether or not personal information can be created, stored or used by public agencies. The CNIL refused to allow the social security number to be used and requested that a new healthcare identifier be created. An ID card is mandatory in France; patient demographic reports can use either this national ID or passport number.
Every person has the right to opt out of the DMP project. Consequently, each patient is required to authorize what information he or she is willing to feed into the national system. Patient information signed by a treating physician cannot be changed, although it can be fully withdrawn. In addition, the patient has the opportunity to add his/her own additional information.

Healthcare providers and healthcare organizations are responsible for data quality. Services limited to sharing clinical reports or lab results have begun in some regions, but the national policy is now to create a national framework of fully interoperable information systems.

**EHR Financing**

CNAM, through the ASIP, funds the national infrastructure, the patient portal and the implementation of a national healthcare ID. Change management is a shared effort between ASIP and providers. Software has been developed by vendor enterprises.

**Technology**

The architecture of the national system relies on Integrating the Healthcare Enterprise (IHE) principles, including a central repository and feeder repertories. Information is pushed from local organizations to the DMP and can be duplicated (i.e., kept in the local system and sent to DMP). The process of feeding the DMP is realized and maintained by the industrials as long as their software is compatible with the French DMP. This interoperability module will be plugged onto existing software.

The patient identification process utilizes a national ID number with access via a smart card system. Healthcare providers are also identified by a smart card in their private surgeries and it is expected that hospitals will be using smart cards within the next three years.

In hospitals so far, HCPs are identified by the Hospital Information System (HIS) and the information sent to the DMP is electronically signed by the hospital.

**Adoption**

Adoption in France remains a major challenge with classic obstacles still being experienced, such as lack of interoperability, incomplete standardization, insufficient training and inadequate provider support.

As cited by the French Ministry of Health,\(^{15}\) the lessons gained from implementation difficulties include:

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\(^{15}\) US Euro Conference; October 20, 2008; Paris.
• Need of a highly pragmatic approach that starts with the clinical documents in use rather than fully structured data;
• Need collaborative involvement of all stakeholders (patients, providers, vendors and government agencies) from beginning of project; should be organized by ASIP and meet under its auspices; and
• Need framework for national EHR early in the implementation process.

It should be recognized that all the stakeholders do not have equivalent goals – patients want high-quality care with rapid access, more convenience and fewer administrative hassles; providers want information to be useful, automatically provided and made available in a manner that supports the existing workflow; vendors are seeking a stable market that can be developed for profitable operations; and governmental agencies are concerned with the overall performance, cost and quality of the healthcare services received by all residents.

The HIT project has promoted the value that successful adoption will be facilitated if these goals remain explicitly visible throughout the implementation process.

**Outcomes**

Usage is the key indicator; we will monitor how many patient files were created in the DMP and how many times were they accessed (by month, by year, by episode of care). On top of that, a program for the qualitative evaluation of rendered healthcare services will be developed and put in place.

**Benefits**

We believe that a benefit analysis for HIT that depends on the calculation of a traditional ROI is not only difficult, but also subject to too many inaccuracies to be worthwhile.

The benefits to public health that we envisage are more qualitative and include the following:

• Improved patient engagement;
• More consistent, timely and reliable services (e.g., immunizations; medication refills; and periodic diagnostic procedures such as mammograms, PAP tests, prostrate exams);
• Improved continuity-of-care; and
• More effective use of health resources.

**Implementation Experiences**
Almost 20 pilot projects were started to test feasibility and some of them will be continued and even extended, after being made compatible with the national framework. For example, a project dealing with pharmaceutical dispensing is in use by more than one million patients, without significant complaints or opt outs. This pharmacy service and database is being extended nationally so that each pharmacist will be able to see all drugs that the patient was delivered and be alerted in case of possible adverse interactions.

Next Steps

ASIP and ANAP (the agency responsible for the performance of hospitals) have just being put in place. Next steps in the project will be:

1. ASIP will produce the interoperability and security standards that must be observed by all shared medical information systems.
2. All software system vendors will be contacted regarding compliance with standards for inputing and retrieving data from the NR.
3. Hospitals will be brought online to start feeding the NR and be used in regional pilots.
4. Multiple local and regional change management teams will be set up to help HCPs (private as well as hospital staff) make the best use of the NR and suggest improvements.

References


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GERMANY

Overview of Country Healthcare System

While the industrial and commercial activities in Germany are focused on cities in the west (Frankfurt, Hamburg, Cologne, Munich, Stuttgart), the average population of the eastern states is older and has higher per capita health-related cost. In regards to absolute and per capita income, cities in the southwest experience high income, high population density and low unemployment while those in the northeast have been subject to low income, sparsely populated areas and high unemployment. Interestingly, health-related costs per capita follow an inverted distribution across the country. With a population of about 80 million people overall, the statutory health insurance system in Germany covers about 70 million insured persons.

In addition to the statutory system, private insurance options range from add-on services on top of the statutory coverage to full substitutes with far better treatment (e.g., no waiting times) and medication options. The statutory health insurance plan covers primary care visits, emergency visits, prescribed medications, dental care, hospital treatment and rehabilitation care. In the recent years, a small fee (€40/year) has been introduced plus a small percentage of the medication cost has been charged as a co-payment. However, the national health insurance covers generally every kind of health-related cost. Treatment and medication for children are completely free, provided one parent is insured under the statutory scheme. This coverage costs about 15 percent of the person’s gross income and is offered through about 200 health insurers.

The statutory health insurance is highly regulated and dictates the reimbursement value of each single medical service or item as “points;” in recent years, however, that reimbursed amount per point has been reduced. Hospital bills are directly paid by the insurer, while GP treatment and medication is paid for by statutory reimbursement funds (per state) who receive a flat fee (about € 2000/p.a.) for each insured person from the respective insurance company. Since the start of 2009, a common nation health trust has been collecting the insurance payments (percentage of income) and distributes a flat payment based on a “morbidity-based risk index”- per patient to the respective insurer.

There are no substantial governmental subsidies to this system; instead all insurers, hospital associations and the 22 statutory reimbursement funds update their contracts and reimbursement terms with little government influence. Together, these entities comprise the “Selbstverwaltung” (self-administration) that is dominated on one side by the position of reimbursement funds and on the other by health insurers. Because the national overall budget for GP and medication is limited and reimbursement is relative to the overall expenditure, there are no incentives in place for GPs to reduce utilization for services, medication prescriptions or card-fraud.

Germany has more than 100,000 GPOs (General Practitioner Offices) and more than 2,000 hospitals, all that will have to face the decreasing values of reimbursement through the statutory scheme. For several years now, hospitals have been reimbursed with flat payments by diagnosis-related groups (DRGs) based on ICD-10 codes (with German-
extensions, ICD10 German). Six big private hospital groups have been built in the last few years in order to improve cost-effectiveness, but the majority of hospitals are state/city-owned and most of them have severe difficulties covering their expenditure through the current DRG reimbursement system.

Over the next few years, the major issues will be:

- The aging of the population and its related shifts in income versus the cost of healthcare;
- The “Gesundheitsreform” (Health Reform) is a rearrangement of all business terms to reflect patient responsibilities and to include a greater part of the population in the statutory scheme; and
- Nutrition-related diseases/metabolic syndromes.

National EHR Program

The overall health IT project (telematics) in Germany is known as the “electronic health card” or “elektronische Gesundheitskarte;” however, it generally refers to all applications in e-health. The card is the only thing visible to the patient; therefore, it has received the most scrutiny under public discussion. All related important health telematics applications will be more or less centralized. These applications will include insurance coverage, e-prescriptions, emergency data sets, medicine interaction cross-check and electronic referral letters.

Following an order from the German Ministry of Health (BMG), the gematik mbH - a limited liability company – was founded and is controlled by the major stakeholders in German healthcare:

- Statutory reimbursement funds
- German hospital societies
- Health insurers
- Other health associations

Since 2005, gematik has governed the national health telematics project that is designing, requesting RFPs (requests for proposals) and certifying the EHR (local: “EPA” for “electronic patient folder”) that is planned to be stored on a few central servers with records referenced by the future German health card (“eGK”).

National IT/ICT Status & Strategy

Regional and local GPO networks receive additional funding of about €500/p.a. for each patient who has agreed to have his medical history shared across the network. Hospitals may participate in such networks and receive electronic referral letters. To date, less than 20 percent of the GPOs are member in such a network.

In nearly all of Germany, broadband access between 1 to 6 MBps is available and competition among providers ensures good quality at an affordable price.

There are three test regions for the national health telematics systems, but only about 10 percent of providers have agreed to participate in such tests. Some extra contracts exist
between one health insurer in the west of Germany with Belgium and Netherlands-based insurers because they are allowed to exchange insurance/coverage data across borders. Data formats for exchange are mostly proprietary and designed by the IT provider for that network.

Gematin observes European standards and participates in the national group. Cooperation with the “eHealth ISO committee” (TC 215 Health Informatics) is going to be scaled-down from “P” (Participant) to “O” (Observer-level) because there was no support from many stakeholders in German e-Health.

National/Regional EHR Approach

The electronic patient folder (local term “EPA”) that includes information on longitudinal, person-related medical history is designed to be stored in one of a few centralized servers. The personal health card will serve to identify, authenticate and possibly authorize access to that patient’s data.

Gematin develops all specifications and test cases, operating a test lab for demonstrations. It also publishes RFPs and moderates the selection of the related offers. Because RFPs are run by region (reflecting the 16 states), there is a large market for products and services within the health telematics project. Currently, GPs fear that this project will increase costs or, even worse, increase their administrative time spent on each patient. Therefore, most are opposed to the health card endeavor. Despite public response in the media, patients are not concerned about the health card concept. “Healthy persons,” however, are worried about security breaches of their health records while “sick” patients are reluctant to get better treatment and regard the health card as support for their health.

To allow for country-to-country comparisons, the approach being followed by Gematin would fall under category #3 “Service Oriented” in the following diagram:
About ten basic transactions are implemented using signed code within the trusted card-reader. This allows interfacing GPO/HIS software to use and navigate the health telematics infrastructure. In addition to transport encryption, there will be an x.509-based end-to-end encryption between user and service-provider.

Though interoperability would require a common “domain” information model, the information models will be different for each single application and are still under development. The basic foundation is the HL7 v3 RIM (ISO 21731) with many added adaptations and extensions. Messages and interfaces within the telematics infrastructure will be generated from the respective information model. User identification, authentication and access control will be based on personalized active security cards.

Additional authorization features will be implemented on top of card-based security measures and personal PINs. Ownership of the personal health cards is shared between patients and healthcare providers. The health cards store certificates and keys for decryption, providing a signature for personalization and a unique variant for encryption. The card also stores some objects, like insurance coverage statements, emergency data sets and content or references for e-prescribing. The devices used to read the cards will also contain “personalized” information that will enable them to perform their own cryptographic identity.

**EHR Governance**

**Legal/Regulatory**

Patient privacy dominates other aspects of the EHR (EPA) in Germany. Insured persons must first give their basic consent to start their personal EPA. They then have the option to hide, or block, any single entry in the EPA, making its usefulness for medical purposes questionable. Without adequate clinical information, medical professionals sometimes refuse to assume liability and, therefore, reject the entire record and the telematics project altogether.

Concerns about potential kick backs and self-interest referrals have not yet been addressed in the design of the EPA.

**Regulatory Aspects**

Since 2005, several German healthcare laws were changed to enable cross-sector care and handling patient data in electronic form.

Security of e-health is reviewed at the federal level by the National Agency for Security in IT (BSI) and the Federal Data Protection Officer (BFD). At the state level, security is checked by security officers in each of the 16 states whose opinions often differ. For example; the State Data Security Officer in Northrine-Westphalia refuses to permit testing of access to emergency data and will allow access only in the case of a real emergency.

The national e-health project is influenced by several national agencies. Because federal electronic networks are involved, the National Agency for Networks (Bundesnetzagentur) reviews and influences the e-health-related designs of gematik. Tax involvement (part of
billing information on e-prescription) requires that the German Ministry of Finance also review and comment on the e-health project. The Ministry of Justice also reviews and comments on the electronic signature used by solutions designed by the e-health project. Although the healthcare and its infrastructure meet the definition of a medical device, the BMG does not consider the e-health project as such. Therefore, its regulation does not fall under the laws of the Medical Device Directive (EC law, similar to FDA). But, the health card and its infrastructure together clearly are a medical device according to applicable law, because they:

- Physically store and process diagnosis/treatment-related data;
- Have been launched by gematik with the promise to store/process medical data; and
- Do not have any considerable problem-resolving community other than gematik, medical professionals and patients.

Nevertheless, BMG repeatedly denied the consideration as a medical device. The government has mandated that healthcare providers collect anonymous outcomes data and send it to a national organization responsible for clinical quality improvement. This encompasses both clinical and billing data, and is based on the DRG system utilizing version 10 ICD with German extensions "ICD-10GM."

From a regulatory perspective, patients are not involved in the national project. On their behalf, six national and 16 state agencies regulate the design of the national EHR system.

**Healthcare Policy**

There are several barriers to optimizing patient benefits through the use of the e-health card:

- Physician buy-in has not been universally achieved. GPs balk at having to enter their own card and PIN number before each patient entry and they see no point in having to enter electronic information into the emergency data set or e-prescribing system.
- The German healthcare system does not reward clinicians for disease prevention, reducing costs in ambulatory procedures, using lower-cost medications or reducing e-health card fraud. Instead, clinicians benefit financially from caring for patients with acute disease, writing expensive prescriptions and engaging in complex medical procedures.
- None of the announced health IT applications support either disease prevention or “assisted ambient living.” Instead, the health card is used merely to facilitate existing administrative procedures through the use of technology.

**EHR Financing**

The payer organization in general pays for “everything” in the German health telematics: The centralized health telematics servers are financed via Selbstverwaltung that effectively uses payers’ money. The network operations are financed the same way. The personalized health card is issued directly by the payer (insurance) to the insured person. GPs receive funding via Selbstverwaltung to purchase trusted equipment for safely connecting to the telematics infrastructure. In the long run, however, the GP’s EHR usage
- driven by the efforts versus medical benefits – will very much be twisted into a “cost discussion” because GPs might be asking for reimbursement opportunities (“Abrechnungsziffer”) in order to get compensation for the time spent with feeding the patients’ EHR.

