eHealth in Action

Good Practice in European Countries

Good eHealth Report

January 2009

European Commission
Information Society and Media

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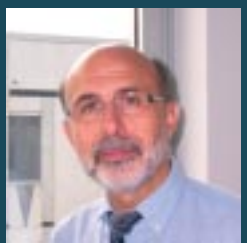
Of course, possible inaccuracies of information are at the responsibility of the project team. This report reflects solely the views of its authors.

Foreword



European Research and Development 'Framework Programmes' have been supporting innovative information and communication technologies to facilitate and improve the delivery of health services (ICT for Health or eHealth) for more than 20 years. This has resulted in over 450 projects worth more than € 1 billion, thus contributing to the emergence of standardised eHealth solutions such as electronic health record systems and a health knowledge infostructure across Union member states.

Since 2004, the EC has also taken a lead in coordinating eHealth policy development and applications deployment by adopting a European eHealth Action plan. Almost all member states have identified within their information society policies or, more specifically, as part of their health policy priorities, the fostering of eHealth implementations as a key priority to help meet the challenges which all our health systems face.

By now it has become a commonly accepted health policy premise that, without the wider adoption of eHealth solutions, national and regional health systems will not be able to cope with the steadily rising demands for better health services and the cost impact of medico-technical progress which allows us to achieve a healthier and longer life for our citizens. And it will foster the further growth of the European eHealth industry and its competitiveness in an emerging global eHealth market, identified as an innovation-friendly market by the recent EC Lead Market Initiative.

But what is the current situation? Where is "eHealth in Action"? Already the 2004 Action Plan envisaged that drawing on and sharing best practices and experience from across the Union would enable Europe to move towards a "European eHealth Area". Indeed, "sharing best practices and measuring progress" is one of the three target areas of this Plan. It is in this spirit that this publication (and the knowledge base on which it builds) disseminates and shares best practice across all member states. It clearly documents that eHealth has become a routine tool in the daily praxis of many healthcare providers and has proven its usefulness in a wide variety of application fields. ICT solutions supporting core activities of the healthcare process like diagnosis, therapy or rehabilitation are supplemented by solutions for continued medical education or facilities management and logistics. Health promotion websites, comprehensive in-house hospital information systems or cross-border health services, teleconsultation or remote monitoring of chronically ill are further examples of advanced eHealth solutions. And the vast opportunities for clinical research and trials, training or public health must not be overlooked.

However, to meet European health policy goals and priorities and further develop the 'European Social Model', many more healthcare providers must follow these early innovators. Learning and knowledge exchange are key to this, but not yet common practice across the fragmented landscape of Europe's health systems. A thorough analysis of differences and similarities, successes and challenges will make the difference. The wealth of experiences presented in this booklet will support such learning processes and enable all stakeholders in the health services sector to get inspired by its treasure of ideas.

An important lesson to be drawn from the eHealth solutions presented is that eHealth has not only proven its usefulness but also its sustainability. Some of the solutions already benefit from close to ten years of experience. Several of them have initially been funded as pilots by various support programmes of the European Commission. And this experience and the lessons learned will diffuse further and faster, as eHealth delivers more and more benefits to all stakeholders: patients, consumers, health professionals, healthcare organisations, third party payers and society as a whole.

The 'Good eHealth' study, which developed a comprehensive data base, has been a key element of the eHealth Action Plan initiatives of the European Commission to foster the Union-wide exchange of eHealth best practice. In a wider eGovernment context, this work will be followed up by 'ePractice.eu' in the years to come. With these initiatives we encourage all eHealth stakeholders to further develop innovative ideas and exchange their experience and knowledge with the European health services and policy communities for the benefit of a healthier Europe.

Brussels, January 2009

Gérard Comyn

Head of Unit ICT for Health
European Commission, Directorate General
Information Society and Media

About Good eHealth and this report

Good eHealth – Exchange of Good Practices in eHealth – is a three-year study (2006-2008) funded under the former Modinis programme by the Directorate-General Information Society and Media. The objectives of this study are to:

- identify good practices and their associated benefits
- develop and implement proven approaches to wider dissemination and transfer real-life experiences
- stimulate accelerated take-up of eHealth by addressing common implementation challenges and lessons learned.

This report presents case studies from 30 European countries for which validated information was available to the project by the end of November 2008. This information reflects the situation of the cases at the date of delivery to the project by national correspondents during the time period 2006-2008. Possible inaccuracies and subjectiveness of information are the responsibility of the project team. This report solely reflects the views of its authors.

The report is the outcome of research in the context of the Good eHealth project, implemented in cooperation between Deloitte Belgium and empirica Communication and Technology Research, Germany. The Good eHealth project is commissioned by the European Commission, DG Information Society and Media, ICT for Health Unit.

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This booklet presents 30 summary case studies from 30 European countries, and many more abstracts of additional cases, all of them described in detail in the eHealth Good Practice Knowledge Base **(www.good-ehealth.org)**. But why is it worth spending resources on identifying, recording and analysing such cases? And what is the wider context within which such efforts must be seen? These are among the issues to be briefly discussed in this introductory chapter, which will also reflect on the relevance and beneficial impact of eHealth applications on health policy priorities and health system challenges. This will be complemented by a short summary analysis of cases presented in this publication and in the online knowledge base, including a concise review of success factors identified in these cases. As we underline in the *Outlook* section, this is 'work in progress', to be continued in the years to come.

Why presenting good practice cases?

Sharing and disseminating "best practices", including measuring progress, is one of three target areas mentioned in the 2004 *eHealth Action Plan* of the European Commission.[1] "Drawing on best practices and experience from across the Union" is expected to facilitate the move towards a "European eHealth Area" and the development of common approaches to shared problems over time.[2] Spreading best practices is a means to support Member States, policy makers and other actors in the health system in their efforts to address common challenges and create the right framework to accelerate eHealth implementation and diffusion for the benefit of all citizens. *"Learning from each other is not a natural behaviour in the fragmented landscape of European health delivery systems. Taking the time to understand the success factors and the mistakes of others can tip the balance towards better health services through innovative eHealth solutions and thus avoid a waste of scarce resources"*, commented Ilias Iakovidis, Deputy Head of the European Commission's ICT for Health Unit.

Documenting good practice

DEFINING A GOOD PRACTICE CASE

Case studies come in a wide variety of types, from short cursory notes to book-length descriptions compiled after months and years of information gathering, observation of and sometimes even direct participation in work processes.[3] For our research, we relied on an approach based on a structured "single case design" [4], focusing on a single unit of analysis, which may be a specific eHealth application or system, but also a regional network or similar "unit".

For our purposes, we defined a *good practice case* as a real life, sustained eHealth solution in routine operation, which represents a good learning experience for Europe or for the country / region concerned, though not necessarily an ideal solution or one without any problems.

We prefer to talk about *good* practice only: there does not exist 'best' practice as a generic concept across disparate health services systems. What is judged as 'best' will always depend on the national, cultural, structural context and subjective assessments. What might be judged by some as best in one context may not be applicable at all in another, even similar context or not "work" for other reasons like legal requirements or habits and attitudes of citizens. On the other hand, good practice cases as defined above - in spite of reflecting unique experiences - can provide useful insights for others, likely to stimulate creativity, self-reflection and the transfer or adaptation of good ideas.

It must be noted that the above definition excludes a wide variety of "cases" quite often regarded as good practice, like experimental or pilot implementations, initial deployment situations and the like. Experience has shown that many of such applications are not sustainable once the research and development (R&D) or start-up funding has ended.

1. COM (2004) 356, Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions – eHealth: making health care better for European citizens – An action plan for a European eHealth Area. eHealth action plan: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2004:0356:FIN:EN:PDF
2. Ibidem, p. 4
3. On the latter type, see, e.g., some of the papers on organisational change in industry, particularly in Volume III, in David Preece, Ian McLaughlin, Patrick Dawson (eds.): Technology, Organizations and Innovation - Critical Perspectives. Four volumes, New York: Routledge 2000.
4. Yin, Robert K. (2003): Case Study Research. Design and Methods. In: Applied Social Research Methods Series Volume 5., Southand Oaks: Sage Publications, p. 34.

FROM IDENTIFICATION TO FINAL CASE DESCRIPTION

The identification of sustained eHealth solutions is the first step in the research process of *Good eHealth*. Initially, the project started re-investigating eHealth collections available from earlier studies like *eHealth Impact*[5] or the applications submitted to the *eEurope Awards 2003 to 2005*[6]. To identify further cases, which had not yet been presented in an international context before, the project initiated a network of country correspondents, who are familiar with the national, regional or local market and are able to speak the country's language. Thus continuously observing the eHealth situation, the project screened more than 600 eHealth solutions.

A *Good eHealth* internal selection board reviews all cases identified and agrees on a final list of cases for further investigation. This selection process is based on the expert knowledge of the board members and is guided by a set of criteria. These include the track record of the respective case, the geographic balance of countries and the types of solutions, the degree of innovativeness as well as the likely commitment of the health service provider to make further information available. The number of proposed cases exceeded the number of cases eventually included in the knowledge base. A limited cooperation of the 'case owners', language problems and other constraints, explain this difference. And, of course, considering this selection process, the cases cannot be regarded as a representative sample of European 'reality' nor assessed 'objectively' as the best ones to be found across Europe.

A selected case is then investigated in some depth. Secondary sources, published and unpublished material and telephone interviews with stakeholders are used. Country correspondents are again active in this process. As native speakers they can communicate most effectively with the case owner. The country correspondents deliver their output back to the project team, which assesses the case's quality and publishes it in the online knowledge base.

5. www.ehealth-impact.org
6. www.e-europeawards.org

IMBEDDING GOOD PRACTICE IN A GLOBAL LEARNING ENVIRONMENT

The importance of learning from good practice has been acknowledged not only across Europe, but also globally. The Canadian Society of Telehealth for example provides an online Telehealth Resource Kit with a variety of change management case studies as part of its Telehealth Change Management Repository.[7]

Recently, the US *Agency for Healthcare Research and Quality* noted that "successful examples [of health information technology] are few and inconsistent. ... To generate substantial and ongoing improvements in care, health IT adoption must go hand in hand with ... the routine use of solid improvement methods by clinicians and other staff."[8] Well organised good practice repositories should be part of this effort. The agency also recognised the need for "a national database of actual results of EMR [Electronic Medical Records] implementations using common terms, definitions and metrics, along with supporting information about the environment that produced those results".[9]

eHealth in support of European health systems

But why is learning from each other and exchanging experience about eHealth implementations so important across Member States? It is because evidence is accumulating[10] that eHealth can indeed help societies to cope with the challenges for European health systems. Solidly financed healthcare systems are an essential part of the European social model, the right to high quality healthcare is a material expression of European citizenship.[11]

7. http://www.cst-sct.org/cm/
8. Langley J, Beasley C. Health Information Technology for Improving Quality of Care in Primary Care Settings. Prepared by the Institute for Healthcare Improvement for the National Opinion Research Center under contract No. 290-04-0016. AHRQ Publication No. 07-0079-EF. Rockville, MD: Agency for Healthcare Research and Quality. July 2007, p. 1.
9. Douglas I. Thompson et al. A review of methods to estimate the benefits of Electronic Medical Records in hospitals and the need for a national benefits database. Journal of Healthcare Information Management, Vol. 21 (2007), No. 1, p. 66.
10. Cf., e.g., European Commission (ed) (2006): eHealth is Worth it - The economic benefits of implemented eHealth solutions at ten European sites. Luxembourg: Office for Official Publications of the European Communities (OPOCE). http://ec.europa.eu/information_society/activities/health/docs/publications/ehealthimpactsept2006.pdf
Economic impact of interoperable electronic health records and ePrescription in Europe (www.ehr-impact.eu)
11. Kickbusch I (2005) The Health Society: Importance of the new policy proposal by the EU Commission on Health and Consumer Affairs, Health Promotion International 20(2): 101-103; Sindbjerg-Martinsen D (2005) Towards an Internal Health Market with the European Court, West European Politics 28(5): 1035-1056.

Good eHealth practice - adding value to health services

However, medico-technical, socio-economic and health system trends challenge the successful pursuit of these values. "Roughly half of the increase in health care spending during the past several decades was associated with the expanded capabilities of medicine brought about by technological advances."[12] It feeds on the average age of the population, i.e. life expectancy at birth increases and the elderly fraction of the population grows. The demographic change caused by these advances, the ageing of our societies, in turn affects both the clinical pattern - driving demand for health services - and the available resources for healthcare - enabling supply. And eHealth applications have proven their potential to become key means in support of meeting such challenges They can open up new opportunities for the further development of our health systems.

eHealth good practice – the evidence

SHOWCASING A WIDE VARIETY OF SOLUTIONS

As the manifold cases in this booklet and in the *Good eHealth* knowledge base demonstrate, eHealth comes in a wide variety of solutions, and can support all types of health services: health promotion, diagnosis, therapy, rehabilitation or long-term care. eHealth can also underpin support activities like management and administration, logistics and supply of health-related goods, facilities management as well as public health, continued medical education, or medical research and clinical trials. All theses activities rely on the exchange of information and communication with each other. eHealth solutions facilitate this across wards and departments as well as the wide range of actors, stakeholders and institutions composing regional, national or cross-border European health value systems.

In its 2007 report on 'eHealth priorities and strategies in European countries', the European Commission presented governments' plans and undertakings with respect to eHealth policies, strategies, roadmaps, and infrastructures on a national level.[13]

In a complementary fashion, this booklet focuses on the diversity of implemented eHealth solutions in European countries – from implementations at a ward up to nation-wide level, and cross-border activities. The *Good eHealth* case descriptions of about 100 successful solutions in routine operation showcase important examples of the diversity of eHealth practice in Europe.[14] They can, for example, be implemented at various levels of a single organisation, between several organisations, and at a regional, national or international level. The knowledge base usage statistics show a particular interest of users for single-site und inter-organisational case studies.

Good eHealth in figures

In general, available eHealth solutions can facilitate any primary as well as support activity of the healthcare value chain within a single organisation.[15] They either offer a specific functionality or support in an integrative fashion several connected activities. About half of all cases in the database deal with or are also connected to health administration and management tasks, i.e. so-called support activities. The other share of cases deals with applications supporting or connected to therapy, then diagnosis - both less than one-third, and health promotion with about one-fifth. The reason for administration and management solutions being so prevalent is probably the very nature of IT systems: they deliver relatively early measurable benefits when applied to well-structured processes, which is a key concern for many healthcare providers. The diagnostic and treatment processes, on the other hand, are more difficult to structure, but are in essence the primary activities of health service provision. In addition, knowledge base users show increasing interest in areas not related to direct patient care but to the re-use of such information for research, training or management purposes.

Analysing the overall set of cases in some more detail, the term 'hospital' appears in three-fourths of them, indicat-

12. The Congress of the United States, Congressional Budget Office (CBO): Technological Change and the Growth of Health Care Spending. Washington, DC, January 2008, p. 12. Technological advances is there defined as "changes in clinical practice that enhance the ability of providers to diagnose, treat, or prevent health problems."
13. European Commission (ed) (2007): eHealth priorities and strategies in European countries. Luxembourg: Office for Official Publications of the European Communities (OPOCE) http://ec.europa.eu/information_society/activities/health/docs/policy/ehealth-era-full-report.pdf.
14. www.good-ehealth.org
15. On these concepts, see Porter, Michael E. (1985): Competitive advantage. New York: The Free Press, p. 36ff.

ing that their great majority is connected in one way or another to hospital-related activities. In contrast, the acronym GP or term 'general practitioner' is recorded in only one-third. Telemedicine and telecare are mentioned in 25 percent of the documents, subsets of which refer to home monitoring half the time and only few to teleconsultation or teleradiology. Electronic health record (EHR) systems are mentioned in 25 percent of the cases, picture archiving and communication systems (PACS) in about 10 percent, and ePrescribing in 7 percent. About one-fifth of cases refer to some type of 'cards'.

The cases with the longest experience included in the knowledge base were planned in the early 1990s. In 1994, the first cases started routine operation. While the database includes 21 cases with more than eight years of experience, most of the cases started routine operation between 2001 and 2006, indicating that eHealth is becoming more and more a routine part of healthcare. The interest of viewers of the knowledge base spreads evenly across all documents, not indicating a specific preference for older or newer cases.

All of these data exemplify the comprehensiveness of the variety of cases documented, but they can in no way be constructed as being representative for the European Union. On the following pages, the *Good eHealth* project presents case studies selected from the ones recorded in the knowledge base. This selection underlines this width of solutions and does not necessarily identify those which may be judged by some as most important, successful or interesting. Such an assessment would anyhow always vary depending on the purpose at hand. The success factors which determine the sustainability of the eHealth cases and lessons learned are presented in the following section.

Success factors and lessons learned

In the course of researching the Good eHealth cases, executives and innovation champions responsible for realising the application in the respective organisation were asked to inform about success factors and lessons learned. Solutions are considered to be successful when they turned out to be sustainable in the longer term.[16]

Project managers and users from various backgrounds described the success of their eHealth solutions mostly in the way 'how' the respective solution was implemented and did not relate success much to 'what' was implemented. The major success factor was securing acceptance within the organisation through the adoption of change management processes. Acceptance starts with a sound analysis of users' requirements at the outset of an implementation project. Project managers emphasised that all stakeholders affected should be included in such an analysis. Furthermore, continuous involvement of the stakeholders during the whole development and implementation life cycle must be assured. Medical professionals turned out to be a crucial stakeholder group that needs to agree. Stakeholder feedback must be taken seriously to create trust. Other important stakeholders are patients. This implies, among other things, that decision makers should not confuse user-centred design with health professional centred design.

Of course, achieving trust and agreement is not always easy. When it comes to changes in an organisation, conflicts cannot be avoided. Project managers mentioned that they achieved effective partnership by working with multi-disciplinary teams, assessing the eHealth solution at stake from different perspectives. Some stressed the importance of in-house IT competence as opposed to complete reliance on external IT expertise.

While teamwork and user involvement appear to be crucial factors, leadership is also an essential part of success. The project team needs support and full commitment from highest level of the organisation's hierarchy.

Many eHealth solutions are developed and deployed successfully by following an iterative approach extending both functionality and number of users step-by-step. This approach does of course not mean to expose users to flawed solutions. The opposite is true. The development team may want to separate the introduction of a new solution into meaningful steps each creating a value in its own right like a specific contribution to reducing

16. The majority of the many hundreds of individual cases identified in various sources could no longer be traced some years later.

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patient waiting times and/or creating added value compared to the existing solution, e.g. through cost savings. The long-term development vision should be clear but the team needs to define goals within a shorter time period and be flexible in adapting to changing user needs and new technologies coming to market. Often pragmatic solutions were preferred to overly sophisticated or innovative solutions requiring a very long time horizon or a complete organisational overhaul. Quick wins help the developers to convince users of the solution's value.

Regarding process reorganisation, various *Good eHealth* cases identify two opposite approaches. Some organisations prefer a complete process reorganisation, others to successively integrate the new solution into existing health services workflows. Both approaches can be successful but have their difficulties. Complete process reorganisation appears to have advantages with regard to the ultimate benefits of the solution, but it is more difficult to manage. In contrast, incremental solutions may fail to reach sufficient added value needed for acceptance, but are easier to realise.

There are also success factors directly related to technology. Simplicity of use was mentioned several times. The technology needs to be reliable and interoperable with other systems. This requires that they apply common eHealth standards wherever available. Furthermore, when the eHealth solution is being deployed, users need at least basic training and competent support, e.g. from trained colleagues, but quite often also rather extended learning sessions disconnected from their normal place of work. Insufficient opportunities for learning and training are a key factor for failures of the whole solution.

Usually, several of such generic success factors surface in any of the case studies. In addition, there are often also idiosyncratic factors strongly related to the individual application. In the individual case summaries to follow after this introduction, lessons learned – which often imply success factors – are described in a specific box in order to facilitate easy access to key information.

Outlook

Good practice cases as documented by the *Good eHealth* study and evaluations of eHealth systems can be an important resource for decision makers, who require reliable and adaptable evidence of the benefits, which would accrue from the investments they must decide on. In a wider context, our work will be followed up and extended by the 'ePractice.eu' project in the years to come.

The authors hope that the cases presented in this brochure and those in the online knowledge base will strongly support the Union-wide exchange of good practice and knowledge about eHealth, and foster the accelerated usage of eHealth applications for the benefit of European and global citizens.

Good eHealth practice

in European Countries

Austria

RPS2 – resource planning system

RPS2 is a multidimensional resource planning system which has been employed since 2003 at the University Clinic of Innsbruck in the accident surgery and sports traumatology department. It integrates several autonomous systems and resources and is essential for achieving optimised clinical treatment.

The Resource Planning System RPS2 is a useful planning tool for health service providers. While physicians previously had to make appointments with patients in a rather time-consuming and laborious way, scheduling procedures have been enormously enhanced through the employment of RPS2.

Currently used in accident surgery and orthopaedics in the University Clinic of Innsbruck, scheduling is facilitated for physicians' surgeries, daily work rotas and on and off days. On adding a new appointment to the agenda the system considers the respective physician's work time, his or her vacations, the availability of an operating theatre, the work hours of other healthcare staff involved, the resources needed and the legal requirements (for example related to work time), before the appointment is confirmed. It even considers seasonal fluctuations and an emergency float. As a result, physicians can effortlessly and efficiently arrange an appointment with their patients during their consultations.

Both the project and the system were funded by the federal and state governments. In 2002 planning procedures were initiated involving members from the University Clinic, an organisation responsible for IT at the Innsbruck hospitals, and a software company. Following a planning and testing phase of six to eight months, routine operation started in 2003.

Benefits

- Planning is more efficient and reliable because RPS2 scheduling takes into consideration various aspects such as shift and vacation schedules, as well as the availability of resources, and because it provides a comprehensive overview of all appointments.
- With RPS2, the hospital bed occupancy rate of the department of accident surgery and sports traumatology of the University Clinic of Innsbruck increased by 10 percentage points to 85%.
- RPS2 has increased patient and healthcare staff satisfaction because appointments have become more reliable.

Lessons learned

- Continuous discussions between the different stakeholders involved during project planning and implementation helped to identify and eliminate potential risk factors.
- Usability problems increased in line with the number of features integrated in the user interface.

Belgium

PENTALFA – continuing medical education through videoconferencing

The PENTALFA project promotes state-of-the-art knowledge about biomedical topics by offering an internet-based and multi-disciplinary learning programme.

Continuing medical education (CME) for professionals is important for high-quality healthcare provision, but can be very time-consuming. The inconvenience involved meant a reduced number of participants in CME sessions at the University of Leuven's Medical School, and a resultant diminished spread of up-to-date information on healthcare. The strong position of the School in CME was further threatened by the isolated location of Leuven in the Flemish region and by increasing traffic. To counteract these difficulties, it developed PENTALFA, a video conferencing programme, providing CME in cooperation with other hospitals from the Flemish Hospital Network.