**Technology**

The basic layer consists of a standard crypto-card with security functionality that only provides access to the card’s content with valid PIN and card-to-card authentication. This personalized card stores private keys of the patient plus minimal health-related data. A trusted secure card-reader with its own cryptographic identity reads this card together with a health-professional’s personal card. Communication is done on secure SSL through VPNs to trusted data centers. Application information is sent via Simple Object Access Protocol (SOAP) on WS-* standards. On top of that there is a PKI-enabled x509-end-to-end-encryption at the application level with private keys from the patient’s card as well as from the professional’s card. The trusted hardware connector in the GPO also has a secure card with private keys in order to establish trust with the personalized moveable cards. Detailed designs for elements of the EHR (EPA) are currently under development.¹⁶

**Adoption**

Currently, there are three test regions for card rollout in the North Rhine area of Germany. Each has 10,000 patient cards being tested offline for insurance coverage checks. Neither centralized services nor security certification has been implemented as yet.

In the first years (2005-2006), gematik invited industry and academia to consult on design aspects of the healthcare telematics. Through industry associations, several consultants provided technical expertise to gematik, who needed to learn about existing healthcare IT standards. However, because the share-holders of gematik – as well as BMG’s “architecture board” – heavily influence all elements of design/implementation and are influenced by political connections, decision making is time consuming and can be changed at any point-in-time. Since mid-2006, gematik has hired more employees with technology expertise in order to increase its understanding of health software applications. This process is still going on in 2009, because additional staff is required to manage multiple ongoing test/rollout projects.

The existing health telematics infrastructure in the North Rhine area is available to all residing general practitioners and ambulatory care providers. GPOs and ambulatory centers receive funding for setting up their front-end connector – a trusted, secure hardware that authenticates patient and provider as a foundation for secure telematics applications. The payers financed the design of not only that connector but also of the backend servers. Signup is voluntary by the GPs and ambulatory centers.

**Outcomes**

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¹⁶ Different release versions can be obtained for free from [www.gematik.de](http://www.gematik.de).
Metrics of EPA usage have been proposed and will measure:

- Overall number of insured persons with at least some data included in their EHR;
- Overall number of (signed) data entries in all EHRs; and
- Average number of (signed) data entries per insured persons in respective EHR.

**Benefits**

A study by Booz-Allen-Hamilton suggests that insurance companies will benefit from cheaper administrative procedures about ten years after rollout. The main points of cost-reduction will be:

- Significant workflow improvements for payers;
- Reduction of insurance fraud; and
- Reduction of medication/prescription fraud.

Because the national budget for GP and medication is limited and reimbursement is relative procedures, card fraud or inappropriate medication. Moreover, GPs and pharmacists will incur significant costs in purchasing telematics devices and lost time due to learning security-related procedures (e.g., card/PIN handling).

**Implementation Experiences**

Major obstacles from the field tests are as follows:

- The 6-digit PIN required by the e-Card can not be reproduced in about 50 percent of the electronic encounters;
- Health telematics network and encryption/decryption performance do not match doctors’ expectations; and
- Patients frequently forget their personal e-card at home.

**Next Steps**

A national German e-health card rollout was started by the end of 2008. The first application will be the card-based insurance coverage checks (offline) followed by online insurance checks against the insurance’s data center.

In regard to e-prescription (“e-Rezept”), rollout for telematics servers and e-Card functionality for electronic prescription is will be during 2009 and 2010.

Subsequent steps will also include emergency data sets on the patient’s card. One hot candidate for political coalitions in the upcoming next German federal government announced to stop the e-Health project immediately when becoming in charge after federal elections end of 2009.

Besides political troubles, the online insurance coverage update will be provided with more servers and possibly new e-Cards in 2010. This functionality will update the e-Cards’ coverage information at each GPO contact.
References


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GREECE

Overview of Country Healthcare System

Greece is located in the South of Europe on the Balkan Peninsula, bordered by the Aegean, Ionian and Mediterranean Seas. The total surface of Greece is 132,000 km², with a coastal line of 15 km and over 3,000 islands.  

According to Eurostat, the population of Greece was 11.2 million in 2008. In 2006, life expectancy in Greece was 79.6 years and infant mortality was 3.7 deaths per 1,000 births. 

In 1983, Greece established the National Health System (NHS) under Law 1397. The goal of this legislation was to “guarantee that all citizens enjoy the benefits of a complete range of services of high quality, free at the point-of-service.” However, these goals have not been met. The NHS is centralized, offers fragmented coverage, and does not provide equal and efficient services. Public under financing has lead to unsatisfied demand, and Greek citizens fill the gap with private funding. Compared to other EU countries, Greece has one of the most “privatized” healthcare systems. Public sector spending accounts for 56.3 percent of total health expenditures while private health insurance accounts for 2.3 percent of healthcare expenditures and out of pocket payment 41.4 percent. In 2008, health spending in Greece was 9.1 percent of the GDP, higher than the 8.9 percent average of OECD countries.

Healthcare coverage is provided through the NHS, health insurance funds and private medical insurance. About 30 different insurance funds provide coverage for approximately 95 percent of the population with the three largest being the IKA, OGA, and OAEE; IKA covers the working population, OGA the agricultural workers and OAEE professionals, small businesses, and merchants. Only eight percent of the population has private medical insurance.

In 2005, there was estimated to be 3.9 hospital beds per 1000, though this number has fallen over time. Private sector accounts for almost 30 percent of hospital care. In contrast to other EU countries, Greek has a surplus of doctors with 4.9 doctors/1000 population.

19 Davaki, 2005.
20 Davaki, 2005.
23 OECD Health Data, 2008.
24 OECD Health Data, 2008.
Efforts to decentralize the NHS were taken in 2001 with the establishment of 17 Regional Health Systems (PESYs), creating a parallel structure to the ministry. PESYs manage health facilities within their regions. The 2001 reform encouraged the introduction of modern information systems as a way to support these networks.

Due to the problems with private sector funding in healthcare, Greece is revisiting the 1983 law that established the NHS and is focusing its attention to improving the quality and safety of healthcare, using IT services to realize these goals.

**National EHR Program**

**National IT/ICT Status & Strategy**

In 2002, the Hellenic Government published its IS initiative and outlined its plan to use ICT to improve the overall quality of life in Greece, including the introduction of IT systems in healthcare settings. Information systems are essential to support the decentralization of the NHS, monitor healthcare quality and develop public health programs.

In June 2006, the Ministry of Health and Social Solidarity presented the National Strategy for Quality and Safety of Healthcare Services in the Knowledge Society and the e-Health Roadmap. The objectives of this initiative were to establish a regulatory framework, create an organization to oversee the development of e-Health services, and to develop basic infrastructures, electronic services and standards.

Specifically, the ministry hoped to use a National Health Information System (NHIS) to improve the quality and safety of healthcare delivery. Projects within the NHIS include the development of patient services to improve accessibility, simplify procedures and support communication with doctors and hospitals. IASYS will manage the information of the NHIS and contain the infrastructure for the National Electronic Health Record. IASYS – a data management system – will be the receiving end for accepting and exchanging information, rules of capture, access and dissemination of information, data centers and applications. The first phase of IASYS will include 18 hospitals across the country and assess the interoperability capacity of the systems currently implemented. This will coincide with the initial work of the e-health plan including pilot program and integration at the regional level. Integration at the national level is planned for 2012.

**National/Regional EHR Approach**

Under the NHIS, the goal of the EHR program is to “allow the unimpeded flow of health information within the healthcare system in an absolutely secure manner, following the citizen in his/her interactions and contacts with the system.” The national EHR will include a subset of medical data for every citizen, available in IASYS and easily accessible from various healthcare units nationally and internationally.

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26 Doupi P. EHealth strategy and implementation activities in Greece: report in the framework of the eHealth ERA project. **STAKES;** April, 2007.
29 Doupi, 2007.
In preparation for an advanced EHR, the initial phase of the EHR program will involve the development of two regional data warehouses housing data from the hospital systems and systems of regional authorities. The budget for this phase is €53 million. Requirements of the national EHR include:

- A national ID system of citizens, healthcare professionals and providers;
- Access and security policies;
- Rights for execution of actions (e.g., referrals, prescriptions); and
- National standardization of health services, systems, information, coding and terminology.

A technical committee will manage work groups in a two-year project to create standardized services and high quality processes, clinical pathways, referrals, medical notes and content requirement for the National Health Record within IASYS.30

EHR Governance

Legal/Regulatory

Many of the current healthcare IT technologies in Greece were implemented before policies around standardization and interoperability had been established, creating funding and interoperability challenges. Until a permanent structure is in place, standardization policies will be made by the Central Health Council and the National Standardization Organization (ELOT).31

The Hellenic Data Protection Authority will make decisions around EHR security policies. This group oversees all decisions regarding individual’s rights and state of democracy in Greece. Before establishing security policies for the EHR, the data protection authority will assess the current regulatory environment. Currently, data included in IASYS requires patient consent and will be accessible only by healthcare professionals. Greek citizens struggle with trust building so a high quality security plan is essential for the successful adoption of the national EHR.32

Healthcare Policy

The EHR will first operate within Regional Health Information Networks (RHINs) to support continuity of patient care within regions, before expanding to the national level. RHINs govern Regional Health Care Authorities, independent bodies within the Greek healthcare system that manage several medical facilities. RHINs allow for communication between RHCs and the use of EHRs will support this effort.

Until a permanent structure is developed, health IT services will be temporarily supported by the “Health 2015” office of the Minister of Health and Social Solidarity. In the future, the NHIS will be guided by the National Center for Quality of Healthcare Services (EKEPYY) and the Center of Information Management and Technical Support of Healthcare Systems (KEPYSY). EKEPYY, the Healthcare Information Authority, will guide the NHIS strategy by presenting policies and strategies related to health.

information, utilization, availability and exploitation of the information, as well as publishing data about the quality of services. KEPYSY will oversee the resources to support the NHIS, including the operational planning, development and technical support framework.33

EHR Financing

Financing of e-health services in Greece is a challenge due to the lack of regulations around healthcare technology adoption. Specific policies regarding the funding process cannot be established until these standards are set. Funding for e-health programs will come from the budget of the Ministry of Health and Social Solidarity, the public investments program and private capital.

The EU-R&D (European Union Research and Development) is in large part responsible for the funding of the research and technology projects taking place right now in Greece. Other organizations conducting researching and pilot projects include the Regional Government of Crete, the Regional Information Society, the Foundation for Research and Technology (FORTH), and the Center for Medical Informatics and Health Telematics Applications.

Technology

Greece is ranked the lowest among EU countries in terms of use of new technologies and broadband services. This has delayed the use of ICT in healthcare for both the patients and providers. However, the government’s Digital Strategy 2006-2013 has expanded broadband services, increasing the use of high-speed Internet by the Greek population.34

The technical infrastructure of the NHIS will be developed by the HL7 affiliate of Greece. The group plans to run interoperability labs to support the NHIS.35

Adoption

While hospital information systems are not yet widely spread within Greece, where they have been used, patients and providers are satisfied. Hesitation around adoption relates to the general lack of IT use in Greece.

Outcomes

Benefits

Because the e-health program is currently in the pilot phase, there is limited data regarding the benefits that have been realized thus far. The ministry predicts that e-health services will improve the overall patient experience by enabling the flow of patient information throughout the healthcare system. Furthermore, they will use the NHIS to collect data regarding use of healthcare services and doctor performance to assess the NHS, thereby improving the quality health services delivered.

34 Doupi, 2007.
Implementation Experiences

HYGEIAnet is the RHIN of Crete, which introduced the integrated Electronic Health Record (iEHR). The iEHR supports continuity-of-care and provides content for e-health services. An iEHR is not the EHR itself, but instead a service that allows for access to the EHR information. The HYGEIAnet project has been a success thus far, and has lead to similar projects in other regions.36

The Twister project was an attempt to implement e-health services in remote areas using a hybrid network with wireless, satellite and terrestrial broadband segments. Twister included three primary healthcare centers, their community offices in Crete and the south Aegean, the Prehospital Emergency Coordination Cent, and the Venizelio-Pananion Hospital. One of the services deployed in this project included EHRs between PCs and their COs. The shared EHR was supported by the Primary Healthcare Center Information System (PHCCIS), a Web-based IS developed specifically for primary care. Shared EHR access in COs increased EHR adoption, rising to 45 percent in Caraks in 2007. Provider and patient surveys showed support for EHR to improve healthcare delivery.37

The e-Health Unit of Sotiria Hospital in Athens conducted a project concerned with e-health services for chronic disease patients. Patients participated in an outpatient rehabilitation program and then a home-based one. As part of this project, an EHR was created for each patient. Nurses completing home visits accessed the patient’s EHR on their laptops to support high-quality care. The overall project decreased patient hospitalization and helped to increase patients’ knowledge of their own disease.38

Next Steps

As data is collected from pilot programs, the next steps for the Greek e-Health program will be to begin implementing these services on the national level.

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THE NETHERLANDS

Overview of Country Healthcare System

The Netherlands has a population of more than 16 million people and, with 400 inhabitants per square kilometer, it is densely populated. The fertility rate in the Netherlands is 1.7 children per woman, well below the 2.2 rate required for population replacement. With a life expectancy at birth of 79 years, the Dutch population is aging and it is expected that the total workforce will be decreasing within 10 years. The Randstad (Rim City – i.e., a city at the rim of a circle with empty space in the center) is a conurbation in the Netherlands. It consists of the four largest Dutch cities (Amsterdam, Rotterdam, The Hague and Utrecht) and the surrounding areas. Its 7.5 million inhabitants represent almost half of the populations of the Netherlands and is one of the largest conurbations in Europe. When other conurbations connected to this area are also taken into consideration, it would have a population a little over 10 million, encompassing almost two-thirds of the entire Dutch population.

The Dutch healthcare market is a €55 billion industry. More than 90 percent of modern Dutch healthcare institutions (e.g., hospitals) are owned and managed on a private not-for-profit basis. The remaining 10 percent are public university hospitals and a growing number of smaller, focused commercial clinics. Primary and acute care is covered by compulsory health insurance and the insurance companies also administer the national funds for long-term care and exceptional healthcare costs. Local county councils manage the funds for non-medical support related with health conditions (e.g., cleaning, meals-on-wheels). In 2005, a new financing system for hospitals was introduced, the Diagnosis Behandeling [treatment] Combination (DBC) system. This system allows healthcare providers and payers to negotiate at the local level on volume, price and quality of healthcare services. The introduction of the DBC system marks the shift from supply to demand-based funding. The system is to be fully operational in 2010. In 2008, a similar system was introduced for mental healthcare and for the entire care chain of some chronic diseases (horizontal, cross-segmented funding for the treatment of chronic diseases). For forensic healthcare – mainly mental healthcare for people who have committed a criminal act because of their mental illness, and therefore stay in a detention center – a comparable system is under construction. Long-term care is governed through a combination of personal budgets and severity-weighted care packages, based on a formally determined indication of the required care.

In 2006, the general hospitals had a combined bed capacity of 44,784 and the academic hospitals 6,624. The number of beds per hospital varies between 138 and 1,368. In the past three years, the total bed capacity has been decreased by five percent, a number that agrees with the vision of the Ministry of Health (VWS) that the number of beds can be reduced from three for every 1,000 inhabitants to roughly two in 2015.

The gatekeeper for the Dutch healthcare system is the GP. For every 10,000 inhabitants, there are on average five GPs for a total number of 8,100.

For the Dutch government, the top three issues facing the Dutch healthcare system are:

- Cost containment;
• Patient safety and quality-of-care; and
• Human resource management (i.e., finding solutions for a decreasing workforce).

Because of the gradual transition towards a market economy, the main issue for most healthcare providers is the relationship with the insurance companies as representatives of the client/patient, and the referrers, mostly GPs, although patient choice is meant to become more important in the coming years.

National EHR Program

National IT/ICT Status & Strategy

The Netherlands is one of the most densely cabled countries in the world. Internet distribution in 2008 was at 86 percent, with 74 percent of all households having a broadband connection, ranking the country the 4th highest in Europe and 5th highest in the world. This infrastructure is a firm basis for the National ICT strategy. Main elements of this strategy are standardization of messaging (HL7 v3), identification and authentication and the gradual implementation of semantic interoperability. The Dutch government does not aim to develop a centralized electronic patient record system; instead, it will keep medical data at the several source systems where the data has been captured. At the time when it is needed, it should be possible to combine relevant medical data from several sources in a national virtual EHR.

At present, nearly all the GPs and most of the primary care entities have EHR systems. Also, all hospitals are equipped with electronic IS. A general characteristic of these systems is that they have been developed from a financial/administrative perspective and are lacking a patient or process focus.

For the development and implementation of a complete national EHR, several releases have been envisaged. The first chapter will be composed by two distinct areas: (1) the Deputizing Practitioner Record (“Waarneemdossier voor Huisartsen ” or WDH) – a professional summary from the GP in order to provide support in the out-of-hours healthcare services; and (2) the Electronic Medication Record (“Elektronisch Medicatie Dossier ” or EMD) – a prescription history. After the implementation, it is intended to expand the EHR allowing additional information to be shared in different care settings.

The functioning of the national EHR system is based on a central system called the National Switch Point (or LSP) that allows healthcare practitioners to locate the existing clinical information on the several regional or local systems through a pointer index. A pilot project was developed in four regions in order to implement the EMD and WDH. The functionality of both the EMD and WDH has been tested in these regions. Based on these tests, major improvements have been made in the architecture, especially with respect to the UZI card that is used for the authentication of healthcare personnel. The Dutch government expects that in 2009 and 2010, the major ICT vendors will adapt their systems to connect to the national EHR system with a national rollout to follow. Specific legislation is expected to take effect in 2010 that will force all healthcare providers to connect to the national EHR.

National/Regional EHR Approach
The present architecture of the Dutch national EHR system (AORTA) can best be described as a fully federated model. AORTA is creating the infrastructure to enable the exchange of patient data between local healthcare systems used by GPs, pharmacies and hospitals. Furthermore, the AORTA infrastructure will provide essential services, such as security frameworks and messaging standards, on a national level. Patient data remains in the source systems and the EHR supports the care processes.

At the same time, we also notice the development of distinct services and the adoption of SOA concepts. In this respect, an important policy guideline is one that states that the healthcare sector should comply as much as possible to the architectures and facilities that are and will be developed within the framework of the Dutch e-government program. The e-government concept is based on SOA and systems operate on the following leading principles: they require a citizen's or a company's registration only once; they offer one central registration number to each client; and use one safe system of authentication. Several services have already been developed:

- DigiD stands for the Digital Identity of citizens and companies. DigiD is a shared system that Dutch government authorities can use to verify the identity and electronic signature of citizens and companies accessing their electronic services.
- PKIoverheid is the name of the Public Key Infrastructure (PKI) designed for safe electronic communication with and within the Dutch government. PKI certificates guarantee high-level security to information sent on through the Internet by government agencies. They can be used for safeguarding websites (SSL), submitting valid electronic signatures, high-level authentication at a distance and message encryption.
- The government service bus that supports the logistics of the messaging and includes standards on how to address messages properly and to how send them reliably.
- Personal Internet Portal (PIP) for citizens for all public services, profile based and signaling with reuse of personal data. The PIP gives the status of going concern of relevant services at any moment.

**EHR Governance**

**Legal/Regulatory**

The existing legislation regarding health data protection takes the patient-provider relationship as a starting point. As such, it does not allow for centralized storage of patient health information. The EHR architecture and new systems and services are being developed in close consultation with the legal department and the institution that governs the protection of personal data. General privacy laws and a separate law related to patient rights apply. Individuals have the right to opt-out or to constrain (role based) which providers are allowed access to certain kinds of data. In February 2009, the Dutch Parliament passed the “EHR Act.” The main aim of this act is to impose the use of electronic systems by health professionals to keep appropriate records of the health status and the care provided for every patient. Also, these EHR systems will be connected to the National Switch Point, where the patient health information is exchanged with other health professionals and where patients can view and limit access to recorded information.
**Healthcare Policy**

The current reform of the healthcare system, towards a more competition-based market model, has both providers and payers competing for the individual patient. This limits the influence the national government has on joint ICT investments and infrastructure. Also, sharing of data between competing organizations does not come naturally, hence the abovementioned EHR Act.

Use of data is limited to those healthcare practitioners identified in the national healthcare practitioner registry (BIG register). Access is constrained by strict privacy laws. Data may only be used for the provision of care. The primary intent of the EHR is continuity-of-care oriented; other usages are not envisioned at this point-in-time. The provider's organization as well as its software system are certified (and liable) to comply with a set of minimal requirements related to security and privacy. The information infrastructure complies with European and Dutch laws with regards to privacy and patient rights. During the initial stages, not all of the legal requirements may be met; this will be resolved over time.

**Technology**

The main element of the national EHR system is the National Switch Point that allows for the location and change of clinical information existent in local systems. It is composed of:

- Patient identification repository;
- Repository with a pointer index to clinical information localization;
- Authentication mechanisms for health professionals and their systems;
- Access control mechanisms used by health professionals; and
- Communication agent allowing the information exchange.

Unique national patient identification is realized by using the national Civil Service Number (or BSN) and the mandatory identification at the point-of-care of each patient using a legal identification document. The proper identification and authentication of health professionals makes use of a central registry and a PKI-based Unique Healthcare Practitioner Identification-card or UZI card. The National Switch Point is currently implemented on the basis of the InterSystems Ensemble platform.

The data will be kept locally at its source; pointers to the data are collected in a central Act Reference Registry. The information model is based on HL7 v3. The data (when sent by systems as a result of an HL7v3 query) will be a collection of HL7v3 messages or HL7v3 documents (CDA). All healthcare practitioners have the option to request an UZI-card that can be used as a user identification/authentication token when communicating with the national infrastructure. The UZI-card also includes the role of the healthcare provider that is used for access control. The security model is based on SSL + PKI user authentication. While WSDL/WS are used, the architecture is messaging based, not services based. The messaging model is HL7 v3, its core is based on international v3 models as available in 2004 with some parts based on later releases. The intent is not to create any new standards but to re-use the existing standard to its fullest extent and to contribute toward its further development. For transport, SOAP over HTTPS is used, based on HL7v3-WS.
The national EHR infrastructure does not prescribe specific systems to be used by healthcare providers. Rather, a set of guidelines is published that includes interface specifications. These guidelines cover only the necessary elements from a national communication and collaboration point of view. Adherence to these guidelines qualifies the healthcare provider to connect to the national infrastructure. A key part of the qualification process involves the qualification of the software used. By the end of 2008, 15 software vendors had qualified their systems to participate in either EMD or WDH processes – just one more than a year before – with some of the major vendors still missing. Leading up to the mandatory connection in 2010, most vendors had qualification on their agendas for 2009.

Adoption

During the past few years, the Dutch government has discovered that the main issue of developing a national virtual EHR system is not related to technology, but instead related to the ambition and the intention among healthcare providers to work together. Of course, technology problems have surfaced during the pilot implementations, but the lack of enthusiasm and adoption is grounded in organizational and political issues. Moreover, because a clear business model for developing and using such an EHR system is lacking for most individual healthcare providers and for the ICT vendors, the Dutch government is facing a real challenge. The main argument for the National EHR system is patient safety (reduction of medical errors) and reduction of hospital admissions (cost reduction). These arguments are not very persuasive for individual healthcare providers to invest in this system and adopt time consuming procedures to cope with the new privacy legislation. Also, ICT vendors are very reluctant to invest in the modernization of their systems if they are not convinced that their clients will buy these new systems. The remaining years 2009 and 2010 are crucial with respect to the actual adoption of the first two releases of the EHR given that the pilot implementations have been concluded with mixed results in 2008 and have been limited to four regions. The implementation of the WDH focuses on GPs and their combined regional out-of-hours offices only. The formation of the regional out-of-hours offices has been a key lever for adoption because no patient information from participating GP practices is available otherwise. A similar format is being envisioned for emergency situations, including the ER departments of hospitals.

Ideally, the EMR should be populated with information from all pharmacies and be viewed by all doctors prescribing medication. However, adoption in hospitals has been very slow so far and has not yet reached other secondary or tertiary care providers. Also, pharmacies are hesitant to share the information they hold because no incentives for participation are in place. Their claim is that they should be rewarded for their investment in systems and data integrity.

Outcomes

Benefits

An initial business case regarding the implementation of the first two releases of the EHR (EMR and the WDH) shows the following benefits:
- Administrative cost reduction – €2.8 million
- Patient transfer cost reduction – €0.23 million
- Contact duplication reduction – €0.28 million
- Prescription medication service improvement – €0.12 million
- Medical prescription errors reduction – €6.75 million
- Absence cost reduction – €3 million

These figures are being disputed by different players and no real evidence has been collected yet due to the fact that the assessment of the pilot implementations has focused on technical and functional aspects that could prohibit a successful national rollout. Evidence of actual benefits is dependent on a wider use of the national EHR.

**Implementation Experiences**

The Dutch government conducted a proof-of-concept test for the National Switch Point in 2003. This confirmed the viability of the approach and of using HL7 standards as well as demonstrated that there would be synergy among ICT-vendors. In 2004, the architecture documents were elaborated and formalized. In 2005, the formal European Tender for the National Switch Point was completed, resulting in an operational system by early 2006. In 2006-2008, production-pilots were painfully but successfully conducted in four regions, focusing on e-prescribing (including the medication record, EMD) and the support for the WDH. Main obstacles for the rollout are the cooperation of ICT vendors, who should adapt their systems to the standards and requirements of AORTA, and the cooperation of GPs and pharmacists. During the last three years, ICT vendors have energetically implemented regional networks based on outdated edifact standards. Because these networks have roughly the same functionality as the first releases of the EHR, except for the strong requirement regarding privacy aspects and the national coverage, a clear business case for individual healthcare providers is now lacking. Another important lesson learned is the scope for such a fundamental transformation in the region where the patient is consuming healthcare; in other words, the introduction of an EHR system will have a large impact on the way healthcare providers are collaborating and on their position within healthcare networks. Healthcare providers are willing to invest in systems that improve their position in these regional networks and that will secure and enhance their relation with their patients/clients. They are not prepared to invest in a national EHR system.

In 2008, a new complication related to patient privacy appeared. The Ministry of Health informed all Dutch inhabitants about the implications of a national EHR system. As a result of this, new questions were asked regarding the collection and management of personal health data, and thus, the entire security architecture of the Dutch EHR system will be carefully analyzed again. Pending this investigation, the National Switch Point is no longer operational. In addition, patients have been given the opportunity to “opt-out” of the national information sharing arrangements through AORTA. Given the fact that little real experience with the national EHR could be reported, many groups of patients and healthcare providers were very cautious and called upon patients to make their objections formally known, using the “opt-out” procedure. Until March 2009, over 400,000 objections had been received (on paper), leading to processing problems in the responsible agencies and systems.
At present, four regions are on the brink of rolling out the EMD or WDH system. In three of these regions, a regional switching point has been added to the AORTA architecture with additional functionality. In our opinion, the success of the AORTA implementation will be determined by the value that can be added directly for the healthcare providers.

Next Steps

Several new releases of the EHR are currently under development, including pathology and laboratory results, e-prescribing (as an enhancement to the electronic medication record), electronic diabetic record, and the emergency record.

References


About the Contributors

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SWEDEN

Overview of Country Healthcare System

Demographics

Sweden’s population in 2008 was estimated at 9,253,675 people\(^{39}\) and the country is the fifth largest in Europe. Sweden has a low population density of 20 people per square kilometers, except in metropolitan areas. Eighty-four percent of the population lives in urban areas that comprise only 1.3 percent of the country's total land area.

There are more male births than females; up to the age of 65, there are more men than women. Thereafter, the proportion of women is significantly greater because women live longer than men. The life expectancy of the Swedish population continues to rise year by year. In 2008, the life expectancy was 79 years for men and 83 years for women. This can be attributed to falling mortality rates for both heart attacks and strokes. A little more than five percent of the population is 80 years or older, causing Sweden to have proportionally Europe’s largest population of elderly people\(^{40}\).