The Medical School organises between 23 and 28 videoconferences per year, each of them dealing with a specific medical topic. The conferences are attended by different experts and audiences. During the 10-year programme, the average number of participants was 177 per session. The videoconferencing is bidirectional - audiences can actively communicate with the speaker's site - and is encouraged by including "classroom" discussions in the programme.

Planning for the PENTALFA project started in 1997 and routine operation commenced in 1998. The solution is customised and structured into three layers: a steering committee which decides on scientific content, an administrative staff responsible for facility management and support for the participants and finally a technical staff operating the conference equipment on each site.

Start-up funding was mainly provided by the university, with sponsorship from private companies. Members of the hospital network provided funding for the upgrading of equipment. Personnel and IT costs are paid by all participating sites. Sponsorship is sought for the printing and distribution of advertisement in the form of posters and programme brochures.

According to a survey, 84.6% of participants at peripheral sites said that they would not make the effort to come to Leuven for this particular session if no videoconference was available. Participants at the video sites reported a saving of, on average, 123 minutes compared to taking part onsite. The multispecialty approach of the programme leads to an audience of which only 30% share the speaker's specialty.

Benefits

- On average participants save 123 minutes of travel time per video conference, resulting in three times more participants.
- The total return per participant in a peripheral location and per hour amounted to approximately 106 euro during the year 2005-2006.
- 65% of participants in videoconference CME report that learning effectiveness is increased compared to classic CME.

Lessons learned

- Establish a framework to ensure that each participating site meets the scientific, administrative and technical requirements.
- Ensure that speakers are trained in using technical devices and are familiar with unique "classroom" requirements.
- Keep in mind that those who benefit and those who bear the costs of the project might not be the same people.

Belgium

Integrating hospital information systems at Ambroise Paré Hospital

The Ambroise Paré hospital in the city of Mons, a public university hospital with 500 beds, effectively integrated its dispersed information systems using a fairly simple solution from a local IT service provider. The solution improved workflows and the accessibility of patient records. Any investments necessary were small, and existing efficient specialised information systems remained untouched.

FLOW – national healthcare network

FLOW is a national Belgian health network for healthcare professionals working with shared healthcare patient records. FLOW enables all healthcare providers to treat any patient anywhere and at any time. Patients will be exempted from multiple unnecessary medical examinations since previous results will be available in the FLOW system. FLOW stands for: Facilities (services and related infrastructure); Legal implementation (telex files); Organisations (loco-regional teams); and Wisdom (coordination and supervision centre). The FLOW project is financed by the Belgian Federal Ministry for Public Health.

Flemish vaccination database and Vaccinet

The Flemish vaccination database and Vaccinet provide an electronically accessible vaccination record for each child. It has been in routine operation since 2000. The application offers the following additional functions: vaccination stock control and supply, a rapid and reliable messaging channel about changes in vaccination policies and practices, data for performance monitoring, and the Flemish government's strategy development. The database provides the means to boost vaccination rates and act on vaccine shortages.

Bulgaria

Integrated hospital information system at the National Heart Hospital

The National Heart Hospital (NHH) in Sofia is the only Bulgarian cardiology hospital that has implemented and integrated a comprehensive hospital information system (HIS), including medical and administrative ICT applications. The main impacts of HIS integration were the improved quality of patient care and improved inventory management and logistics.

The NHH is the biggest hospital specialising in cardiology and paediatric cardiac surgery in Bulgaria. It is a leader in ICT use in Bulgarian hospitals. Active development of the hospital information infrastructure and systems began in 2003. Today, ICT applications in the NHH support the following processes: patient admission, registration, primary care, hospitalisation and discharge, clinical pathways allocation, purchase and distribution of drugs and consumables, costs calculation, accounting and reporting, procurement management, personnel management, laboratories investigation, as well as general management and administration. The infrastructure consists of 250 personal computers and ten servers connected to an intranet. Interoperability of the different applications is achieved through a special interface application - the common standard for medical data exchange developed by a Bulgarian company that is based on XML and which supports various software platforms.

The HIS has significantly improved the quality of health service and job satisfaction in the NHH. Since the HIS provides easy, rapid, 24-hour access to patient records, physicians receive all the necessary information in seconds, allowing them to treat the patient without delay. Daily information about any medical service provided to the patient enables management to detect mistakes and to respond immediately. Patients know that all medical services provided to them are entered in their records and supervised, which increases their trust and comfort.

The costs for the patient stay in the hospital are reduced by 10 – 15% due to the faster provision of medical services and the control over the delivery of medicines and consumables.

Benefits

- Due to rapid access to the patient record with full medical information, many unnecessary tests and procedures are avoided.
- More patients can be treated in a given period of time. Costs for patient stays in the hospital were reduced by 10 – 15%.
- The HIS improved the quality of health service significantly. Physicians receive all the necessary information in seconds, allowing them to treat the patient without delay.

Lessons learned

- Include the hospital's management and staff in the development and implementation process in order to adapt the hospital information system to the medical requirements and to increase motivation and work satisfaction.
- User friendliness of the solution helps to overcome initial obstacles.
- Ensuring that healthcare staff are familiarised with the system before they start working with it is essential to avoid time-consuming changes.

Hippocrates – software supporting general practitioners and medical centres

The Bulgarian software "Hippocrates" creates a full electronic patient record by compiling information such as family anamnesis, medical history and examination results. General practitioners and medical centres can produce all records required by the National Health Insurance Fund according to the standards and local codes for examinations, diagnosis, and drug prescription. In routine operation since 2003, the system's medical and administrative functions have reduced paperwork by 70%. It is currently used by 50% of all GPs and 15% of Medical Centre specialists.

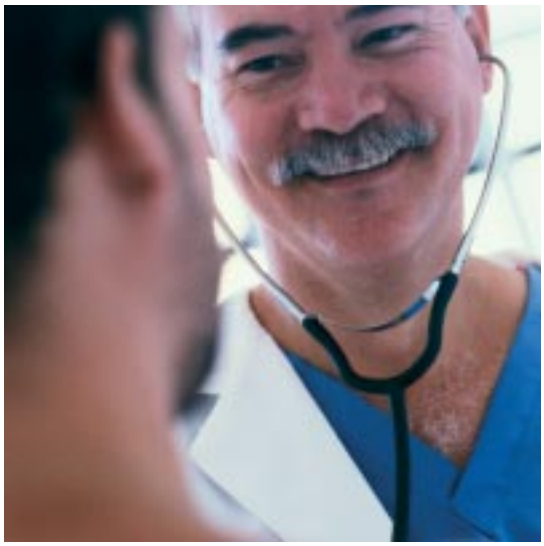
Cyprus

DITIS – network for virtual homecare teams

The DITIS network enables effective collaboration and management of virtual home healthcare teams in Cyprus. It is a web-based system that provides electronic health records (EHRs) and other supporting tools such as messaging and ePrescription with secure access from anywhere.

DITIS facilitates management and cooperation between homecare health professionals from different organisations. It includes nurses, physicians, physiotherapists, psychologists, social workers and other health professionals who care for a single patient at home but neither normally nor easily meet. They can instantly access electronic health records (EHR) via desktop computers and mobile IT devices. DITIS provides various tools such as instant messaging to team members, as well as automatic notification and alerting triggered by predefined rules. It also offers tools for improved efficiency and for minimising errors: a calendar, symptom and pain diary, medication chart, wound care assessment and information on drug interactions. Additionally, it has ePrescription and eReport features.

Planning of the application started in 1999 and it went to routine operation in 2003. Currently, it is supporting the activities of the Cyprus Association of Cancer Patients and Friends (PASYKAF), offering homecare services to over 600 Cyprian cancer patients every year. DITIS was originally developed by the University of Cyprus and PASYKAF with support from various organisations. Development was continued in the eTen market validation projects HealthService24 and LinkCare.



Benefits

- Increased efficiency of team communication.
- Chronically ill patients and their families experience an improved quality of life because if one health professional is present on site, all others can be virtually present as well.
- Cost savings of up to 40% - for example staff visits to head office for paperwork and management, as well as some visits to patients, can be avoided.
- Audit processes, research and policy-making are supported, as DITIS makes comprehensive data and statistics available.

Lessons learned

- Continuous use and evaluation of the application are necessary to meet the users' needs and to steadily improve the application's performance.
- Full-time support should be provided to ensure smooth operation.
- Sufficient pre-implementation and ongoing training for users should be provided to allow for exploitation of the system's potential.

Czech Republic

IZIP – a web-based, nationwide electronic health record system

The web-based IZIP is a nationwide electronic health record system (EHR), used by all relevant stakeholders in healthcare, including the patients themselves.

The primary objectives of the EHR system are to improve the quality of healthcare through an accurate and rapid exchange of information among healthcare professionals and in the doctor-patient relationship; to increase transparency and limit examinations and drugs to those really necessary; and to involve patients in order to extend their medical awareness.
The electronic health record includes all relevant information about a citizen's contacts with healthcare services compiled for example from regular GP visits, dental treatments, laboratory and imaging tests, hospitalisation reports and vaccination history. Doctors can have access to a patient's EHR at point of care, so that each doctor can resume treatment where the previous doctor had stopped. Since 2008, patients can also see how much their health insurance fund paid for their personal treatment.
Citizens have the right to access and consult their own EHR, but only healthcare professionals can make changes to the record. Citizens are able to authorize healthcare professionals to view their data, making them a truly active element of the healthcare system. Data security is currently guaranteed by a password and PIN system for all healthcare professionals.
Planning for the system started in 1999 and in routine operation began in 2005. IZIP is co-funded by the largest health insurer in the Czech Republic, covering about two thirds of the Czech population. 10% of the population and over one third of all healthcare organisations are currently connected. This fully functional, nationwide system is a globally unique flagship application which received a World Summit Award in 2005 and was recently selected as one of the outstanding eGovernment applications worldwide by the European Institute of Public Administration.

Benefits

- Involving citizens in their healthcare will likely lead to healthier citizens, better informed about their health condition and personal health risks.
- Insurance companies benefit from the network through cost savings, stemming from the avoidance of repeated tests and examinations.

Lessons learned

- The system's constant alignment with long-term goals is essential.
- Initial problems of convincing physicians and hospitals to participate can be overcome by offering financial incentives, software support and training sessions.
- Health insurance may be a strong long-term partner for funding the system.

MeDiMed – metropolitan digital imaging system in medicine

MeDiMed aims to create a central database of digital images from different medical imaging devices (X-ray, PC tomography, ultrasound, etc.) by connecting 6 health institutions, 17 medical devices and one communication centre in the Czech Republic. The central database supports knowledge-sharing among researcher, educational projects (pre- and postgraduate education for medicines and radiologists) and primary diagnostics. It currently contains over 150,000 images.

Pecujici.online

Pecujici.online is a Czech website intended to help people take care of their older relatives and disabled spouses. Given the fact that nearly one quarter of the Czech population looks after an elderly relative this application is intended to provide home carers with useful information, advice and support. There is even a psychiatrist available online to answer questions.

Denmark

Remote treatment of alcohol abusers

This Danish eHealth application facilitates access to therapy for alcohol abusers in remote areas. Using video equipment set up at a rehabilitation centre on the island of Funen and two hospitals located on remote islands, abusers are treated via teletherapy.