Healthcare Services in Sweden

The entire population of Sweden has equal access to healthcare services and the Swedish healthcare system is government-funded. In Sweden, the responsibility for providing healthcare is decentralized to the county councils and, in some cases, to the municipalities. Municipalities are responsible for ensuring that their residents receive the help and support they need. With respect to health and medical services, the municipalities are responsible for the care of elderly people and people with disabilities living in special accommodation. Half the municipalities in the country have agreed with the county council to take over responsibility for care of elderly and disabled people living at home. In the other municipalities, such care remains the responsibility of the county council.

The county council is always responsible for care provided by doctors. According to the Swedish health and medical care policy, every county council must provide residents with good-quality health services and medical care as well as work toward promoting good health in the entire population. Sweden is divided into 20 county councils and the population in these councils ranges from 60,000 to 1,900,000. The county councils have considerable flexibility in deciding how care should be planned and delivered and this explains the wide variations experienced regionally. At the national level, there are a number of healthcare authorities. The National Board of Health and Welfare\(^{41}\) plays a fundamental role as the central government’s expert and supervisory authority. The others are the Medical Responsibility Board,\(^{42}\) the Swedish Council on Technology

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\(^{39}\) Statistiska Centralbyrå, Sweden November 30th, 2008.


\(^{41}\) Socialstyrelsen

\(^{42}\) Hälso- och sjukvårdens ansvarsnämnd, HAS
Primary care has traditionally played a less important role in Sweden than in many other European countries. However, the aim now is to make it the basis of the health and medical care system. Today, most healthcare is provided in health centers and the vision is that patients should be able to choose their own doctor. Around 25 percent of health centers are privately run by enterprises commissioned by county councils (e.g., special clinics for children and expectant mothers). The county councils own all emergency hospitals, but healthcare services can be outsourced to contractors. For pre-planned care, there are several private clinics from which county councils can purchase certain services to complement care offered within their own units. This is an important element of the effort to increase accessibility. In Sweden, a total of 60 hospitals provide specialist care with emergency room services 24 hours a day. Eight are regional hospitals, with a total of 8,830 hospital beds, where highly specialized care is offered and most teaching and research is located. The eight regional hospitals are:

- Sahlgrenska University Hospital, Gothenburg (2,300 hospital beds)
- Karolinska University Hospital, Stockholm (1,600 hospital beds)
- Lund University Hospital (1,180 hospital beds)
- Uppsala University Hospital (1,130 hospital beds)
- Malmö University Hospital (760 hospital beds)
- Linköping University Hospital (640 hospital beds)
- Örebro University Hospital (620 hospital beds)
- Norrlands University Hospital, Umeå (600 hospital beds)

Seventy-one percent of healthcare is funded through local taxation. County councils have the right to collect income tax with the average tax rate being 11 percent. Contributions from the state are another source of funding, representing 16 percent, while patient fees only account for three percent. The remaining 10 percent comes from other contributions, sales and other sources. 

**Challenges Facing the Healthcare System**

One of the most dominant issues of Swedish healthcare today is waiting times for pre-planned care. This has long been a weakness and is causing dissatisfaction, especially among the younger and more demanding generation. A second issue is that the Swedish population is aging rapidly and the approximate number of people between the ages 75-84 years will increase by 22 percent in 2020. This results in older patients with multiple sicknesses, changing demands on the hospitals. Noteworthy is the fact that the increased
extent of highly specialized healthcare requires scale in terms of a larger numbers of patients, resulting in fewer and more focused hubs for this type of care in Sweden and Europe.

National EHR Program

National IT/ICT Status & Strategy

Some of the challenges addressed via IT capabilities are:

- Access to patient information for healthcare staff;
- Patient security (i.e., securing proper diagnosis and treatment based on access to the patient’s medical history);
- Patient's information (e.g., giving patients access to their own journals);
- Efficiency in the delivery of healthcare services, such as avoiding duplication of work; and
- Enhanced IT capabilities that enable healthcare staff to handle the increased movement of patients between regions and different healthcare providers.

The patient data law enforced from July 1, 2008 is driving the development towards increased sharing of patient history and journals between municipalities and counties. This, in turn, requires interoperable IT systems. The National Patient Overview Program, aimed at developing a system for sharing patient information across different healthcare providers (hospitals, private institution, municipalities) is currently being implemented. A test rollout of the program is targeted for 2009 and the system is expected to be implemented on a national level within the next two years.48

Over 80 percent of the population between 16-84 years has access to Internet services in their homes.49

The patient data law gives healthcare staff the opportunity to electronically access the patient history from different levels of the healthcare community. The implementation of the National Patient Overview program will enable connectivity between different healthcare providers. It will be fully implemented within a couple of years. Today 97 percent of all journals within the Swedish primary care sector are electronic; the same is true with 83 percent of journals within hospitals.

There are currently programs to increase the level of IT-related healthcare services for citizens. An example is “Healthcare on the Web” (Vård på webben), a project run by the counties aimed at giving citizens better information and access to healthcare providers. The service will be launched in 2009.50 Today, there is already an Internet service in place where citizens can search for information regarding diseases and medicines (Sjukvårdsrådgivningen).

The standards mostly used for healthcare transactions are HL7, but the EN 13606 implemented under openEHR will be used in the upcoming national applications.

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50 Nationell IT plan 2008
Örebro is the first city in Sweden to implement a system for sharing patient information (patientöversikt); within a couple of years all counties in Sweden are expected to implement the system.

In the National Strategy For e-Health, Sweden met the challenge set out in the European Commission’s Action Plan for e-Health: “Each Member State is to develop a national or regional roadmap for e-Health by the end of 2005.”

The national e-Health strategy constitutes the first stage of a long-term undertaking aimed at achieving a higher degree of collaboration at national level on these issues. The second phase, launched in 2006, involved gaining support for the strategy among the country’s county councils, municipal councils and other actors and stakeholders in the sector. Issues such as scope, scheduling, financing and decision-making procedures in connection with the work ahead were also discussed at this stage. A policy position on the planning, implementation and financing of future work on ICT issues at national level were taken by the National High-Level Group for e-Health based on the outcome of these discussions. A report on how to proceed in the focal areas in the second phase was presented in March 2007.

The work to be jointly undertaken is grouped into six action areas. The first three are concerned with establishing better basic conditions for ICT in health and elderly care. The last three are about improving e-Health solutions and adapting these to patient needs. Education, training and research initiatives are crucial to all six areas. These six action areas are:

1. Bringing laws and regulations into line with extended use of ICT;
2. Creating a common information structure;
3. Creating a common technical infrastructure;
4. Facilitating interoperable, supportive ICT systems;
5. Facilitating access to information across organizational boundaries; and
6. Making information and services easily accessible to citizens.
# National/Regional EHR Approach

**#1 Fully Federated**
- Patient data resides with source facility
- Data remains in the source systems
- EHR is a process which pulls patient data from carer systems
  - Real time: Google models
  - Batch extracts

**#2 Federated**
- Patient data resides with source facility
- Patient data consolidated in facility CDR
- EHR is a process which pulls from local CDRs for updates to central CDR as needed (e.g., dbMotion)

**#3 Service Oriented**
- Patient data sent to EHR by message at end of care event
- Local systems message enabled
- EHR is a process which manages flow of messages
- CDR holds care events within patient ‘record’

**#4 Integrated EPR** (Electronic Patient Record)
- Single integrated system for all hospitals and clinics
- Embodies EHR capabilities
- CDR replicated from EPR

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*NOTE: EHR is a service not just a data repository i.e. does processing; further details provided in the next slides.*

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Sweden is heading towards a hybrid of categories #1 and #2. Patient data are mostly kept at the local level. At the same time, SOA is the way local/regional healthcare facilities connect to the national levels. The National Patient Overview (NPÖ) and the National Security Services (BIF) are designed in such a way. To get to a unified and more detailed guidance, several projects were started in 2006-2007. NARRR is a project with the goal to provide a national architecture with rules, guiding principals and recommendations. Other projects specify information domains both technically, as well as by content and methods, on how to document and build message formats like HL7v3 and EHRcom. Today’s standards adapt more closely to the EHRcom 13606 implemented under openEHR. The preferred envelope is SOAP.

The NPO is also designed to handle the citizens overview through a project called “Care on the Web” or Vården på webben. For this service, a citizen is able to get his/her medical record and additional information on self care.

BIF will handle:

- Authentication
- Access
- Consent
- Care relations
- Logging
- Patient context
- Handout
- Notification
The application is under development and the first pilot is planned for mid-2009. A national generic process model, flow model, and information/structure model are being developed by the National Board of Health and Welfare, the NI project. The work will be delivered in December 2009. Some pictures are shown below.

Another project at the National Board of Health and Welfare is Nationellt Fackspråk, or NF. The project covers development, maintenance and standardisation to standards including SNOMED CT. The project plan will complete in 2012. The project needs to coordinate with the NI project as shown below.
EHR Governance

Legal/Regulatory

Today, the legal aspects of mediating medical information between caregivers and citizens are in the process of being changed. A new law, patientdatalagen, has been established. This law regulates, among other things, access to the EHR and the use of its contents. Specifically, it regulates cross-border HIE. In summary, the new regulation sets high demand on organization, processes and IT applications. It also highlights the need for effective collaboration between actors and having a patient-centric focus.

Healthcare Policy

The Swedish model is federated. Because a caregiver decides on most healthcare policies, this process could be a barrier in national implementation. The National IT Strategy is the enabler to get the process going. The collaboration among the counties is in place, but a similar collaboration steering group of municipals is not established yet. The NI and NF projects are essential for quality of data and common standards.

EHR Financing

The picture above shows how the National IT work is organized. On top, the Ministry of Health and Social Affairs finances the projects of the National Board of Health and Welfare like NI and NF. The ministry also finance a share at SKL, Swedish Association of Local Authorities and Regions (SALAR). The counties also finance projects through SALAR. Inside SALAR, the steering board decides and procures national applications. There is an advisory board for architecture governance. The counties and the government fund EHR development. The annual budget for national IT connected to healthcare is 320 MSEK, of which 220 MSEK is funded by the counties and 100 MSEK by the government.51

Technology

51 Realisering av den nationella IT-strategin för vård och omsorg, Gösta Malmer, SKL
The national architecture is not finally defined yet, but the figure below shows a working model of domain architecture and reference architecture. The reference architecture is a result of collaboration between Carelink and Swedish Medtech.

The domain architecture has three layers:

- National domain
- Fellowship domains
- Care giver domains

The domains are connected through SOA platforms.
**Presentation**

The presentation layer takes care of presenting information to channels like PDA, mobile, Web browser and PC. The layer does not rule the layout of information. W3C is the standard.

**Workflow**

Orchestration of:
- Defined processes with activities
- Rule engine
- Queue of activities
- Scheduling
- Monitoring (BAM)

**Access**

Services integrating applications and functions in the SOA. It could be a SOAP-message containing a message based on the RIV method and technical specification.

**Interaction**

The presentation logic.

**ESB**

The service bus.

**Common Services**
Services like context manager, audit, notification.

**Business Services**

Services like:

- Care documentation
- Care processes
- Waiting lists
- Drugs
- Clinical processes

**Data Services**

Unified data access, update, federation, replication and transformation of data.

**Security**

Authentication, access, consent, integrity.

**Operational Management**

- Service management
- IT administration
- IT governance
- Managing systems, services and applications

**Physical Storage**

- Infrastructure services
- Physical layer
- Core infrastructure

The structure of technical specifications are shown below.
National IT Strategy for Healthcare

The purpose of the program is to ensure that the right information is available to the right healthcare staff when needed. The NPO program makes it possible for healthcare staff to receive patient information registered by counties, municipalities and private healthcare institutions via a Web interface. The expected benefits with program include improved clinical results, improved patient security, increased efficiency and increased patient influence.

Örebro county and municipality are the first to implement and test run the program during the spring of 2009. Within a couple of years, all 21 counties will implement the program.

Outcomes

Several counties are in the process of consolidating systems. Ninety-seven percent of primary care uses the EHR (elektroniska journaler). In hospitals, the figure is around 83 percent.\(^{52}\) In December 2007, e-recipes were implemented to a grade of 68 percent totally.\(^{53}\)

An obstacle to the road of EHR is the difference in logic and guiding principles in primary care versus hospital care. Different care systems for primary care and hospitals in the same county are common. We see the trend towards fewer IT care systems overall and a greater demand for systems in the care processes. Five care systems are being used in 84 percent of the counties.

Projects adopting a top down approach in this process of consolidation tend to fail. National activities require the need of consolidation in the counties and harmonization of vocabulary standards.

Benefits

Benefits include more accurate diagnosis due to the presence of a more complete picture of the medical history of the patient. This decreases the risk of wrong treatments. The sharing of information also increases the level of efficiency due to the elimination of duplication of work.

The first wave of national applications is planned to be finalized by 2012.

Implementation Experiences

The program is still in the development phase and the first pilot was planned to be launched in mid-2009.

Many forums around standards in healthcare have been held and these are still active. An example is the discussion over HL7 verses EHRcom/EN13606/openEHR.

\(^{52}\) Nationell IT 2008

\(^{53}\) Apoteket
Next Steps

In 2010, a revised version of the Swedish Strategy for e-Health (“Safe and accessible information in health and social care”) will be published. Focus areas are municipals and private care companies.

A critical success factor is to have a strong adoption of the national projects. Counties, municipals and private care companies must connect to the national application with a reasonably fast speed. This is a challenge in a federated environment.

As of July 1, 2009, the pharmacy market became deregulated allowing private companies to sell drugs. As a result, a new company established to provide infrastructure for the purpose of linking between healthcare entities and pharmacies will be formed. This infrastructure service will work to ensure patient safety as well as cost-effectiveness and will be the infrastructure hub for healthcare in the future.

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ion/NI-projektet/.

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jektet/.

About the Contributors

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Overview of Country Healthcare System

Quick Facts\(^{54}\)

Population (July 2008 est.): 71,892,808  
GDP (PPP – 2007 est.): US $853.9 billion  
GDP per capita (PPP – 2007 est.): US $12,000  
Healthcare Expenditures (% of GDP – 2005): 7.6 percent  
Internet Users (2006): 13.15 million

Turkey’s healthcare system is a centralized, state-run system overseen by its Ministry of Health (MoH). While basic healthcare is provided to the majority of citizens, a large number still access private medical care due to the low quality-of-care provided through the public system. State-funded healthcare is funded through employer and employee contributions, fees paid by insurers and partial taxes paid on some consumer goods, such as fuel and cigarettes.