The application is based in the Alcohol Rehabilitation Centre (ABC) in Funen County on the main island of Funen. Given a remarkably low proportion of people from the remote islands of Funen County seeking treatment for alcohol abuse, the application aims at making alcohol abuse therapy accessible: firstly, by providing patients living in remote places with easier access to alcohol abuse treatment and secondly, by preventing them from being stigmatised when entering an alcohol rehabilitation centre. The ABC offers teletherapy as a therapeutic option for patients from the remote islands of Langeland and Aeroe. Therapy offered at ABC is conducted as individual outpatient sessions on a weekly basis involving only the patient and the therapist. The initial session clarifies the patient's situation and he or she is subsequently offered the most appropriate type of therapy. The only difference from regular face-to-face therapy is that, having made an appointment with an ABC therapist, the patient only has to travel to the local hospital where a healthcare professional assists him or her in using a portable and fully integrated standard video conferencing system. The connection between the hospital units on Langeland, Aeroe and the ABC is established within the closed network of Funen County, which is connected to the Danish Health Data Network via a secured virtual private network connection.

The planning phase started in 2003 and the system was launched in 2004. After initial technical problems had been solved, routine operation started in 2006. Project officers, hospital managers, therapists and IT technicians were involved in setting up the service. Since the operating costs of the application are very limited they have been borne by Funen County without recourse to external funding.

Evaluation results show that both patients and therapists are satisfied with the teletherapy solution: they experience almost no difference from the traditional face-to-face sessions. Since October 2005, 30 alcohol dependents from Langeland and Aeroe have received teletherapy, which represents a significant surge in the number of patients treated. An important advantage of the teletherapy solution is that these patients stayed longer in therapy than the patients who received traditional face-to-face therapy (223 days in comparison to 162 days on average). In addition, more patients completed their treatment, and as this completion is of great importance for the abusers' social integration, it is hoped that the new system will have a far-reaching therapeutic value.

An initial challenge of the project was therapists' doubts that patient contact would be as close as in face-to-face sessions. This concern soon turned out to be unjustified. Some minor problems arose with regard to the technical equipment that, in the beginning, was not fully adapted

Denmark

to the therapeutic context, but those difficulties were quickly remedied. There remains the challenge of informing all potential patients of the application. As of today, all patients starting an alcohol abuse therapy are encouraged to participate in teletherapy. In a current pilot, alcohol addicts are introduced to teletherapy during their hospitalisation.

Benefits

- The number of alcohol abusers receiving therapy and the duration of therapy attended has increased significantly.
- Access to alcohol abuse therapy is facilitated for patients in remote locations.

Lessons learned

- Technical equipment has to be adapted to the healthcare requirements: high quality has to be combined with ease of use.
- Information about the availability of teletherapy should be given attention in order to make it well-known and encourage patients to partake.

sundhed.dk – Denmark's eHealth portal

Launched in December 2003, the Danish health portal www.sundhed.dk provides information about healthcare providers and health promotion to citizens. For example through the portal they can consult their General Practitioners via e-mail, enter their GPs' online booking system, and renew prescriptions online. GPs themselves can order laboratory tests through the portal.

MedCom and the Danish health data network

The role of the Danish organisation MedCom is to support eHealth projects, to develop and implement a nationwide health data network (DHDN), and to secure electronic communication of local and regional projects in the healthcare sector. Planning the DHDN started in 1994; in 2001 it went to routine operation. Healthcare providers benefit from effective data exchange, improved data quality and costs savings in preparing and sending information to other healthcare services.

Estonia

PACS – nationwide instant access to radiological images

A nationwide picture archiving and communication system (PACS) has been established for simultaneous archiving and viewing of radiology images produced in different healthcare institutions throughout Estonia. It consists of two PACS systems installed in two major hospitals in Estonia, both containing the same data. This central PACS receives all images taken at local hospital PACS systems, archives them and provides the local systems with access to these images as needed.

The system enables radiological images to be stored and viewed electronically, so that physicians and other health professionals can access the information and report on the images. Images are ready for reporting immediately after the examination. Patients may receive their images on CD upon request.

This data exchange is performed via internet and secure connection protocol. Currently, 42 healthcare organisations and about 800 general practitioners are connected to the nationwide PACS, which means that 82% of all medical images made in Estonia are sent to and retrieved from the central PACS system. It is used not only for direct patient care but also for education and research purposes.

Planning of the system started in 1999 and routine operation was initiated in 2006. The strategy was developed by the Estonian Society of Radiology and implemented under the coordination of the radiology department of Tartu University Clinic as well as other major hospitals in Estonia. The Estonian PACS is operated by a non-profit foundation.

Benefits

- Reduced waiting times for patients due to rapid access to specialists and the possibility of a second opinion.
- X-ray film expenditure is estimated to be decreased by 90-95%.

Lessons learned

- The involvement of all stakeholders in planning and deployment – i.e. radiologists, IT personnel, the board of main hospitals, Medical University, Estonian Society of Radiology, Ministry of Social Affairs – has been a precondition for success.
- A high percentage of digital image use and a good virtual private network connection between hospitals have significantly contributed to successful implementation.

An internet-based digital health record system in Estonia

The digital health record (DHR) system enables the exchange of health data between healthcare professionals throughout Estonia. The system aims to create a country-wide network of centrally stored health data. The central database includes an emergency dataset that contains information on the contact, insurance coverage and allergies; a directory that links to other sources with medical data about the patient; and centrally stored medical records.

Finland

Impacts of ICT in the Hospital District of Helsinki and Uusimaa

In the Hospital District of Helsinki and Uusimaa (HUS) in Finland, electronic health services and electronic patient records are incrementally impacting on the role of hospitals. The most important changes regard the relationship to patients.

The HUS comprises 23 hospitals with more than 3,500 beds in 32 member municipalities of Uusimaa province. The HUS seeks more effective health service operations and high-level treatment results as well as patient and personnel satisfaction. However, the HUS vision does not include the implementation of ICT as a goal in itself. In the HUS, the use of ICT is already very common. The HUS hospitals are connected to each other and to municipal health services through a regional health information network. All HUS hospitals are filmless and have used one central PACS for storing images since 2004.

In the HUS, patients are being given more information about their medical conditions than previously, and as many tests and treatments as possible are being done outside the hospitals. ICT supports the related flow of information, enabling a reduction in the number of hospital visits necessary, a reduction in the length of stay in hospital, and an increase in outpatient visits over inpatient stays. ICT also lowers the boundaries between hospitals and primary care centres, as information flow is speeded up and increased. There is also increased specialisation of hospitals in the region facilitated by ICT due to the related enhanced level of information.

The HUS has an ICT vision for 2012. Some of the most important elements of this vision are that: patients are meant to contact healthcare providers from home-using electronic communication; care personnel is meant to have all necessary information readily available; management is independent from organisation boundaries; and municipalities have real-time information about costs and quality of health services.

Benefits

- ICT speeds up and increases the information flow between patient, primary care facilities and hospitals.
- Patients have much better access to information about their medical conditions than previously.

Lessons learned

- While it would be technically possible to fulfil the HUS ICT vision quite quickly, completion is not planned until 2012 because organisational changes require considerable time for implementation.
- One of the biggest barriers to enhanced ICT communication between primary and secondary care facilities is that (for good reasons) doctors often do not want to rely on impersonal electronic information.

France

Institut Curie, Paris: Elios, a comprehensive electronic patient record, and Prométhée, a meta search engine

The combination of a sophisticated electronic patient record system (Elios) and the search tool Prométhée allows the use of the latest research in current treatment, analysing data and creating new knowledge.

The Institut Curie, Paris, France, has been a leading international research and treatment cancer hospital for a long time. The introduction of Elios and Prométhée in 2002 was the key driver behind the active progress of Curie towards becoming a paperless hospital. Elios is a comprehensive electronic patient record (EPR) system. It enables access to patients' information by all members of the relevant healthcare team. These include Curie's external partners, such as other hospitals or general practitioners. Prométhée not only acts as a portal to gain easy access to Elios, it is also a user-friendly meta-engine tool. It enables healthcare professionals to ask specific medical questions across a large number of Curie's administrative, patient and clinical research databases. The advantage of Prométhée lies in its rapid data compilation and analysis, particularly for research purposes and evaluation of medical practice.

The implementation of both tools fundamentally transformed Curie's healthcare processes. It improved the Institute's medical, research, and administrative performance. Hence, 92% of the annual benefits of these two applications – estimated at 4-5 million euro – is reaped by the Institute itself, and 8% by the citizens. It took Curie 7 years to achieve a positive annual net benefit, and 8 years to recover from losses that were made in the investment phase. Productivity – measured in eHealth cost per patient – is growing steadily.

The results of Curie's systems are particularly positive: improvement in quality of care due to better informed professionals, time-savings for doctors and administration, improved collaboration between doctors in relation to specific patients, and cost-savings on both paper and archiving. The commitment of the Curie's stakeholders (board of directors, multidisciplinary teams and clinicians) to this pragmatic step-by-step approach is recognised as one of the two systems' major success factors.

Benefits

- Improvement in quality of care as a consequence of extensive knowledge-sharing among practitioners.
- For 2008 annual benefits are estimated to exceed the annual costs by 4,3 million euro, with the institute reaping 92% of the annual benefits.
- Significant time-savings for doctors and administration and cost savings on paper and archiving due to the EHR system.

Lessons learned

- Continuous commitment of management and clinicians was essential for the positive outcome.
- A great effort was however needed to keep this commitment over a development period of 7 years.

France

Arras public hospital information system

In 2000 a public hospital in Arras, in Northern France, had run up heavy financial losses and was dependent on a patchwork of hardly integrated information systems. As a solution to tackle both problems an entirely new hospital information system (HIS) was envisaged. It comprises a hospital record management system and both performance management and enterprise reporting software. The investments in IT infrastructure lead to improvements in clinical workflows and made them profitable again. Investment amounted to 3.5% of the hospital annual budget, being 2% over the national average.

DPPR – a patient record for the Rhône Alpes region

The Shared and Distributed Patient Record (DPPR) used in the Rhône Alpes region enables clinical information about a patient to be shared among those physicians who deliver care to the same patient. Physicians have real time access to patient data which is stored remotely at a variety of locations. The DPPR essentially relies on the identity server STIC, which helps to match the different identifiers used in the different systems. Since its start in 2005, use has grown continuously, currently housing over 100,000 health records and linking 30 different data sources.

RIPAM – Southern Ardèche patient information network

The Southern Ardèche Patient Information System RIPAM remotely stores patients' health records which are accessible by both patients and healthcare professionals. Since 2004 the application has been used by physicians in various public and private hospitals, private practices and diverse laboratories and imaging centres in the French Ardèche region. The personal health record contains information on patients' allergies, vaccination, their social and general context, organ donorship, health insurance specifics, current treatment, etc. and access to this information is exclusively authorised by the patients.

COHERENCE – a clinical information system of Georges Pompidou Hospital, Paris

COHERENCE is a comprehensive clinical information system (CIS) implemented in the Hôpital Européen Georges Pompidou (HEGP). Opened in 2002 HEGP completely redesigned the care workflow and around that built a new hospital building and tailored off-the-shelf ICT components to fit that redefinition of hospital care. One of the biggest hospital reorganisations in Europe resulted, for example, in increased nursing personnel bedside presence (from 1.43h to 1.52h/bed), or a reduction of the average length of stay by one day.

Germany

Medical Online Portal of the Ingolstadt Hospital

The Medical Online Portal of the Ingolstadt Hospital (Klinikum Ingolstadt) in Germany optimises input and retrieval of information at the point of care. The use of tablet PCs for filling in forms, accessing laboratory results and scheduling examinations allows for increased value in healthcare services such as diagnosis, therapy and rehabilitation.

The Medical Online Portal is a communication platform that connects all healthcare professionals in the hospital. The Ingolstadt Hospital serves 35,000 inpatients and 40,000 outpatients. Before the portal was implemented, patient-related information was collected on paper forms and then inserted manually into the electronic information systems spread throughout the hospital for further processing. This time-consuming handling of data meant the 3,000-strong healthcare staff had less time to spend on healthcare activities. It also hampered communication for hospital staff and imposed longer waiting times on patients.

The current solution interconnects the hospital's databases, e.g. for radiology, patient records or patient administration, via web services. The physician on duty enters data into the different forms using a tablet PC. This information can be retrieved at any time, thus avoiding duplication of patient data gathering. The physician can also schedule x-rays, laboratory tests or ultrasound examinations at the same time, without re-entering patient information. In order to protect sensitive patient data, the digital forms are signed manually, like paper forms. Authorisation and identification are ensured by the automatic registration of biometric attributes such as the direction and speed of writing.

Various benefits arise from the optimised and more rapid data exchange and entry:

- Simplified filling-in of forms and avoidance of duplicated data gathering results in a time reduction of about five minutes per patient at admission, resulting in 2,000 hours saved in the emergency room every year.
- Improved search for medical information adds up to 35,000 Euro per year. Faster and more reliable decision-making are not included in these figures.
- In general the risk of entering and receiving wrong information is reduced, due to basic elements of a computerized physician order entry system (CPOE).

Initially, an online system had been implemented in the emergency room in 2004. The eHealth Integration Platform, connecting various hospital systems, was established in 2005. In 2007 the Medical Online System started its routine operation. The application is predominantly funded by the hospital itself, anticipating efficiency gains to compensate expenditures. Based on the hospital's experience it can be concluded that positive outcomes require user feedback, acceptance and support. Additional costs caused by data storage in paper format due to legal requirements were underestimated and have to be borne in mind.

Germany

Benefits

- Work time savings of 2,000 hours annually due to improved administration procedures, resulting in additional time for healthcare activities.
- Cost savings of approximately 35,000 Euro per year, due to enhanced search for medical information.
- Identification of users by biometric characteristics increases patient data protection.

Lessons learned

- Bear in mind that paper records may have to be stored for legal requirements and may demand additional costs.
- Update the system, taking into consideration users' feedback.
- Introduce the system incrementally in order to increase user acceptance.

Jeder-fehler-zaehlt.de – platform for information on medical errors in general practice

The website www.jeder-fehler-zaehlt.de ("every-error-counts") is a service tool for primary care physicians and practice assistants who recognise that knowledge of medical errors can be used to improve patient safety. Providing an opportunity for healthcare professionals in general practice to report incidents, the website is aimed at collecting and analysing reports in order to generate a general understanding of the errors.

RFID wristbands and computerised prescribing at Saarbrücken Hospital

In order to avoid adverse drug administration, patients at Saarbrücken Hospital (Klinikum Saarbrücken) are equipped with RFID (radio frequency identification) wristbands to have information on their medication available any time. Since these wristbands are linked to their centrally stored data, previously prescribed medication can be retrieved by holding a pocket or tablet computer equipped with an RFID reading unit near the patient's wrist. Additionally, health professionals are recommended or warned against certain prescriptions and receive an alert if a dose is missed or was already administered.

MedicalOrder® Center Ahlen – supply chain optimisation

Several hospitals in the Münster region gave up their local warehouse, pharmacy, purchasing department and sterilisation unit and centralised it in a single building - the MedicalOrder® Center Ahlen (MOC). By means of an ICT-supported storage and supply system the hospitals automatically order medical and pharmaceutical products from the MOC which can, if needed, deliver in 30 minutes. The MOC helps to reduce stock levels in the hospitals and can reduce product prices due to joint ordering.

GesundheitsCard Europa (GCE) – access to healthcare abroad

Since 2003 patients insured by AOK Rheinland in Northwest Germany can be treated in 14 hospitals across the border to the Netherlands and Belgium by presenting their GesundheitsCard Europa (GCE). This card is also their German health insurance card. In this way, patients can receive treatment abroad as conveniently as in their own country. A web application enables the hospitals to verify insurance coverage and to initiate reimbursement procedures.

Greece

Integrated pre-hospital health emergency services in the Crete region

An integrated pre-hospital health emergency management system was developed to support optimal response management of pre-hospital health emergencies.

The pre-hospital emergency management system (EMS) is an integrated information and communication system that enables optimal response management by pre-hospital emergencies on a regional level. Given that the first 60 minutes are the most critical ones regarding long-term effects on patients, the employment of various modules of the EMS helps to provide vital healthcare in time.

Through intelligent triage algorithms the operator-dispatcher application is able to generate an 'incident card', evaluating the type and severity of an incident and selecting the most appropriate mobile (intensive care) unit for the incident.

With the remote monitoring and management module, first observations and ECGs by the mobile unit can be directly transmitted to a physician at the dispatching centre who in turn can give advice to the paramedics. Information that has been generated or transmitted is recorded on the onboard computer of the mobile unit. Information in the complete archive of emergency episodes is used for administrative decision-making, e.g. for hiring, training, statistics and the acquisition of specific equipment.

The planning phase was initiated in 1996 and after gradually extending the system, routine operations began in 2000. The results were very positive: response time dropped significantly between 2000 and 2006. Dispatch time dropped from five minutes to one, arrival time from twelve to five minutes and transfer time from 18 to 14 minutes. Furthermore, the initial decision by the dispatching unit regarding the assignment of the most appropriate resources turned out to be correct in 82% of the approximately 40,000 cases per year. This is considered a substantial improvement on the situation before the implementation of the EMS.

Funding initially took place in the framework of EU projects such as HECTOR and JUST, and the implementation of a regional health information network (RHIN) of Crete. Later, the implementation of the required eHealth technology in all mobile intensive care units of the region was financed by the Regional Healthcare Authority. Maintenance and support costs are borne by the National Centre for Emergency Care.

Greece

Benefits

- A significant reduction in time for response management.
- A substantial improvement in the accuracy of decisions taken by the dispatcher regarding the assignment of resources.
- Expected 'spill over' effects on the main economy of Crete, for example tourism, through an increase in confidence about the quality of healthcare services on the island.

Lessons learned

- Ensure that both the technical equipment and the implementation team are capable of achieving the changes required in such a complex setting.
- Secure uninterrupted financial support from the concept phase to the point of routine operation.
- Look for an 'internal champion' with the ability to continuously mobilize and motivate people for the project.

CardioExpress telemedical services

CardioExpress telemedicine services is a company which operates a modern call and control centre with the aim of providing instant evaluation on a case-by-case basis and suggesting the best available treatment options. An experienced team of eight cardiologists responds to patients' calls and analyse the available clinical information and symptoms provided by the patient or by his EHR. In the case of a cardiological problem that could be treated through self-management, an appropriate care plan is defined including the required medication.

Delivering home care for chronically ill patients by Sotiria Hospital in Athens

Sotiria Hospital implemented an e-health application for long distance monitoring of patients with a specific type of chronic disease. After an initial phase of training the patient on how to apply the required follow-up technologies, the e-health unit within Sotiria hospital is able to telemonitor the status of the patient and televisit the patient regularly via video-conferencing sessions. Behind this home-based follow-up system is the idea of empowering the patient and increasing the degree of self-management abilities, autonomy and feeling of safety, to the advantage of the patient.

Hungary

TIP – the transplant information portal

The Hungarian transplant information portal (TIP) facilitates the process of matching patients and donors by connecting as many donors and receivers in an information system across the borders of European countries as possible.

It is the aim of TIP to develop and share its portal technology with users all over Europe and to establish networks between European countries and regions. By providing all stakeholders with relevant information the entire transplantation process can be supported: a web-based electronic health record, which is the core of the platform, allows for retrieving medical information on donors and receivers. In order to find a matching donor the physician in a dialysis centre can generate a new patient file, entering the tissue type of the patient for whom he or she is seeking an organ. Other attending physicians can also add further relevant information. Patients who are on the waiting list have a smart card or transplant card, and, if authorised by a healthcare professional, have access to their own records. In addition, the system has several tools available to assist healthcare professionals in the process of tissue typing and organ matching. Medical information can be translated to and from other languages and the relevant information is organised in folders representing the clinical pathway of organ transplantation. Besides giving support in finding matching organ donors, TIP also creates a transparent process of organ search and location.

Funding was provided by the Ministry of Informatics and Communications stemming from a research and development programme. Planning procedures started in 2000 and after a system evaluation and nation-wide roll-out the routine operation was initiated.

Benefits

- The likelihood of finding a matching donor is significantly increased due to the large number of donors and the exchange between both groups.
- Time on the waiting list is shorter as decisions can be based on reliable, up-to-date information.

Lessons learned

- Only through close cooperation between transplant surgeons, immunologists, nephrologists and other physicians can the portal's potential be fully realised and the efficiency of organ transplantation increased.
- Basing the application on a pre-existing conventional clinical information system makes successful operation more likely.

Anesztinfo OJE – a nationwide anaesthesiological information system

The Hungarian Society of Anaesthesia and Intensive Care (HSAIT) developed the anaesthesiological information system ANESZTINFO NRS (Nationwide Reporting System). The system aims at simplifying the nationwide process of data collection in anaesthesia and intensive care. Data from related hospital departments has to be gathered, summarised, analysed and sent to healthcare authorities. The application's routine operation started in 2003.

Ireland

Vhi.ie – a web-based interactive health information resource for the general public

Vhi.ie is a comprehensive electronic gateway for Irish patients to gain extensive information on health issues. It has a library of health and lifestyle articles, an A-Z of medical matters, an ask-the-experts interactive service, an extensive range of interactive online health promotional tools, and a monthly personalised e-mail newsletter available.

Vhi.ie was launched by the health insurance fund Vhi Healthcare. The portal service was implemented in compliance with Vhi Healthcare's eHealth strategy to meet consumer demands for health and lifestyle information and to increase contact with its insurants. It provides support with regard to these topics in order to promote healthy living among its members and the Irish population in general.

It is organised into main and sub-categories dedicated to different aspects of healthy living, for example diet and nutrition and health at work. These categories are additionally targeted at different groups such as elders or students. Members also have the opportunity to exchange experiences and discuss health topics. The service is regularly reviewed with regard to usability and meeting the demands of target groups. The Vhi health insurance fund says that it is committed to inter-generational support rather than a risk-rated system in its reimbursement structure. Thus, health promotion plays an important role in achieving lower health-related claims among younger age groups.

Vhi.ie is entirely funded by Vhi Healthcare. The planning phase started in 1999 and routine operation was launched in 2000.

Benefits

- The portal has 300,000 site visits per month and more than 112,000 registered users, of whom 60% are Vhi Healthcare members, indicating highly beneficial contents.
- The overall reputation of Vhi Healthcare (and therefore customer loyalty) has apparently improved: 87% of members who visit the portal service regularly reported an improved image of their health insurance company.

Lessons learned

- The portal's maintenance, regular input, information reviewing and managing is continuous and time-consuming, and thus cost intensive.

Irishhealth.com – an Internet-based health resource

IrishHealth.com is a comprehensive source of healthcare information, offering quality assured and locally produced health information to all Irish citizens. With the overarching goal of patient empowerment, the website aims to promote beneficial health outcomes, to address the lack of provision of healthcare information at national level and to enable citizens to interact better with the national health system.

Italy

RESPECT – telemedicine service for neurological emergency cases

The RESPECT service is an innovative telemedicine system which supports healthcare professionals in their management of neurological emergencies in peripheral areas of Italy.

RESPECT stands for "regional network for the management of neurological emergency cases through telemedicine". The primary objective of RESPECT is to improve the management of neurological emergency cases: through better access to highly specialized healthcare for citizens from less densely populated areas (the province of Messina) and through knowledge-sharing between specialist centre and peripheral healthcare services.