Healthcare is provided to individuals through the social security system. The system is comprised of three distinct organizations that provide social assistance support to different groups of citizens: the Social Insurance Organization (SSK); the Government Employees Retirement Fund (GERF); and the Social Insurance Agency of Merchants, Artisans, and the Self-Employed (Bag-Kur). Under the 2003 Health Transformation Program, these agencies are combined under the umbrella of the Social Security Agency.

National EHR Program

National IT/ICT Status & Strategy

Turkey’s adoption of ICT products and services reflects the mixed influences of rapidly increasing rates of mobile smart phone usage (with Internet accessibility) and limited usage of the Internet otherwise. In 2006, there were 13.5 million Internet users representing approximately 18 percent of the population. By 2008, this figure had increased only to 34 percent, a relatively low population compared to other countries who average closer to 50 percent of the population as Internet users. The low Internet utilization rate is attributed to the low rate of Turkish personal computer ownership, averaging 4.31 per 100 inhabitants in 2003.\(^{55}\) While personal computer ownership has most likely increased since 2003, the ownership rate in Turkey was less than a quarter of the average European country’s personal computer ownership for the same period. Broadband subscriptions among citizens are similarly low.

National/Regional EHR Approach

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\(^{54}\) Library of Congress – Federal Research Division. United States Government. Available at:  

In 2003, the Government of Turkey prepared a document, “Turkey Health Transformation Program,” that outlined a strategy to solve the existing problems within the healthcare system as well as to improve the quality and accessibility of medical care for citizens within Turkey. This report characterized Turkey’s previous attempts to establish e-health services as being disjointed and complex, and went on to form the basis for Turkey’s current e-health strategy.

Turkey’s e-health strategy is focused around the implementation of a National Healthcare Information System, known as the Turkey Health Information System (THIS). In 2003, Turkey’s Health Information System Action Plan was published, outlining 15 actionable items concerning the implementation of e-health in Turkey. From this document came the establishment of an e-Health Project, approved in December, 2003. The main activities within the Turkish e-Health Project are:

- The enhancement of the existing MoH-Wide Area Network into a National Health Information Platform (tentatively called Saglik-NET) hosting and enabling access to nationally required systems and services by all Turkey health sector institutions.
- For strategic and technical reasons, implementing the Family Medicine Information System by first developing a National Health Care Management Information System (NHC/MIS); these are based on individual MISs in each healthcare institution creating a “national solution” with all hospitals and health centers participating on an elective basis.
- The adoption of national standards for data items, entities and related procedures that would then govern the development of all new content of health information in Turkey. These standards would be stored in a National Health Data Dictionary accessible over Saglik-NET.
- The development and operation of a National EMR system that is functionally tied to the EPR components of the NHC/MIS.
- The expansion of the existing security measures of redundancies, firewalls, anti-virus and passwords to cater for profound digital security of all healthcare transactions that requires the identification and authentication of all users as well as the integrity, confidentiality and non-repudiation of all healthcare messages and transactions.

To date, all of the above initiatives have been achieved or are in progress for final phases of achievement.

The third category – Service Oriented – is the one that is applied in our Turkey. A National Health Data Dictionary (NHDD) has been published. It includes data items and minimum health data sets. It is compulsory for hospitals to comply with NHDD data definitions and minimum health data sets.

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56 Yurt N. Turkey’s e-health activities: a country case study. *American Medical Informatics Association*; July 2008
**e-Health Applications and Services Overview**

<table>
<thead>
<tr>
<th>Program/Service</th>
<th>Description</th>
<th>Partners</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saglik-NET</td>
<td>Saglik-NET is a LAN-WAN intranet system for the Turkish health system. Currently the system offers: linkages, patient data and other services to members of the healthcare community. Saglik-NET includes electronic health information gathering systems, such as “Basic Health Statistics Module.”</td>
<td>Ministry of Health</td>
<td>Operational/Ongoing (still being developed in some areas).</td>
</tr>
<tr>
<td>Family Medicine Information System (FMIS)</td>
<td>FMIS is a software application that allows the healthcare provider to input all of the health information for patients into an electronic system that is stored by the</td>
<td>Healthcare Providers, Ministry of Health</td>
<td>Currently installed in 21 provinces and expanding.</td>
</tr>
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<td></td>
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</tr>
<tr>
<td>System</td>
<td>Description</td>
<td>Ministry of Health</td>
<td>Status</td>
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</tr>
<tr>
<td>Health Coding Reference Server (HCRS)</td>
<td>This is an online classification system that codifies all elements of the healthcare system, from institutions to drugs. The main goal of the classification system is to provide ease and accuracy of data collection from across the country. This system is available through Saglik-NET.</td>
<td>Ministry of Health</td>
<td>Ongoing</td>
</tr>
<tr>
<td>National Healthcare Information System (NHIS)</td>
<td>NHIS is the overall system that encompasses all of the above systems. This system brings together all systems in order to create a comprehensive electronic health record for citizens.</td>
<td>Ministry of Health</td>
<td>Ongoing – pilot phase. Expected to be completed in 2009.</td>
</tr>
<tr>
<td>Decision Support System (DSS)</td>
<td>A DSS has been configured into Saglik-NET. This will be used throughout government to determine spending allocations.</td>
<td>Ministry of Health</td>
<td>Ongoing</td>
</tr>
<tr>
<td>National TeleMedicine Services</td>
<td>The National TeleMedicine Service will facilitate the exchange of medical information, such as x-rays, so that patients can benefit</td>
<td>Ministry of Health</td>
<td>Pilot phase, located within 17 hospitals in 2007.</td>
</tr>
</tbody>
</table>
The Turkish MoH has jurisdiction more than 900 public hospitals. When private sector and university hospitals are included, this number exceeds 1,200. All hospitals are now equipped with hospital IS. MoH hospitals are free to purchase their own hospital IS according their needs. On the other hand, the hospitals are obliged to use NHDD data definitions and minimum health data sets for integrating through Saglik-NET to the THIS database. Saglik-NET serves as the health information and communication platform. The hospitals are using state budgets and they have their own revolving funds. The ICT applications are mostly financed through revolving funds.

**EHR Governance**

**Legal/Regulatory**

Currently, there are no laws directly related to e-health; however, several documents cite the need to establish such laws. There are several laws related to ICT such as the law enacted in 2004 concerning digital signatures that would relate to e-health practices.

Under the Turkish constitution, the country's criminal code and civil code establish regulations covering ICT applications in health. All business sectors, including healthcare, can use and adopt their ICT systems as long as they comply with these laws and technical regulations.

A major Individual Data Protection law was recently introduced into Parliament and is awaiting approval.

**Healthcare Policy**

When the Turkish MoH reviewed the previously implemented national informatics projects, it was noted that they were focused on meeting institutional requirements and needs almost exclusively. However, the Health Transformation Program launched in 2003 was the beginning of a new active era in health informatics and e-health, augmenting traditional institutional IS projects with initiatives intended to have more patient-centric e-health value.

Studies of the impact of the THIS Action Plan implementation were conducted by the Turkish MoH from 2003 through January 2004. This plan was based on the very intensive work of 10 separate sector-specific working groups, including governmental institutions, universities and non-governmental organizations. It can be said that the action plan provided the framework for ongoing e-health studies that are still underway.

**EHR Financing**

National and World Bank resources are being used for the deployment of THIS.
Technology

THIS is built on Saglik-NET and connects the following components:

- The National Health Data Dictionary and the Minimum Health Data Sets Server;
- The Health Coding Reference Server; and
- The digital security mechanisms.

As of today, Saglik-NET is fully operational and providing linkages with hospitals and primary healthcare centers including family physicians.

As of January 1, 2009, all Turkish hospitals were obliged to integrate with Saglik-NET using the NHDD data sets and technical business rules. HL7 version 3 is required for health message communications.

In order to provide common coding/classification systems that are available to all healthcare players, the Health Coding Reference Server (HCRS) includes all the international and national coding systems within a publicly accessible server.

Some of the coding systems available from HCRS are ICD-10; Drugs; ATC (Anatomic, Therapeutic, and Chemical Classification System); Associations; Clinics; Specialization; Careers’ National Health Tariffs; Health Application Instructions; Supplies; Vaccines; Baby Monitoring Calendar, Pregnant Monitoring Calendar; Child Monitoring Schedule; and Parameters.

A digital patient identity card pilot has started. This card is being tested for use as a secure authentication process for healthcare and Social Security purposes.

Adoption

Hospital IS are adopted according the NHDD and business rules published by the MoH. There are about seven hospital IS vendors in the Turkish Market. Interoperability problems have required the use of NHDD minimum health data sets and core modules in order to compile what is exactly required. HL7 version 3 is being used for health message communication for Saglik-NET integration.

One of the concrete achievements of e-health activities in Turkey is the deployment of the Family Medicine Information System that was introduced in one selected province as a pilot 2004; today, it operates in 33 of 81 provinces and contains the EHRs of more than 19 million citizens.

Approximately 600 hospitals have now successfully integrated into Saglik-NET and send their data into the THIS. The MoH is setting incentives sufficient for the remaining hospitals to also join Saglik-NET. This means that successful integration with Saglik-NET will result in an improved performance score and supplementary budget for the hospital.
Outcomes

A Decision Support System (DSS) has been built on the Saglik-NET and was initially implemented over the Family Medicine Information System. Reports regarding Turkey’s health profile from the Family Physician Medicine Information System ensure the decision makers allocate resources efficiently.

System modules such as Core Health Resources Management System, Basic Health Statistics Module, New Performance Monitoring System, and Patients Rights Information System are now regularly utilized to produce several reports used for complying with the MoH’s requirements for planning, monitoring and evaluation.

Benefits

Significant benefits have been realized from the e-health program:

- National Health Information Standards have been developed, including content and structural standards for the EHRs of the Family Medicine Information System in the primary and secondary care arenas;
- Agreements governing health data types and collection methods at the national and regional levels have resulted in data being collected and analyzed efficiently;
- Agreements on data interchange standards between different health information systems;
- Evaluation of implementation experience and impact of health sector reform activities; and
- Telemedicine programs implemented in selected rural and poor regional hospitals.

Patients are generally being evaluated more efficiently following the adoption of EHRs for family physicians. Since January 1, 2009, hospitals have been sending structured data through Saglik-NET. Evaluation of the Saglik-NET integration is still in progress. Telemedicine including teleradiology and telepathology services have been operating in 18 hospitals since last year. Of the telemedicine sites, 11 are sending hospitals that require clinical expertise and seven are receiving hospitals that provide consultancy services. As of today, more than 1,700 medical images are reported through the system annually.

Implementation Experiences

The ICT projects have experienced less user resistance to the new way of delivering e-health services than was expected. Family Physicians in particular have adapted easily to the Family Medicine Information System. Since the MoH started their incentive program, virtually all hospitals are integrating with Saglik-NET.

Next Steps

There are plans for the telemedicine system to expand to an additional 47 hospitals with the addition of teleultrasound services for pregnancy monitoring.
The DSS that was developed as part of the Family Medicine Information System will cover the hospitals during the integration phase. Communicable disease surveillance system will be integrated into Saglik-NET.

New added-value clinical services will be integrated such as elderly care, remote patient monitoring and chronic disease management. Plans are underway that will allow citizens to access their health data on a secure platform and online rendezvous for delivery of healthcare services will be possible.

References


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Content of this document was heavily sourced from market research conducted for ISIS Health Informatics by Jeffrey Thackeray, Market Intelligence Specialist, Saskatchewan Trade and Export Partnership (www.sasktrade.sk.ca).

We would like to thank Dr. Nihat Yurt, E-health Coordinator for the Turkish Ministry of Health for reviewing, confirming and adding to this report.

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WALES

Overview of Country Healthcare System

With a population of 3 million people, Wales is one of four Home Countries that comprise the UK. Healthcare is provided predominately by the National Health Service Wales (NHS Wales) and is free-of-charge to the individual.

Health funding and policy are made at the central government level by the Welsh Assembly. NHS Wales receives its allocation as part of the negotiation between Westminster (seat of UK’s central government) and the Wales, Scotland and Northern Ireland governments. The sum available for health and health services in Wales forms part of the block grant, the total funding for all areas for which the Welsh Assembly has responsibility.

Wales spends over £4 billion every year on its health services and this figure is expected to rise. Corporate governance in healthcare is led, directed and controlled by health bodies such as NHS Wales Trusts and local health boards.

Primary care services are provided by approximately 1,800 GPs in health and surgical centers throughout the country. NHS Wales Direct also offers primary care services through a 24-hour nurse telephone helpline. Nurses provide on-demand information and advice to patients about health, illness and healthcare services.

There are 14 NHS Trusts in Wales that manage 135 hospitals with 15,000 beds. Most patients have access to a District General Hospital (DGH), but there is also a network of community hospitals across Wales that provide more limited services. Wales has one main teaching hospital – the University Hospital of Wales based in Cardiff.

The NHS Wales provides mental health services in partnership with government social services departments. It is also responsible for all emergency, paramedic and patient transportation services throughout Wales.

While the general health of the Welsh population is improving, it is still lower than other European countries and its death rate is higher. Cardiovascular diseases – especially heart attack and stroke – are responsible for the majority of deaths followed by cancer and respiratory disease. Together, cardiovascular disease and cancer account for two-thirds of all mortality.

The Minister of Health and Social Services of the Welsh Assembly Government is ultimately responsible for the National EHR Initiative. It has created the IHC and placed it under the auspices of the Director, NHS Wales. IHC programs are designed to increase electronic connectivity of care across the country. At the core of this initiative is the implementation of the Individual Health Record (IHR).

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Wales Individual Health Record (IHR) Program

Strategy

The goal of the Welsh IHR is to shift the focus of HIS from healthcare organizations to individual patients. Information services are, therefore, built around the needs of patients (patient-centric) rather than expecting patients to navigate through the labyrinth of organizations involved in their care. By providing both access to information and information-based services (i.e., care advice and care alerts based on health status), the NHS Wales anticipates that the system will focus on both wellness and prevention of disease and directly involve the patient in his own care. The available comprehensive information will include health data supplied from all sources throughout the patient’s lifetime. The management of that information will rest with individual clinicians and institutions, including the hospitals and GP practices that are responsible for the creation and maintenance of the patient’s EHR. This concept of collaboration through connectivity is central to the design of the IHC.