Emergencies, such as a stroke or a cranial trauma, require prompt and effective treatment. In the case of a stroke for example, a systemic thrombolysis intervention within the two subsequent hours could lead to a significant improvement in the patient's situation. However, such an intervention could only be carried out in specialized centres situated 30 to 100 km from Messina or that are difficult to reach. RESPECT overcomes this distance barrier by using a telemedicine approach.

RESPECT is based on a web platform that allows real-time sharing (streaming) of data and high-resolution medical images between specialists and physicians. The specialist centres are equipped with PC viewer stations, while the peripheral sites in the Province of Messina are supplied with a workstation which they use for sharing medical images with the specialist centres. Based on the images that have been transmitted, practitioners from the specialist centre evaluate further actions to take for a specific emergency case and fax their recommendations back to the peripheral site. The overall procedure takes no longer than 15 minutes.

The project began in July 2003 and received funding from the Italian Ministry of Innovation. It is currently financed by local health agencies. After a positive evaluation, the geographical scope of the telemedicine solution was extended to other less densely populated areas, and the pathological scope was broadened to stroke events.

Benefits

- Access to highly specialized healthcare for citizens from less densely populated areas.
- Appropriate and rapid intervention with less inconvenience to the patient. Around 90% of the operators from peripheral sites agreed that the efficiency and quality of the assistance delivered improved significantly.
- Cost savings due to the reduction of the number of patient transfers to specialist centres (52% between 2003 and 2004).
- Better quality of diagnosis, due to knowledge-sharing between healthcare professionals.
- Average time to provision of specialised treatment has dropped from 160 to 40 minutes.

Italy

Lessons learned

- Involve all stakeholders in the project implementation process in order to increase the overall acceptance of the application.
- Allow enough time for training activities and learning processes to take place so that resistance to the application can be overcome.
- Conduct a project assessment to prove the system's positive outcomes.

Health Optimum – healthcare delivery optimisation through telemedicine

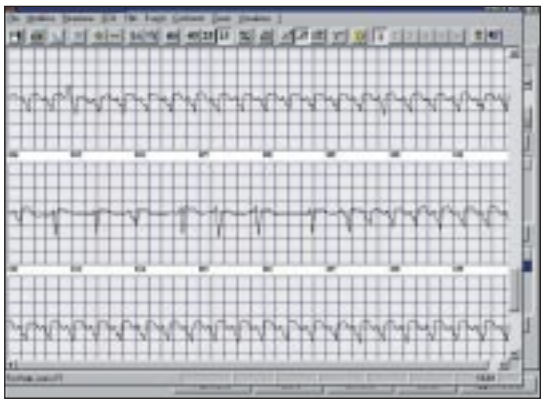
Health Optimum provides telemedicine services to optimise the healthcare services' workflow and promote access to local best practices by using teleconsultation and telelaboratory applications in the Veneto region. A request form with the personal data of a patient and other relevant information is electronically signed by a regional technical workgroup and sent to a neurosurgery specialist, who expresses his opinion electronically. Since initial operation in 2005 there has been a significant reduction in the number of patients hospitalised in specialist centres, and significant cost and time savings.

Telecardiology in Italy – benefits from a telemedicine network

The Health Telematic Network provides a 24-hour telecardiology service to the entire region of Lombardy, using clinical data and recording biological signals. Patients' electrocardiogram data is transferred to a call centre and monitored by nurses who may pass on the data to a team of cardiologists throughout the region. The network improves cardiology services and resources allocation though integrating rapid second opinions for GPs, home telenursing and call centre services for hospitals.

RFID at the Istituto Nazionale dei Tumori

Since 2005 the Istituto Nazionale dei Tumori in Italy uses an RFID application for the traceability of blood bags in order to improve patient safety. To ensure correct identification of patients and the allocation of blood bags, nurses and physicians make use of handheld terminals with RFID antennae, a wristband for the patient and a tag installed at the hospital bed. The system recognizes discrepancies between the data read from the bag and the patient's wristband and stops the blood transfusion.



Latvia

Latvian MIS – web-based national health services management information system

The Latvian management information system (MIS) administers all relevant information about inpatient and outpatient services, contracts, finances, and statistics throughout the country. It also allows for the centralised procurement of medicine. Healthcare providers can access patients' medical history via this system.

The system serves the state's health funding for primary healthcare and emergency services in accordance with the national reimbursement patterns. The primary objectives of MIS are threefold: firstly, to implement the state policy for the provision of healthcare services, secondly, to administrate the State's compulsory health insurance resources and, thirdly, to provide operative and accurate information exchange between the Health Compulsory Insurance State Agency (HCISA) and the various healthcare providers. Latvia's healthcare system is both state and privately funded, with the state providing basic healthcare services including primary healthcare and emergency care. The HCISA administrates the state funding and distributes it among healthcare institutions including general practitioners (GPs).

The Latvian MIS is a centralised three-level web-based system supervised by HCISA, consisting of 14 modules: user management and basic security system; a reimbursement system; a register of participants of the Health Compulsory Insurance fund; a register of medical institutions and medical professionals; a waiting list management system (for some healthcare services); an accounting system; a system for contract and funding regulations for in- and outpatient and dentistry services; emergency medical care; data analyses and statistics; a system for centralised procurement of medication; and a system for the management of the European Health Insurance Card (EHIC). Recently, a public health module monitoring the spread of infectious diseases in Latvia was integrated.

The MIS is based on an Oracle platform software whose interface modules have been programmed in a special manner to allow easy exchange of information between healthcare providers and the MIS. Advanced information security tools are used for the safe-guarding of data against loss, misuse or damage. GPs can access the system directly, provided they have the necessary technical support, i.e. computers, internet connection and sufficient ICT skills. Otherwise they will have to ask the HCISA to enter their data into the MIS, in order to be able to invoice their services.

Benefits

- Costs of health services can be managed efficiently and in accordance with national reimbursement patterns.
- Important information can more easily be administered and exchanged among different healthcare providers.

Lessons learned

- Make sure that a large-scale eHealth project has the support of the relevant authorities.
- The fact that some GPs had no computers and were not connected to the internet hampered cooperation between different healthcare providers and the exchange of patient information.

A nationwide electronic patient record system

A sophisticated solution allows hospitals to access all relevant information about every contact patients have with the healthcare system in Latvia, for example general practitioner and hospital visits, dental treatments, laboratory and radiology tests. The objective is to reduce time devoted to documentation as well as to improve and facilitate the compilation of statistical data.

Lithuania

Eastern Lithuania Cardiology Project

The Eastern Lithuania Cardiology Project is a complex ICT-based network of cardiology assistance. It aims to improve the delivery of healthcare services in rural areas of Lithuania for patients with cardio- and vascular diseases. The project modernises and optimises the existing infrastructure.

In Lithuania, the highest morbidity rate is related to cardio- and vascular diseases. The Eastern Lithuania Cardiology Project covers a region of 15 local authorities. The aim is to achieve optimised diagnostics and healthcare provision, improved access to, and quality of, care, renewed technical standards and implemented information technologies.

The network of cardiology assistance covers and integrates primary, secondary and tertiary healthcare provision. It comprises 40 healthcare institutions (23 primary care facilities, 15 hospitals and two major rehabilitation centres for children). It is situated both in rural and urban areas. Two major university hospital centres in Vilnius and Kaunas are also integrated. Part of the network's functionality is medical data exchange between health professionals, receiving second opinions from remote healthcare colleagues and monitoring.

The project started in 2004 and led to routine operation in 2007. 80% of the funding accrues to the EU Structural Funds, complemented by funds from the Lithuanian government.

Benefits

- The capacity to provide cardio-vascular health services to outpatients in the relevant regions has increased by 20%.
- Waiting times for hospital outpatients seeking cardio-vascular disease consultation has been reduced from 2-4 weeks to less than one week.
- Healthcare is provided within reach of patients' homes.

Lessons learned

- A "waterfall approach" for implementing the system instead of a "big bang approach" proved to be successful.
- Extensive attention needs to be paid to clinical staff using the end product. Appropriate training and assistance needs to be provided.
- Learning from international experience contributed greatly to the system's positive outcomes.

eHealth system development in the Lithuanian healthcare sector

The national eHealth system of Lithuania was implemented in order to replace the fragmented and poorly organised information and communication technologies (ICT) in the healthcare sector. The new eHealth system provides consistent, rational and coordinated activities as well as technical solutions in order to enable electronic exchange of medical data.

Luxembourg

Wikifood.lu – enabling citizens to avoid food allergies

Wikifood.lu is a simple-to-use internet portal that enables citizens with food allergies to identify which packaged foods contain allergens to which they might have a reaction. Details of some 13,000 food products are on the Wikifood website.

For patients, managing a food allergy means avoiding eating particular allergens. When an allergen has been ingested accidentally or unintentionally, it means it is important or even urgent to seek some form of therapy. However avoiding these allergens is not always easy as reading the list of ingredients on all the products one buys is a cumbersome task and not all products have a complete list of food ingredients.

Wikifood helps allergic persons when planning their shopping or meal in listing all products that they need to avoid. As of December 2008, Wikifood had 12,630 foods entered on its database. When searching the database various different types of foods can be chosen, including special dietary preferences. Since recently also cosmetics are included in Wikifood to help avoiding contact allergies. An indicator for the success as well as the need for this platform is that the number of food products registered has doubled within the last 18 months. Since its start in early 2006 usage has grown steadily totalling in 90,000 visits over the past six months.

Wikifood's operation is built on a volunteer network of about one thousand food product users. Users complete the database by typing in the ingredients' lists of products that may be interesting to allergy patients and consumers. Digital photos of bar codes, packages, and ingredient lists help to validate the data entries.

Not only patients or citizens are involved with Wikifood. Various import functions can enable data to be incorporated into the application from existing databases or text files. As a result, food producers or retailers can demonstrate their concern about and interest in food security by delivering information about their products to the Wikifood community. Wikifood is supported, among others, by Cactus Supermarkets, which is a Luxembourg-based largely organic supermarket chain and Haus Rabenhorst, a German food producer.

Unfortunately the application does not yet contain a complete list of food ingredients. Ecological and bio-food producers and retailers, and smaller companies, have been keener and quicker to get involved. More conventional producers and retailers have been less so. Efforts are being made to enhance the relationships with larger corporations.

Wikifood was originally national in its parameters, but it is increasingly international, especially among German-speaking countries. Possible take-up at a wider European level is currently being explored and a French and English version of the portal is already available.

Benefits

- Allergic persons can avoid buying food containing allergens more easily.

Lessons learned

- A complete list of food ingredients is difficult to obtain especially from conventional food producers.

Malta

National eHealth portal

Malta's eHealth portal (www.ehealth.gov.mt) is a web platform serving both information and interaction purposes. Besides offering general information on health-related issues, the portal facilitates communication between citizens, patients and their healthcare providers. A longer-term goal is to enable more advanced transaction-based services requiring registration and authentication.

Malta's national eHealth portal was initiated by the Maltese Ministry of Investment, Industry and IT in 2004 and became operational in 2006. It allows residents and tourists access to various health services on the web. For example, Maltese citizens can apply online for a European Health Insurance Card, enrol online with the National Blood Transfusion Centre as a potential blood donor, apply for weight reduction and smoking cessation clinics, send online requests for healthcare counselling, and submit online public health complaints. The portal also includes an online emergency pharmacy roster.

Most of the eServices hosted on the portal have been taken up quite well, while some - e.g. online registration as a blood donor - have not. This was at least partly due to the difficulties that arose around the Government electronic identity (e-ID) component of the portal: For some of the services, access depends on possession of a valid e-ID by the person requesting the service. Notwithstanding these initial difficulties, further integration of eServices with the e-ID infrastructure is a dedicated objective, as it will facilitate the provision of more advanced transaction-based services.

The portfolio of eServices available through the portal is due to be further expanded. A market analysis has been issued to identify those areas with the highest potential. Possible services are in the fields of progeny (reproductive care), breast care, diabetes care, speech/language pathology and services for the elderly.

Benefits

- Practical one-stop-shop for health services, providing information and transaction services.
- Opportunity to pilot e-ID based applications: other projects, most importantly the e-ID, will benefit from the experience of the end-user acceptance gained through the portal.
- Modular ePortfolio: new eHealth services can be developed and added over time, taking into account demand and the experience from the provision of other services.

Lessons learned

- Difficulties with the e-ID component of the portal: uptake was not good of some of the services requiring e-ID registration (e.g. online registration as a blood donor), due to difficulties with using the e-ID infrastructure.

The Netherlands

The Thrombosis Digital Logbook

The Thrombosis Digital Logbook is an electronic health record system which enables home-monitoring for thrombosis patients in the Netherlands and Germany.

The system allows patients to perform their blood analysis at home and still have their data monitored by the Thrombosis Services. Instead of going to the hospital for blood tests 18 times per year, thrombosis patients have the opportunity to log on to their Digital Logbook every ten days in order to submit their data. The Logbook elaborates a new dosing scheme based on the registered blood values and the individual patient record. Blood results diverging from the established parameters of the system result in intervention by the healthcare professional, who holds ultimate medical responsibility. In addition, the Logbook enables interaction between patient and healthcare professional through free text messages as an alternative to inbound phone conversations.

The Thrombosis Digital Logbook offers significant time and cost savings in terms of supervision and paperwork. The thrombosis services spend about five hours annually on educating a self-managing patient to use the Digital Logbook, whereas supervision of the same patient on a face-to-face basis would amount to ten hours per year. Moreover, home-monitoring not only results in more flexibility and independence, but also creates a feeling of empowerment which results in increased patient compliance.

Planning procedures on the Digital Logbook started in 2002 and one year later the system began routine operation. Based on HL7 and Snomed CT standards the logbook can be linked with laboratories and hospital information systems. Currently more than 10.000 patients make use of the Digital Logbook.

The Thrombosis Digital Logbook was developed by Portavita, a private Dutch company specializing in multidisciplinary chronic disease management systems. In 2005, the Thrombosis Digital Logbook won the ICT award for Innovation 2005, organized by the Ministry of Economic Affairs.

Besides the EHR for anticoagulation treatment, the solution is also available for diabetes, stroke and COPD treatment.

Benefits

- Empowerment of the patient through self-management, resulting in patient compliance, high satisfaction and a feeling of independence.
- Significant time and cost savings with respect to the supervision of patients.
- The "medical cooperation" intensifies the relationship between health professional and patient.

Lessons learned

- Provide sufficient training capacity for self-management patients.
- Convince health suppliers of the positive outcomes of the new health management system to foster patient acceptance.

Zorgdomein ("Caredomain") – internet referral application

This internet referral application intends to bridge the information gap between primary and specialized healthcare services and to decrease the number of unnecessary specialist consultations. The application automatically transmits referral information from the GP to the hospital information system and vice versa and allows GPs to arrange appointments with specialists for their patients through the internet. It ensures rapid feedback from the hospital to the GP after the referral and gives the GP insight in the care products of the specialized services.

The Netherlands

Meavita – Tele-homecare for chronically ill patients

A private company in the Netherlands, Meavita, treats chronically ill patients via the internet through their own TV, using a specific box, a camera and a remote control. Driven by the permanent shortage of nursing and increasing healthcare costs in the Netherland, the company looks for tele-homecare alternatives for treating these patient groups. Patients can make direct contact with a nurse, working for the homecare delivery company.

Portal website for in-vitro fertilisation treatment

The portal website aims to self-empower patients who undergo in-vitro fertilisation (IVF) treatment in a routine care situation. The portal makes use of the nationwide public key infrastructure (PKI) for access control management. Besides general information on infertility and IVF treatment patients are enabled to view all digitally available information concerning their IVF/ICSI treatment in their personal health record, and to communicate with their physicians and other patients.

Norway

Blood donor booking through SMS and internet

Since 2003 blood banks in Norway have employed a blood donor booking system that allows electronic communication between blood banks and blood donors. Now covering 20 blood banks in Norway, this application serves to achieve a stable and predictable blood store without time-consuming "invitation" procedures.

Blood banks need to sustain the attention of potential blood donors to ensure that hospitals obtain sufficient blood to save patients' lives. However it is very time-consuming for blood banks to constantly urge and invite potential blood donors through phone calls or by mail.

In order to avoid the traditional way of making blood donation appointments, the Norwegian blood donor booking system allows blood banks to handle the appointment process via computer. Currently, 20 blood banks and 25,000 donors use the system. It has a module for communicating with donors by SMS and e-mail and for inviting them to, and reminding them of, donation appointments. Communication is limited to standardised out-going messages and simple yes/no replies. The communication module is connected to the internal booking module. Upon reception of a donor's reply the system will immediately and automatically confirm or withdraw the appointment.

Planning started in 1999 and the system went to routine operation in 2003. One third of the expenses were covered by the Norwegian Directorate for Health and Social Affairs. Governmental funding of investment costs ceased in 2005.

Benefits

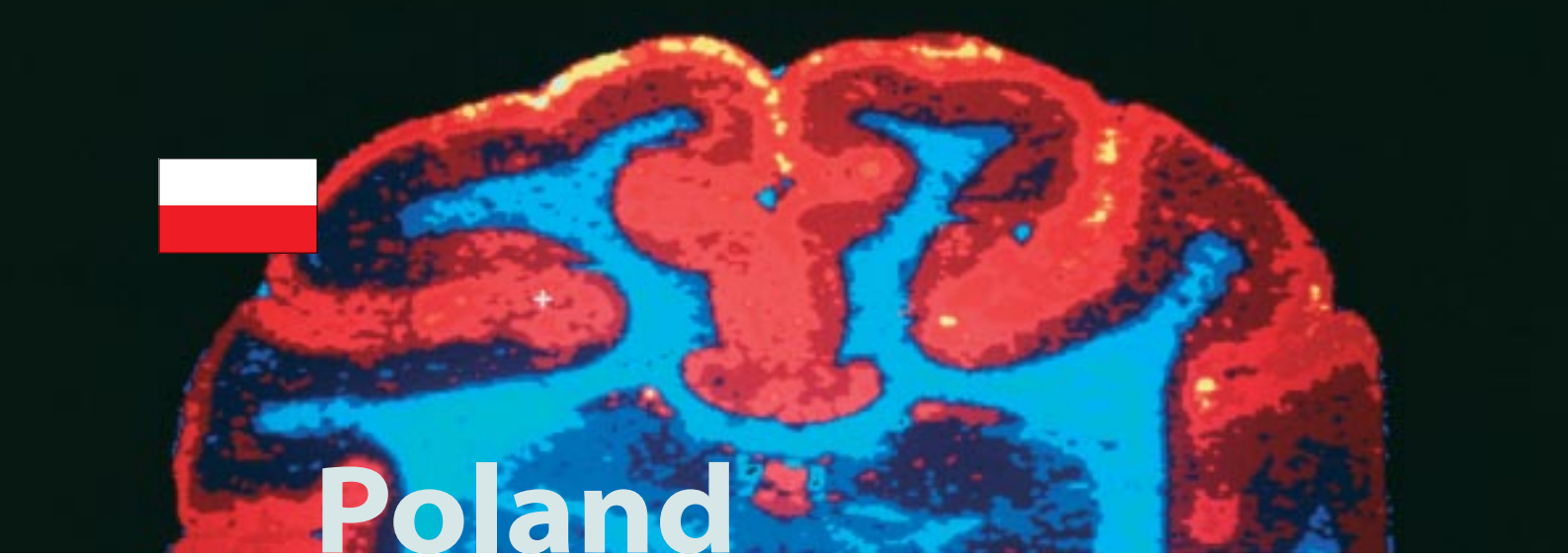
- The number of blood donors who confirmed an appointment but did not show up decreased by 15%.
- The efficiency of donation scheduling has been improved significantly: blood banks can make appointments at short notice, and can reach more people in less time without much effort.
- Blood supply has grown, and is more stable and predictable.

Lessons learned

- The costs of running the system are insignificant compared to its benefits.

Electronic messaging between health service providers

Throughout Norway electronic messaging is a common means of communication between health service providers, including electronic health record (EHR) systems. Hospitals, private laboratories, government bodies and general practitioners can send and receive, for example, analytic test reports, sick leave notifications as well as referral and discharge letters. The computerised communication of such documents has improved cost effectiveness and continuity of care.



Poland

Digital imaging systems at John Paul II Hospital in Cracow

The implementation of a picture archiving and communication system (PACS) as well as a radiology information system (RIS) was the most important part of the ICT strategy of John Paul II Hospital. It led to increased quality of care and cost reductions.

John Paul II Hospital in Cracow is one of the most modern hospitals in Poland. It has approximately 520 beds and 40 specialised laboratories as well as a diagnostics centre for heart and lung disease. The centre conducts about 100,000 tests and consultations yearly, including 60,000 imaging examinations.

Due to constantly decreasing public healthcare expenditures, the implementation of appropriate ICT applications was meant to facilitate both administrative and health operations. However, the core driver of ICT implementation in the hospital was improved provision of patient care. The hospital's ICT strategy was established in 2002. Its aim was to become an "e-hospital", which would use integrated digital networks in all departments and integrate the hospital's network with external institutions. Since 2002, all operational applications and systems have been modernised and integrated. Most important for providing healthcare was the implementation of a PACS and a RIS. Due to the high importance of diagnostic imaging in patient care, especially in the specialist clinics, the managing directors decided to replace the expensive, time-consuming, manual film-based system with digital technology.

Digital imaging brought considerable cost benefits to the hospital. An X-ray picture is costly, demands a certain processing time and requires storage solutions. Apart from material costs, the hospital achieved sustained savings on imaging operations. Today, only two people are involved in conducting and delivering the tests on CD, whereas previously at least three departments and several people were involved. Furthermore, the storage space for radiology film processing, administration and archives was reduced and the space is now used for consultation purposes, thus increasing the hospital's capacity. The hospital also achieved considerable efficiency improvements in diagnosis due to reduced delivery time, anytime access and better co-operation as images can be viewed from multiple terminals and locations. Efficiency also improved due to a reduction in the number of lost or misplaced images, more efficient time management and research and education support.

The greatest benefit for patients is that images are no longer lost or misplaced, which previously led to postponed or cancelled appointments and repeated X-ray exposure. Patients no longer have to bring their X-ray images with them for appointments in the hospital.

Benefits

- The deployment of ICT systems for digital imaging has improved quality of care and reduced cost.
- The greatest benefit for patients is that images are always readily available.

Lessons learned

- Due to a lack of interoperability, John Paul II Hospital cannot take full advantage of the technology in place to extend its usage outside the campus. On the one hand, there is too much incompatible software in the market; on the other, there is a lack of state regulation on data storage and exchange.

Portugal

SIS-ARD – information system enabling eHealth interoperability in the Azores

SIS-ARD is an information system that integrates different IT systems of healthcare providers in the Azores. In routine operation since 2007, it connects patients' electronic health records with a myriad of integrated modules containing clinical and non-clinical data.