Electronic health data will be delivered by four primary architecture components:

- The Life Long Record (LLR)
- The Individual Health Record (IHR)
- The Welsh Clinical Portal (WCP)
- MyHealthOnLine

The Life Long Record

The LLR will be stored and maintained locally by the GP. Each patient is assigned to a GP to be his/her primary care giver within the NHS Wales. The hospital can coordinate inpatient care with the GP by providing a Discharge Summary or Outpatient Letter. These letters are being transformed into electronic messages with the patient’s diagnosis, treatment, prescriptions, key test results and outcomes from the hospitalization. Some of this information will be coded through existing and evolving standards while other information, such as clinician progress notes, cannot. The ultimate goal is for all clinical information to be standardized and exchanged electronically. This model makes the GP accountable for manually populating and maintaining the LLR with data received from other care providers.

The Individual Health Record

Whereas the LLR contains detailed patient information collected from all sources, the IHR contains the patient’s current summary information.

Most of the patient’s healthcare data will remain within the GP’s LLR and the hospitals’ Patient Care Record (PCR), including patient location and scheduling while in the hospital. The IHR, however, contains a higher level of information such as:

- Personal details, including demographics such as name, date of birth, address, special needs, primary language spoken and emergency contacts;
- Care relationships, listing all healthcare providers involved in the patient’s care;
• Summaries of health events that occur in urgent care settings like hospital admission and discharge summaries, referrals, diagnostic tests performed and procedures completed; and
• Current health status, including current medications and diagnoses.

**The Clinical Portal**

The WCP will facilitate the exchange of patient information between GPs, hospitals, outpatient laboratories, radiology centers and other healthcare providers. Data is accessible from both the IHR and LLR.

As an example, while in the hospital, the patient’s information will be recorded and maintained in the local facility system known as the Personal Care Record (PCR). At the time of discharge, the clinician will authorize the final record and then send an electronic discharge summary to the IHR and LLR.

**MyHealthOnLine**

MyHealthOnLine is a portal that can be used by the individual and/or his designated sponsor (e.g., family member). Through the portal, the patient will have access to a number of information services including the LLR. Eventually, the patient will have the ability not only to view his health record and test results, but also to enter information about health events outside of the NHS Wales such as treatments outside of the country, self care and use of over-the-counter medicines.

Messaging and data exchange must conform to a basic set of standards that includes provenance (credentials and attribution of the document) and purpose (documents that exchange information with the LLR and IHR).

The information stored in both the LLR and IHR is owned by the patient but held in his behalf by the “custodian” of that record. As is the case in England, Welsh citizens can opt out of the health record program. All requests to access the electronic patient information must come from an authorized user controlled first through authentication and then by determining permissions. Permission is granted on the basis of several factors including the role of the requestor; the nature of the request; and limits set by the individual patient. Any misuse of patient information is determined through audits and subject to professional, employment and legal sanctions.

**Technology and Status**

The IHC has made significant progress towards developing the services necessary for a national electronic record system. The conceptual architecture has been defined and many of its elements and concepts have been piloted or implemented. These implementations have gained support from healthcare stakeholders, allowing IHC to improve its architecture in the process. The IHC thus continues to make significant progress by utilizing a combination of budgets within the local health community as well as providing incremental national funding.
The following table, developed from the 2007 IHC National Architecture Standards, lists the key IHC/IHR initiatives along with their current status and future objectives.

**Extract from IHC’s National Architecture Standards Document, September, 2007**

<table>
<thead>
<tr>
<th>Architectural Element</th>
<th>Current Status</th>
<th>Future Objectives</th>
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</thead>
</table>
| LLR/ IHR              | IHR implementation has started with the provision of a primary care record into the Out of Hours (OOH) Government Service.                                                                                                                                                                                                                  | Pragmatic migration to a comprehensive LLR and IHR across all emergency and elective care settings for acute and chronic conditions. The sources of information will expand over time until the full vision is reached. To provide a single user interface for most secondary care clinicians, replacing existing clinical workstations. The portal will allow clinicians to:  
  • create, exchange and manage clinical communications  
  • view an individual's records  
  • schedule and document care  
  • track progress  
  • request investigations and prescribe treatment. |                                                                                                                                                                                                                                          |
<p>| WCP                   | Currently testing at three early-adopter Trusts and already piloted in Cardiff and Carmarthen. Other Hospital Trusts and Health Solutions Wales (HSW) have agreed to collaborate.                                                                                                                                                                                                  | NHS Wales organizations will need to contribute relevant information to the appropriate PCR through the use of standard messages. The clinical portal will provide all NHS Wales clinicians with access to the PCR. |
| PCR                   | The first version of the clinical portal will request information from appropriate hospital systems. Future versions will establish the PCR as a set of services and information standards.                                                                                                                                                                          |                                                                                                                                                                                                                                          |
| Patient Identification| NHS Wales numbers are employed in communications between organizations. Significant investment has been made to increase the use of the NHS Wales number in existing IS and health services will become available to link identifiers.                                                                                                                                                  |                                                                                                                                                                                                                                          |</p>
<table>
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<tr>
<th>Architectural Element</th>
<th>Current Status</th>
<th>Future Objectives</th>
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</thead>
<tbody>
<tr>
<td><strong>Welsh Demographics Service (WDS)</strong></td>
<td>WDS is in place in existing systems. The Welsh Administration Register is the definitive source of national demographics.</td>
<td>WDS will be realized as a SOA model</td>
</tr>
<tr>
<td>Welsh Demographics Service (WDS)</td>
<td></td>
<td></td>
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<tr>
<td>Information services include the allocation of NHS numbers for Welsh residents and newborns, the management of primary care registrations, tracing or finding NHS Wales numbers and other national identifiers as well as the availability of demographic information.</td>
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</tr>
<tr>
<td>MyHealthOnLine</td>
<td>The first pilot provided basic facilities for patients to record information about their care including a special module to record progress during maternity. A second pilot is planned. Project looking at possible use of SCI Gateway (existing NHS Scotland solution).</td>
<td>This will become the standard process for patients to view their health information and interact with healthcare providers. Will be delivered via the clinical portal; any existing solutions must migrate to this service.</td>
</tr>
<tr>
<td>MyHealthOnLine</td>
<td></td>
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<tr>
<td>Provides patients with access to their records, enabling them to take an active part in managing their care.</td>
<td></td>
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</tr>
<tr>
<td>Electronic Referrals</td>
<td>Map of medicine being rolled out via a structured Websites for clinician and patient access</td>
<td>Access will be incorporated into clinical portal and MyHealthOnLine</td>
</tr>
<tr>
<td>Electronic Referrals</td>
<td></td>
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<tr>
<td>A single mechanism for the secure direction and real time communication of structured patient information between service organizations.</td>
<td></td>
<td></td>
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<tr>
<td>Access to Care Information</td>
<td>Access to Care Information facilitates access to high quality comprehensive information for health services staff and the public.</td>
<td></td>
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<tr>
<td>Access to Care Information</td>
<td></td>
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<tr>
<td>Messaging Fabric</td>
<td>An interim version of the Messaging Fabric is being established for the first phase of the clinical portal</td>
<td>The Messaging Fabric will become the standard means of communication between IS, including those outside NHS Wales, using SOAP protocols. Additional WS* standards such as WS-Security and WS-Addressing will be integrated to the SOAP protocol.</td>
</tr>
<tr>
<td>Messaging Fabric</td>
<td></td>
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<tr>
<td>Provides collaborative and interoperable functionality using the principles of a SOA and defined service interfaces. The Messaging Fabric will be the mechanism by which communication between service interfaces will be achieved.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Document Metadata</td>
<td>Generic Information Framework for Individual Records (GENIFIR) is used to the extent it is viable for NHS Wales.</td>
<td></td>
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<tr>
<td>Clinical Document Metadata</td>
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</tr>
<tr>
<td>Architectural Element</td>
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<td>have header and body components and, where appropriate, conform to the HL7 CDA. The body will enable communication of free text, semi-structured and structured clinical data.</td>
<td>being developed in stages.</td>
<td>A limited number of large code sets will be mandated, with systems using the most appropriate of these.</td>
</tr>
<tr>
<td><strong>Clinical Coding and Terminology</strong> Intent is to move towards a more coherent and consistent use of clinical coding and terminology following a pragmatic approach, with priorities based on the practical, immediate needs of clinical safety, efficiency and improved patient experience.</td>
<td>The approach recognizes that there is no single coding system that is suitable for all purposes. Currently, coding and terminology systems used are largely heterogeneous and unplanned.</td>
<td></td>
</tr>
<tr>
<td><strong>Message and Service Definitions</strong> Approach based on multiple information services working together, as embodied in a SOA. In this approach, the emphasis is on information services rather than IS, separating what the IT does (service) from how it is put together (system). Pilot projects exist in the following services areas: pathology requesting and reporting; waiting list enquiries; admission and appointment status; patient identification and demographics; and user authorization and authentication.</td>
<td>Following standards set by BS7799 / ISO27001.</td>
<td>NHS Wales Security Policy and ISO27001 will be followed.</td>
</tr>
<tr>
<td><strong>Security of Data</strong> All IS will preserve confidentiality, integrity and availability of information.</td>
<td>Enforcement will be supported by continuous monitoring of access audit trails. Misuse of health data will be investigated in conjunction with existing professional standards of conduct related to information privacy.</td>
<td></td>
</tr>
<tr>
<td>• <strong>Confidentiality</strong>: ensure access to only those authorized; • <strong>Integrity</strong>: safeguard accuracy and completeness; • <strong>Availability</strong>: ensure authorized users have access to information and associated assets when required.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Architectural Element</strong></td>
<td><strong>Current Status</strong></td>
<td><strong>Future Objectives</strong></td>
</tr>
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</tr>
<tr>
<td><strong>Staff Authentication and Authorization</strong></td>
<td>Development will occur incrementally with the first implementations being part of the clinical portal and Welsh Demographics Service.</td>
<td>Organizations will be advised to use national authentication and authorization services for access to local services in order to facilitate single sign-on.</td>
</tr>
<tr>
<td><strong>User Directory</strong></td>
<td>All organizations will move user identities into the National Active Directory by March 2009. All new national applications must have user identities stored in the Active Directory.</td>
<td>National Active Directory will become the primary source for all user identifiers.</td>
</tr>
<tr>
<td><strong>National Network</strong></td>
<td>Single wide-area network in place. Code of Connection provided by service provider. This is a Multiple Protocol Label Switching (MPLS) based on Virtual Private Network (VPN). All NHS Wales organizations in Wales will connect directly or indirectly.</td>
<td>Will become a closed VPN within Wales when the new public sector wide network is implemented.</td>
</tr>
</tbody>
</table>

**NHS Wales IHR Approach**

NHS Wales IHC program employs a highly collaborative approach to its strategy. Since 2005, IHC has hosted numerous events where leading clinicians and healthcare leaders meet to review the IHC program, its conceptual architecture and clinical implications, and then reach consensus for its implementation.

The development and implementation of the NHS Wales LLR/IHR follows a set of priorities based on the following principles:

- Focus on achieving benefits at every possible point in implementation;
- Effectively utilize the information already stored in current healthcare IS;
- Deploy services that facilitate exchange of patient data through the Web portal; and
- Prioritize scenarios including:
  - Support of urgent and unscheduled care such as GP after-hours;
o Support of scheduled care whenever “internal” information services fail; for example, when “the notes can’t be found”;
o Support of self-care through direct use of the IHR by the patient; and
o Identification of long-term conditions (e.g., chronic diseases) and unified assessments.

The conceptual architecture used by NHS Wales IHC to implement the LLR/IHR best represents a “Federated Model” – category #2 in the chart below. This approach was determined to be the most effective given the existence of variable legacy systems and the cost/time involved in replacing them within the hospital and other healthcare settings.

Governance

Legal/Regulatory

The patient legally owns his health record while the clinician is its custodian. While regulation makes this clear, patients do not normally perceive themselves as owning their records and care-givers often behave as if they do.

As is true in most countries, the privacy of health data is taken very seriously in Wales. All process and technical design activities address privacy requirements including the creation of “sealed envelopes” that contain sensitive personal and health-related information. Patients can employ these sealed envelopes to provide information on an as-needed basis.

Healthcare Policy

In 2003, a national review of health and social issues recommended restructuring health and social care delivery. It suggested that an integrated system be developed to promote health and wellness instead of always focusing on acute and intermittent care. The review recommended that patients take more responsibility for disease prevention and early intervention, and made funding information management and technology a high priority of the Wales Assembly Government. Since then, government health policy has focused
on improving health and wellness through the delivery of integrated and better informed healthcare. The IHC was created to develop the information services necessary to enable this policy.

In 2004, through the “Making the Connections” document, the Welsh Assembly Government described its plan for public services. The plan included bringing patients onto center stage and facilitating the full use of all healthcare resources.

In 2005, the “Designed for Life” document described the Welsh Assembly Government’s plan for future healthcare in Wales through 2015. The overall goals were to improve overall health and to reduce and eliminate inequalities in healthcare by encouraging patients to take a more active role in their healthcare. The document recommended engaging service users and clinical leadership to provide quality assured clinical treatment and evidence-based medicine. It suggested building accountability into the healthcare delivery system, taking a more corporate approach so that organizations would work together to promote health.

Adoption

As noted in the table of key elements, adoption has been relatively limited across Wales. But the concepts of the IHR have been validated in the “Out-of-Hours” implementation of the IHR. In this after-hours setting, the electronic solution has been adopted by primary care clinicians who provide care through the night when patient health information was formerly unavailable.

Next Steps

Over the next 12 months, IHC will focus on four major areas:

- Providing clinicians with access to the IHR whenever they deliver urgent, unscheduled patient care;
- Migration of data into the LLR maintained by GPs and assimilating GP systems into a nationally hosted environment;
- Development of the WCP and PCR Service to support continuity-of-care for patients with long-term conditions; and
- Empowering patients by allowing them to see their health records through MyHealthOnLine.

References


About the Contributors

Gerry Yantis is a Vice President with Capgemini where he leads the Group’s Global Healthcare Team and is the Public Sector Healthcare Lead in the US. In 2005, Mr. Yantis worked with Informing Healthcare as their interim CIO and advisor while based in the UK during the period of 2003-2006.
The content of this document was heavily sourced from materials developed by the team at Informing Healthcare – in particular, Dr. Anthony Nowlan, Alan Dickinson, Dr. Martin Murphy, Gary Bullock and Andrew Griffith.

Importantly, we would like to thank IHC Director Gwyn Thomas for his time in reviewing and confirming the content in this report.
DENMARK

Overview of Country Healthcare System

Denmark is located in northern Europe as a part of Scandinavia and has a population of a little more than 5.4 million people. Copenhagen is Denmark’s largest city with a population of roughly 600,000 inhabitants with 1.6 million in the near region. Population density is half of UK and Germany, but four times higher than US.

Denmark is the oldest monarchy in the world, ruled by Queen Margrethe II. Political power is vested in the Folketing, a 179-seat parliament elected by universal adult suffrage that presides in the Christiansborg Palace in Copenhagen. Denmark has two tiers of local government – regional and municipal. The country is divided into five regions, each with an elected regional council and council chairman responsible for policies on primarily hospital matters. There are 98 municipalities, whose responsibilities are nursing homes and home care, social services, protection of the environment, local roads, and schools. The Danes tend to be avid followers of political events, frequently paying close attention to the debates in the Folketing that are broadcast live on television.

Denmark has one of the most integrated healthcare systems in the world with a vast exchange of information between healthcare sectors.

The state and municipalities levy taxes to finance healthcare. Countrywide reimbursement of public monies is done between the operating actors.

In January 2007, the regions and municipalities were re-established as part of a major structural reform. Fourteen former counties were merged into five regions, and 275 municipalities were merged into 98 larger municipalities. The reform has initiated a larger number of IT consolidation projects, most of which have been completed. At regional level, consolidation will continue in 2009 and into 2010.

There are more than 3,500 hospitals, pharmacies, home care agencies, general practitioners and specialists practicing in Denmark.

The Danish healthcare sector is basically operated by the following entities:

- The State/Government agencies, the Association of Regions (Danish Regions) and the Association of Municipalities – responsible for central regulations and services and cross sector initiatives;
- GP and specialist clinics – all operated as private business units;
- Regions – responsible for all public hospitals; and
- Municipalities – responsible for nursing homes for the elderly, home care activities and health centers (e.g., rehabilitation and preventive care).

There are only a few minor private hospitals and while private health insurance has increased over the recent year, the private hospitals only account for about three percent of the total hospital costs.
The main healthcare issues facing Denmark’s healthcare system are the aging population and increase in chronic diseases that drive higher overall healthcare costs. Also, the less common issue of lack of healthcare providers is an increasing concern to the healthcare system. Due to the predominantly publicly funded healthcare system, waiting times to obtain treatment has constant focus from providers, citizens and politicians.

National EHR Program

National IT/ICT Status & Strategy

Denmark is exemplary of a country that focused on building national networks early. Now that the infrastructure has been built, the focus has shifted towards providing patient-centric healthcare services across organizational boundaries, with a focus on quality of care, efficiency, and patient safety.

The healthcare IT market has evolved due to the initiatives of National Healthcare Information Technology (IT) strategies, together with regional and municipality procurement processes of specific systems.

In 2007, a formal central independent organization, Connected Digital Health in Denmark, was established. This organization is governed by the Ministry of Finance and Ministry of Health and Prevention, the Danish Medicine Agency, Danish Regions and the National Association of Local Authorities in Denmark. Connected Digital Health is responsible for strategies and initiative for digitalizing healthcare in Denmark.

The current health IT architecture and system landscape consists of a number of different elements:

- National healthcare network: VANS operated EDI network and Internet-based network for other traffic;
- Healthcare portal: Citizen and healthcare professional portal using a SOA for accessing information and services from external systems;
- National registers: National Person Identification Register with a unique ID for all citizens in Denmark; National Patient Register used mainly for statistical and national accounting purposes; Personal Medical Profile with medication information from GPs and municipalities; and e-Journal, with aggregated EHR information from most hospitals; and
- National Quality Database used for accreditation based on annual self-assessment and external evaluation.

National/Regional EHR Approach
The existing EHR approach is primarily Service Oriented (category #3). It consists of a national healthcare network supporting about 50 different types of messages. National databases imbedded in the national framework serve as CDR.

The new Danish healthcare IT strategy from Connected Digital Health in Denmark is also Service Oriented (category #3). It has been expanded to include not only the CDR but other services as well. The new strategy also aligns requirements to local systems while centralizing certain mature functionalities (e.g., a national Medication Card with information on all medication for the individual, whether the medication is prescribed by the GP, at the hospital or for certain medication prescribed through Home Care).

The new strategy contains a stronger governance structure, coordinated by the National EHR Organization, with the ability to intervene in local projects.

The national network, MedCom, became a permanent organization within the Danish structure in 1999. It coordinates several Service Application initiatives along with all technical and legal aspects related to them, including:

**Hospital and Home Care Communications:** MedCom established its Local Authority Project (2002-2005). It included mandatory and large-scale use of MedCom's standards for communication between hospitals and home care.

**E-Prescribing:** MedCom’s message standards are also used by primary care physicians for e-prescribing. The Danish Health Portal allows patients to refill their prescriptions directly online, just as it is possible for home care employees to renew the prescriptions of the elderly from the home care solutions.

**The Danish National Health Portal:** The Danish National Health Portal was established in 2003. It is a combined portal for patients and healthcare professionals. The infrastructure of the Health Data Network is also the basis for the development of the Danish Health Portal. It is the main access point to the primary health portal of the Danish Health Authorities and enables communication and services to be delivered between patients and their health professionals. Additionally, the Health Portal provides a
reliable space for patients to obtain advice on health, medical treatment and disease prevention.

**Medical Reports:** MedCom has defined templates for over 40 types of clinical reports based on consensus of healthcare professionals (e.g., Patient Discharge Summaries from hospitals).

**Personal Electronic Medication Profile:** The Personal Electronic Medication Profile (PEM) and Common Medication Cards are national databases of drugs prescribed by GPs, hospital prescriptions, and administered by home care and nursing homes. These solutions are operated by the Danish Medicines Agency.

**Security:** All healthcare systems require user identification and authentication passwords. There are strict rules regarding the logging of the systems (e.g., read, write, change, delete). A clinician can only access a patient’s EMR when the clinician is in an active treatment relationship with the patient.

A national digital certificate and signature solution is available for patient and healthcare professional access into the National Health Portal. Within local systems, the security model is role-based. A national role catalogue is on the agenda at Connected Digital Health in Denmark, as well as a national security model to be used in local and national solutions.

**EHR Governance**

**Legal/Regulatory**

In Denmark, it has been recognized that the use of technology in healthcare improves welfare, while simultaneously improving the efficiency of the health delivery systems. The government is highly focused on mitigating the risk of creating systems that allow violation of confidentiality and security. To address these issues, Denmark enacted the Patient Rights Law, a departmental order from the National Board of Health. The law addresses consent and exchange of information between healthcare parties, handling of personal information, identification of patients, hospital-based IT-security and the handling of data by public authorities.

In Denmark, data is normally considered owned by the authority responsible for the system into which the data was entered, even if entered by the patient himself. Legislation gives the patient right of access to documents, including EMRs.

Provider liability associated with EHRs is a minor issue in Denmark compared with the United States, for example.

**Healthcare Policy**

While there has been success in creating standards for healthcare IT in Denmark, a continued effort is needed to ensure interoperability. The National Panel for Standardization of Medical Informatics has published a booklet on Danish and European standardization work. Additionally, there is a Danish Standardization Committee.
Convergence towards HL7 is ongoing. The same is the case for SNOMED where the adoption is expected to require a longer time frame.

Specifically relevant to MedCom, an open standard for EDI-mail has been developed to ensure compatibility with existing VANS- based communications and interoperability between the new IP-based network and the VANS- based network. EDI communication (XML, EDIFACT, HTML, HL7, DICOM) is in wide use. The National Healthcare Network is based on EDIFACT messaging and their newer XML equivalents. EDI messages are frequently transmitted through VANS suppliers. Use of the Internet is only permitted in closed and secure networks.

G-EPJ was an ambitious attempt by the National Board of Health to establish a new healthcare reference model to support problem-oriented, interdisciplinary medical practice and records. This initiative was a core part of Denmark’s previous National Healthcare IT strategy. However model development of G-EPJ has proven difficult, especially in systems implementations and support from practicing clinicians. G-EPJ has now been mapped into HL7 in order to integrate the Danish IT-solutions into this global framework instead.

Procurement of products and services above €200,000 are regulated by European Union procurement rules that, in practice, requires that most procurements be made through public formal tenders.

With regard to outsourcing, systems operation is often outsourced; however, major internal IT department outsourcing is almost non-existent.

IT vendors align their contributions to national healthcare IT strategies and new healthcare specific legislation through the healthcare subcommittee in the Danish IT Association.

**EHR Financing**

Tax is collected at national and local (municipal) levels. Regions (hospitals) are financed through an 80 percent fixed allocation plus 10 percent each from the state and municipalities, with 5 percent from both latter sources being activity-based.

Regions finance their acquisition of EHR solutions through their own budgets. The same is the case in municipalities for Home Care, Health Center and all other IT solutions.

**Technology**

The following denotes the number of years of operation for the systems/initiatives:

- National Patient Register - 30 years
- Personal Electronic Medication Profile (PEM) - 3 years
- E-Journal - 6 years
- Sundhed.dk: - 6 years
- Patient access (phase one) - 4 years
The first dedicated EPR and home care solutions have been in place for 12-15 years, while the first GP systems have been available for more than 20 years.

Routine tasks are carried out electronically by healthcare professionals on a daily basis. These include hospital admit/discharge/transfer functions, administration of medication, clinical processes (including clinical planning, documentation and monitoring of results and vital values), scheduling and CPOE.

Adoption

All hospitals have used EHR for years. With few exceptions, all GPs use an IT solution for their patient records. All municipalities use Home Care solutions.

The amount of HIE between sectors is very high.

MedCom is the national healthcare data and information network set up in 1994 to enable secure electronic communication between all healthcare professionals and the social care sectors of Denmark: One hundred percent of all emergency physicians, 92 percent of GPs, 65 percent of all specialists, 100 percent of hospitals, 100 percent of pharmacies, and 98 percent of laboratories use MedCom for electronic communication. MedCom's "Internet X-Ray Image and Description Search" project also provides healthcare professionals with direct Web access to essential patient information stored in the diagnostic radiology system of another region or hospital. The MedCom message standards are also used for e-reimbursement from public insurance organizations to GPs, specialists, pharmacies, and dentists. In addition, the MedCom message standards are used to generate e-discharge letters and referrals between hospitals, GPs, specialists and physiotherapists. It can be used for submission of e-laboratory, e-pathology, e-microbiology and e-radiology requests and reporting of the results to GPs, specialists, and other laboratories and radiology departments in both state and private hospitals. Finally, e-correspondence (free text letters) between clinicians and e-municipalities, including hospitals and community care centers, are facilitated by utilizing MedCom standard.

Patients can use the Danish National Health Portal to book appointments with their GPs. However, most GPs have not yet published their schedules on the Web site and, therefore, most appointment bookings are still done through phone contact.

To allow the patient access to his/her own data while in hospital, the EHR has been implemented at a few selected hospitals.

Outcomes

Danish constituents demand a modern, coherent healthcare service system that can avoid errors and duplications, decrease waiting time and improve clinical outcomes to rival the best seen in other North European countries.

In recent years, numerous research studies and surveys have attempted to document the ROI of implementing EHR/EPJ in the Danish healthcare sector. Several studies confirm significant time savings resulting from electronic communication, allowing more time for...
the care and treatment of patients. This is particularly true in hospitals. In addition, financial savings have been predicted to be as high as €84 million annually.

Studies suggest that EHRs save 50 minutes per day in each GP’s office, phone calls to hospitals are reduced by 66 percent, and 2.3 minutes are saved per message. This translates into €60 million saved per year. An additional savings of €22.5 million, or 25 thousand person months, can be saved in human resources.

**Benefits**

Based on experience using MedCom standards, electronic communication enables direct reuse and automatic validation of data prior to sending it. It also removes human error resulting from incorrect re-entry of data and flawed interpretations of handwriting.

A 2004 study, “The cost benefit of electronic patient referrals in Denmark,” found that 217,160 hard-copy referrals per year that are sent to hospitals via the postal service take an average of 1.33 days longer to reach the hospital than an electronic or fax referral. This extends patient waiting time and for those patients who are unfit to work, creates extra costs to society in general. GPs estimate that between five percent and ten percent of patients referred to the hospital are classified as unfit for work at an average cost to society at €939/day.

MedCom standards allow hospitals to use electronic referrals, send discharge summaries and avoid data re-entry. The professional quality of referrals has risen as a result. Interestingly, 45 percent of MedCom messages are referrals. Through MedCom standards, access to specialists and retrieval of their reports has significantly improved.

The introduction of electronic medication systems has already reduced the number of medication errors in Denmark. In addition to identifying errors, the system also sends documentation of medication errors to risk managers in order for future errors to be mitigated. Moreover, medication errors and other unintended events are anonymously reported to a national database, run by the National Health Board.

**Implementation Experiences**

Prompt, complete and valid information regarding the entire period of patient care is perhaps the most important benefit derived from MedCom. This has improved communication and resulted in positive organizational change in the Danish healthcare industry.

While common across all countries, barriers still exist in Denmark’s healthcare system, due to bureaucracy and the fact that laws lag behind technology possibilities. Even after technical problems are solved, it remains to be seen whether or not organizations can overcome IT adoption challenges. Budgets are increasingly strained, causing government to make choices as to its funding in healthcare.

**Next Steps**
The 2009 action plan from Connected Digital Health in Denmark includes the following initiatives:

- The Common Medication Card that ensures that medication from all sectors is available, wherever the patient is in contact with the health system;
- An increased use of telemedicine in order to provide the patient with a better possibility to participate in his or her course of illness through monitoring at home and self-care;
- Expanded National Patient Index to include information from all sectors in addition to the existing index with information from the hospitals; and
- Standardization of clinical pathways.

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NORWAY

Overview of Country Healthcare System

Norway wraps around northwestern Scandinavia, stretching 1,752 km from southernmost Lindesnes across the Arctic Circle to the North Cape. As of 2005, approximately 75 percent of the population lives in urban areas. The country has been a NATO member since 1949 and is the celebrated home of the Nobel Peace Prize.

Since the 1970s, the economy and its welfare policies have been buoyed by the sea – from its oil extraction in the North Sea to its strong growth in the fishing industry. Norwegians’ benefits include, among other things, government-sponsored university education and free medical care. The country’s social welfare programs are politically sacrosanct. Even when the longstanding rule of the left-leaning Labor Party came to an end in 2001, the new centre-right government still continued the social welfare programs.

Two referenda on Norway’s membership in the EU ended in a “no” vote, while a 2004 poll suggested that support for membership had risen to above 50 percent. For many centuries, Norway was forced to cede sovereignty and its citizens became minor inhabitants in someone else’s kingdom. In 1905, a constitutional referendum changed that and established a Norwegian constitutional monarchy with Haakon VII on the throne. Haakon VII’s descendants rule Norway to this day with decisions on succession of the monarchy remaining under the authority of the Storting (Parliament).

The state provides healthcare funding to the counties and municipalities but municipalities can, and increasingly do, levy additional taxes for this purpose. The 434 municipalities are responsible for the management of primary care, but the state has a more extensive role and has been responsible for the 72 hospitals in the regional hospital service since 2002.

National Healthcare Reform has organized the hospital sector into four regional health authorities: North-Norway, Mid-Norway, South-East Norway and Western Norway. These four regional health authorities are required by law to cooperate with one another with regard to IT. Like other Nordic countries, all care providers are regulated to document what they do.

The citizens of Norway are concerned with the availability (including wait times), efficiency and quality of the healthcare services. While IT may not immediately improve these areas, it may offer new opportunities to reduce strain on the healthcare delivery system.

Central financing for Te@mwork2007 provided 222 million NOK over the course of three years. Additional contributions from participating partners (e.g., hospitals) are estimated to be far greater than 222 million NOK already pledged. Funding for the National Health Net and electronic communication has been a priority for several years and accounts for between 38-39 percent each of the central financing budget.
National EHR Program

National IT/ICT Status & Strategy

Denmark and Norway are two examples of Nordic countries that focused on building national networks early and are now addressing activities to increase communication across those networks. These activities must consider any issues pertaining to security, regulation and standardization as well as the applications themselves.

Norway’s progressive national IT strategy encompasses a massive patient-centered, cross-government initiative designed to give businesses and patients access to digital public services. Communication to electronically deposit and retrieve information is structured to work through a national Internet portal.

Norway is committed to leadership in customer service through a "virtual service centre" and the continuation of Høykorn, Norway’s support program for broadband and "digital competence." Te@mwork2007 is the latest (2004) e-health roadmap drafted by the Directorate for Health and Social Affairs. It calls for the expansion of electronic communication across the nation to promote access by patients and their relatives into such service agencies as pharmacies, municipal health and social services.

The national healthcare network now includes all hospitals and a significant proportion of PCPs. The network facilitates telemedicine and the interchange of electronic messages (lab reports, referral and discharge letters and radiology reports). It also offers government-level security for safe access to the Internet for Web-browsing and e-mail, as well as widening its spectrum of services.

All hospitals, with one exception, have implemented an EHR system. There are three hospital EMR systems used throughout Norway. The hospitals in North-Norway and the smaller hospitals in South-East Norway use DIPS. Very few hospitals use the Infomedix system from TietoEnator. The hospitals in Mid-Norway and the larger hospitals in South-East Norway use Siemens Doculive. In 2007, the Western Norway Regional Health Authority was in the process of replacing its current vendor.

The primary EHR systems used in GPs’ offices are Winmed, Profdoc Vision and Infodoc. All four of these systems are designed as multi-user systems to be run on a local network.

Another electronic resource is the Practice-Related Electronic Knowledge (PEK) initiative. PEK is a subproject of the National Health Library and provided access to clinical guidelines for nurses and clinicians.

National/Regional EHR Approach
The hospital EHR systems are centralized systems. The healthcare authorities’ plan to develop a service oriented architecture (such as category #3 above) that will incorporate EHR standards. The proposed changes are under the jurisdiction of the "Nasjonal IKT," a healthcare IT group established with stakeholders from the four regional health authorities.

**EHR Governance**

**Legal/Regulatory**

The Norwegians recognize that the use of technology in healthcare has the potential to improve welfare while simultaneously improving the efficiencies of the health delivery systems. They have enacted strong legislation concerning the confidentiality of personal information. In 2000, Norway passed Act No. 31 (Personal Data Act) relating to the processing of personal data in order to protect that information. In 2001, focusing on healthcare, Norway passed Act No. 24 (Personal Health Data Filing System Act) relating to the processing of personal health data in order to protect patient confidentiality by making anonymous both structured and unstructured text in the EHR. Studies such as this led to the enactment of the Patient Rights Act that regulates the privacy rights of patients regarding the information contained in EHRs. Both Acts define the liability of healthcare providers who participate in the electronic exchange of information.

In 2004, the Norwegian Research Council funded an “anonymization” project by the Department of Computer and Information Science at Norwegian University of Science and Technology (NTNU). The project focused on the GP’s office and was designed to protect patient confidentiality by making anonymous both structured and unstructured text in the EHR. Studies such as this led to the enactment of the Patient Rights Act that regulates the privacy rights of patients regarding the information contained in EHRs. This Act confers ownership of EHRs to the patient and, therefore gives he/she the right to inspect the information contained therein.

**Healthcare Policy**
The terms on which providers, health plans, public health authorities and researchers participate in HIEs are regulated by the Personal Data Act and the Personal Health Data Filing System Act. As indicated above, the Patient Rights Act regulates the privacy rights of patient regarding their information contained in EHRs.

Kickbacks and self-interest referrals are not perceived to be a problem in Norway and, therefore, are not regulated.

Every Norwegian is assigned a GP who typically cares for between 1,200–1,800 patients. When a patient needs specialty care, his GP has to write a referral letter. In theory, the GP is obligated to restrict access to specialists; in practice, however, it is the patient who decides.

Public awareness of privacy issues is high and there have been incidents regarding breaches in security that have reached the front pages in the newspapers. The Norwegian Data Inspectorate is responsible for compliance with federal laws regulating privacy and security and the government has announced that new regulations will follow, further restricting access to patient information. It will soon be prohibited for a healthcare person to read the EMR of a patient who is not under his care unless directly given the authority.

In 2006, the government began a legislative research study to determine what negative impacts on e-health, if any, resulted from the Personal Data Act, the Health Registries Act and others. That same year, the Directorate launched a code of conduct study to determine how the different healthcare organizations should treat patient health information in order to comply with the National and European Data Protection Act. As a result of these investigations, technology has been developed that can check for and track unauthorized entry into clinical e-records.

The Norwegian Centre for Informatics in Health and Social Care (KITH) was founded to stimulate the use of IT in the health and social sectors. Since 2003, there has been a test and acceptance scheme provided by KITH to ensure that all EPR systems conform to standards in the National Centre on Emergency Communication in Health (KOKOM) program including codes, classifications and terminology. Unlike other European countries, Norway has not yet adopted SNOMED, HL7 or LOINC.

The Department of Telemedicine at University of North Norway (UNN) was established in 1993 and it became the Norwegian Centre for Telemedicine (NST) in 1999. This organization focuses on developing and implementing telemedicine in new areas.

**Technology**

At the 2007 E-Health Conference in Iceland, Liechtenstein and Norway adopted a common commitment to pursue structured cooperation on cross-border electronic health services throughout Europe.

In order for GPs to be reimbursed by the Norwegian social security system, they must adopt standardized EHRs. Billing elements that must be included are the unique personal identifier of the patient: gender; date of birth; address; the date, time and type of the healthcare encounter; and the diagnoses using the International Classification for Primary Care (ICPC).
Norway is known for its broad and innovative use of telemedicine, including such services as: teleradiology, otorhinolaryngology, telepathology, ophthalmology, teledermatology, telecardiology, teledialysis, prenatal, emergency service, teleoncology, telecare, teleodontology, teleendocrinology, telesurgery, psychiatry, solutions for patient empowerment, maritime telemedicine and distance learning programs.

Norway provides digital signature software to all healthcare providers using PKI. This program was created by the National Insurance Service and is made available throughout the healthcare sector.

The “E-Resept” (e-prescription) program is charged with the task of establishing a national, fully electronic information chain for prescription drugs and medical supplies. The EPR systems for both GPs and hospital-based physicians will be modified to produce electronic prescriptions through XML and will require digital signatures using a PKI-based smart card. The Norwegian Medicines Agency will support e-prescribing through a downloadable dataset covering all drugs and medical supplies (prescription and dispensing support). This dataset will be integrated directly into the EPR and will be synchronized with data from the pharmacies’ computers. This will create a single source of information to ensure uniform data quality on all prescriptions.

Most Norwegians have Internet access. It is less common, however, among older adults and low-income families. Making EHRs available to patients through the Web has raised many security and confidentiality questions and mass Web health record access may not be available for some time. As a prelude, the government has instituted a pilot project known as “The Individual Plan.” This is a “lighter weight” application than an EHR and there has been less resistance to its implementation. Patients have had access to their records in the Individual Plan since 1999 when the Norwegian government enacted legislation to provide electronic data for patients who need coordinated long-term care and assistance. While initiated by the central government, the municipal/town authorities are responsible for creating and maintaining the Individual Plan. In this program, the patient (plan owner) owns his record.

A Web-based system called “SamPro” was started by the Ministry of Health, despite the fact that some plan owners do not have access to the Web. SamPro is a mini-version of an EHR and, in addition to the Web, a telephone for personal entries can be used to update the record.

Norwegians have other means of accessing information. For example, MedAxess provides a secure electronic communication system between the patient and his PCP. In addition, the Ministry of Modernization has established multiple portals including a patient portal, MyPage, a Security Portal and the Public Procurement Portal.

MyPage enables patients to view information, such as addresses and the names of their PCPs, that is held in various healthcare agencies. The patient can use MyPage to correct information or submit an application for change.

The use the Internet for health information will continue to grow. The Directorate for Health and Social Affairs showcases the Norwegian Healthnet as a means to ensure continuity in services and preventive care.
Adoption

More than 99 percent of GPs use an EMR-system for a majority of their clinical and administrative tasks. Studies have demonstrated that an increasing proportion of lab reports, referral and medical discharge summaries are electronically exchanged via the National Healthcare Network.

Outcomes

While use of EMRs among Norway’s GPs is almost 100 percent, relatively little use has been made of this resource for quality improvement and research. The three main EMRs (Winmed, Profdoc Vision and Infodoc) do not provide a simple, flexible way to extract data so they must use third party software called QTools. The use of QTools is a starting point for Norway to begin extracting and reviewing data in the interest of quality healthcare improvement.

The National Centers for Expertise will contribute to Te@mwork2007 as will KITH, NST, KOKOM and the EPJ centers. Each will have a central role in developing Norway’s national EHR system to develop a focus on quality in the future.

Benefits

A 2006 study by Lareum was conducted at six hospitals to which 64 physicians, 128 nurses and 57 medical secretaries responded. It found that physicians reported diminished efficiency using EHRs when compared to the use of paper-based records. Nurses reported using EHRs the least and mainly for retrieval of information instead of entering or storing information. While physicians entered their daily progress notes into the EHR 85 percent of the time and used it extensively to retrieve information, they did not use the EHR for entering or storing patient data – similar to what was found with the nurses.

Many Norwegian hospitals have implemented EMRs and weaned themselves from paper-based clinical workflow. Two studies of hospitals that have implemented EMRs concluded medical secretaries benefited from the change even more than physicians and nurses.

In 2005, another study focused on the experiences of patients who exchanged secure electronic communication with their PCPs. The study was designed to examine privacy versus the usability of the system; 15 patients who used MedAxess were interviewed. The researchers concluded that, despite a perceived need for secure electronic patient-physician communication, security barriers exist that can diminish the overall usefulness of patient access to an EHR. A dual approach is, therefore, necessary to improve patient interaction with the electronic healthcare system. First, patients need to be better informed about security issues and, at the same time, user interfaces must be modified to improve patient access to their records.

Implementation Experience

Data security and other legal issues pose enormous challenges to the adoption of healthcare technologies. They create barriers that can inhibit the diffusion of EHR. Such
barriers to the finalization of Te@mwork2007 may be economic, legislative or organizational in nature.

Throughout Norway, old paper records are being scanned in order to make all records available in digital form. This is not a simple task because, in addition to old paper records, new paper records such as lab results and referral letters are still part of the system.

The patient-specific data contained in the EMR is also a source of medical knowledge for researchers. The Department of Computer and Information Science at NTNU has developed techniques and methods to semi-automate the anonymity of medical information contained in the physician office EMR. This ensures that data may be stored and retrieved without violating patient confidentiality. The government achieved this level of security in 2004 and has since focused on the use of abbreviations, legibility and sensitive data elements in a patient’s record.

As countries across the globe plan for the utilization of technology, potential barriers to its adoption include health and social sector bureaucracy. In addition, because laws and regulations lag behind technology adoption, technical solutions may not always lead to organizational change.

Budgets and funding for EHR are being increasingly strained in Norway, with ever-increasing demands to shift contributions to healthcare delivery systems stressed by an aging population.

Finally, a lack of common standards continues to plague the healthcare IT field despite continuing efforts to improve the situation.

Next Steps

Within Norway’s EHR/PHR/HIE programs, the Ministry of Modernization plans to implement a website for patients to view their prescriptions registered in the Reseptformidler (Prescription Broker). Other major goals of the e-prescription program are to improve the quality of the prescription chain, reduce medication error and duplication rates, and improve the availability of prescription drugs. The e-prescription program will also provide NAV (the Norwegian Labour and Welfare Organisation) with the electronic documentation needed to reimburse pharmacies for prescriptions.

Norway will continue to focus on the secure exchange of electronic health information. To the end, it will continue to develop interoperability, facilitate messaging and widely promote the use of the PKI for security.

Finally, as the population of the country ages, the government will focus on the delivery of home care and how the EHR infrastructure can expand into this sector of healthcare.

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