SIS-ARD stands for Sistema de Informação da Saúde - Açores Região Digital. It was developed in 2006 and went into operation in 2007. This information system is a kind of hub that links the electronic health records (EHR) of patients with four main systems: firstly with a multi-channel platform for health professionals and their clients; secondly with the Electronic Resource Planning (ERP) systems of hospitals and other healthcare organisations; thirdly with the Integrated System of Health Unit Management; and fourthly with the Integrated System of the Regional Health Service.

The principle is roughly as follows: the Integrated System of Health Unit Management is fed with data from the EHR, the ERP systems and the multi-channel platform. This information, linked from different sources, facilitates planning and management processes in practically all areas of health management, such as patient and hospital management, the scheduling of consultations, and the management of external entities.

Patients can interact with the system through the multi-channel platform. They can use telephone, internet, SMS or eMail to access the system, using a Citizen Card for authentication.

The SIS-ARD information system is expected to strengthen team-orientation in healthcare provision. Those involved are better connected, access to data is facilitated, and data is more up-to-date.

Benefits

- Transparency and quality assurance: improved access to patients' data for healthcare professionals.
- Facilitated planning and management: linking different information systems provides better data for planning and management.
- Improved basis for research: the connection of different information systems facilitates data analysis.

Lessons learned

- Changes in workflows: the effective use of the system requires some adaptations in workflows; it takes time to get the health professionals actively involved.
- Critical scope of the project: the wide span of system integration was very ambitious; this requires risk assessment.

Portugal

ePrescription at Coimbra University Hospital

Coimbra University Hospital (HUC) in Portugal has implemented an ePrescription scheme on the basis of the "Integrated Management System of Medication Circuit" (SGICM). This is a cycle consisting of three main elements: observation, decision, and prescription (action). The SGICM ePrescription system implements this cycle, including data on the actions of doctors, nurses and pharmacists. The system became operational in 2003. It improved the transparency of processes and created a new culture of control and validation and, as a result, it was possible to reduce the average number of prescriptions per patient from 8.2 to 6.4.

INSA – improving the quality of clinical tests in decentralised sites

In 2006, the National Health Institute of Portugal (INSA) introduced a web-based facility to improve the quality of clinical tests and to speed up related processes. The application allows laboratories on the mainland, the Azores, Madeira and Macao to have their analytical performance compared with reference labs. The participating institutions can register for tests which INSA has scheduled, submit their data and results online and analyse them jointly with INSA. This initiative is part of a longer-term quality assurance project launched by INSA in 2000.

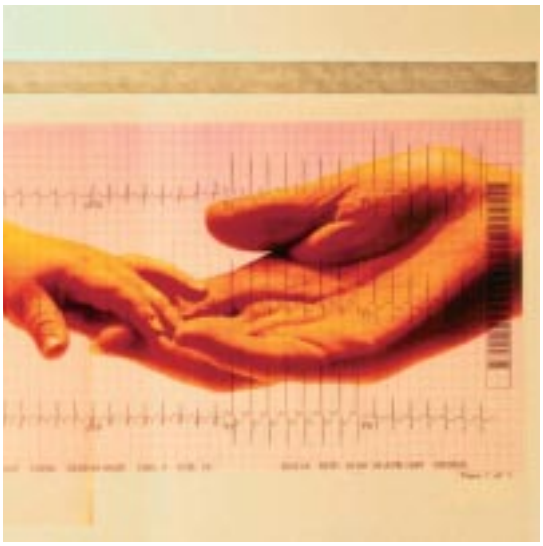
Romania

DISPEC teletriage and dispatch system – City of Bucharest Ambulance Service

DISPEC is a sophisticated ICT-enabled emergency ambulance teletriage and dispatch system. It was specifically developed for the City of Bucharest Ambulance Service (SAMB) in order to identify and allocate available ambulances.

SAMB is a strategic medical unit in Bucharest providing 24 hour available medical emergency service. Rising costs and tight budgets in the mid 1990s forced SAMB to think of innovative ways to increase its productivity and effectiveness. This led to the decision to develop DISPEC, and the system was introduced in 1996. Prior to its implementation, a paper-based system had been used. Emergency calls were received by untrained call-centre operators who took notes on paper slips. Their notes were (physically) taken to the coordinating physician who, in turn, tried to identify and allocate the appropriate resources with the help of radio operators.

By contrast, working with DISPEC means that trained phone operators enter into the system information from incoming emergency calls. The operator identifies the nature and severity of the emergency directly with the person reporting the incident and gives initial advice. Then he or she attributes one of the four severity levels for emergencies to a provisional diagnosis. Next, DISPEC automatically generates the best match with the rescue teams available, which are scattered all over the city area. The radio operators allocate an ambulance equipped with the appropriate facilities and staff and then direct the teams to the emergency sites. In routine care, the match is controlled by a coordinating physician. Time savings are gained from a location reporting system based on GPS (or global positioning system), which allows operators to identify free ambulances nearest to the location of the emergency.



DISPEC has had an important impact on response times: today, ambulance arrival takes on average only a quarter of the time needed in 1992. Efficiency gains resulting from DISPEC enabled the ambulance service to cope with increasing demand despite decreasing resource availability during the late 1990s. After 2003, estimated net economic benefits stabilised at a sustained level of just over 1.4 million euro per year. DISPEC is entirely funded by the Romanian Ministry of Health.

Benefits

- Faster response times: in 1992 the average response time for all types of emergency calls was about 72 minutes for an ambulance to arrive on site. After the implementation of DISPEC this was reduced to an average of 24 minutes in 1997 and 18 minutes today.
- Improved productivity: despite decreasing resources, the ambulance service was able to cope with the increasing demand.
- Cost savings: estimated net economic benefits have stabilised at just over 1.4 million Euro per year since 2003.

Romania

Lessons learned

- Employing a local IT vendor was crucial for DISPEC's success: the service provider was familiar with the environment, adaptive to sudden change – and affordable.

Clinical information system for private clinics, Medicover Romania and laboratories

Since 2004 seven Medicover clinics and nine Synevo laboratories in Romania have employed a clinical information system (CIS). Web-enabled applications allow the streamlining of clinical processes such as referral management, patient invoicing and billing and operational and managerial reporting, as well as the integration of activities of related healthcare providers and laboratories. Interoperability enables easy exchange of structured documents between physicians, laboratories and CIS clients.

Medical software at Dr. Victor Babes Hospital, Bucharest

Medical software supports workflows at Dr. Victor Babes Hospital in Bucharest. In routine operation since 2004, the software links the various departments and integrates pharmacy and laboratory applications. It provides easy access to information on the patient flow, thus supporting decision-making and administrative processes, and facilitates management of the hospital's pharmacy stock. Various reporting functions facilitate the processing and analysis of stored medical information.

Slovakia

T3C – Tele-radiology Communication Centre

The Tele-radiology Communication Centre T3C is currently used by 96% of all healthcare facilities using a Picture Archiving and Communication System (PACS) in the Slovak Republic. The exchange of imaging data between Slovakian healthcare facilities and professionals has also been expanded to the Czech Republic.

T3C allows for the exchange of imaging data between healthcare facilities and healthcare professionals in the Slovak Republic as well as between the Slovak and Czech Republic. This data exchange is possible between PACS systems, stand-alone systems and stand-alone and PACS systems. All data stored in DICOM standard (Digital Imaging and Communications in Medicine) and all health-related information may be sent and received through T3C. Imaging data can thus be transferred to and from all DICOM-compatible radiology and nuclear medicine modalities, and structured reports and other DICOM data can also be sent and received. An important aspect addressed was the creation of a secure data exchange encrypting system that ensures secure user identification and authorisation.

In routine operation since 2006, T3C has led to faster and improved diagnostic processes, resulting in higher effectiveness. Tele-counselling features are now possible with the help of the system.

Benefits

- Faster and improved diagnostic processes due to enhanced access to imaging information.

Lessons learned

- Interoperability was facilitated by using the DICOM standard rather than connecting systems operating with many different standards.

Slovenia

eDRG – web application for collecting, processing and analysing inpatient episodes

eDRG is a web application implemented in 24 hospitals throughout Slovenia. The system supports the collection, processing and analysis of inpatient episodes in XML format according to disease-related groups (DRGs) at the hospitals and at a national data gathering centre. It went to routine operation in 2004.

The eDRG application is a response to a challenge that all national health systems are facing: to gather health data for purposes such as epidemiological studies, statistical studies, reimbursement and the balancing and planning of financial expenses on a national level. In order to establish a secure and reliable digital data exchange channel between the participating hospitals and the data gathering centre at the national Public Health Institute, an existing government communication network named HKOM was used. Using eDRG, data on inpatient episodes are collected every three months and transferred to the data gathering centre. The centre processes and analyses the data and provides the hospitals with feedback on the results.

The system was co-funded by the Republic of Slovenia's Ministry of Health and Institute of Public Health, through a World Bank project called Health Sector Management Project. Upgrading, maintenance and support of the system is financed by the Institute for Public Health.

Benefits

- eDRG has set new standards for communication, security and interaction between hospitals and the national data gathering centre in Slovenia.
- The implementation methodology and secure internet technology developed can be used for other nationwide applications.

Lessons learned

- Users have to be very disciplined with regard to accurate and on-time data input.
- eXtended Mark-up Language (XML) turned out to be an appropriate data format.
- Different levels of IT equipment, IT skills and technical support in the participating hospitals have to be considered during implementation.

Spain

Receta XXI – ePrescribing in Andalusia

Receta XXI is an ePrescribing system used in the Spanish region of Andalusia. It facilitates the prescription, control and dispensing of drugs as well as related billing processes. The implementation of the system has had a positive impact on the control of medication use and expenses.

Receta XXI is built on three functional modules for: prescriptions, dispensing and checking. When patients consult a physician at a primary healthcare centre, they present their electronic health card which contains their identity as well as insurance status and rights profile. The card enables the physician to access the Citizen Electronic Health Record, which includes an electronic prescription module. The physician uses this module to generate an electronic prescription that is centrally registered in Receta XXI. Patients can then go to any Andalusian pharmacy with their healthcare identification card and the pharmacist can check the prescription online and dispense the prescribed drug. In the case of a contraindication, the pharmacists will not dispense the medication, but leave a message for the attending practitioner.

Receta XXI brings benefits for all stakeholders involved. For example, GPs can issue long-term prescriptions for chronically ill patients for a period of up to one year. This releases both patients and physicians from the burden of repeated consultations for prescription renewal only. For pharmacies, Receta XXI facilitates stock control and administrative processes, as it is interconnected with the pharmacy management system and with the General Pharmaceutical Council system for billing and accounting services. Receta XXI became operational in 2003. In 2007, it was implemented in 28% of around 1,500 primary healthcare centres and nearly 90% of approximately 3,500 pharmacies in the region. The system is entirely funded by the Andalusian Health Service.

Benefits

- Convenience for patients: long-term prescriptions have reduced the number of visits of chronically ill patients by 22%.
- Improved control mechanisms: ePrescription of drugs via electronic health cards facilitates checks for contraindications.
- Improved process efficiency: the integrated data flow from prescribing to delivery simplifies administrative tasks and reduces costs.

Lessons learned

- Information requirements: educating users of the system required a substantial amount of effort.
- Need for change management: changing traditional work processes can meet resistance, even if the benefits are clear.
- The complexity of the relationships between the stakeholders involved (physicians, pharmacists, the Pharmacists' Professional Organisation, other healthcare organisations, patients) has to be considered.

Spain

Diraya – the electronic health record system of Andalusia

Diraya is a health information system in the Andalusian region of Spain. It currently covers primary care, outpatient specialised care and emergency care services and integrates the health records of 6.7 million citizens. Since its rollout in 2003 different modules have been gradually integrated into the system, such as for appointments, electronic health records and ePrescribing. Patients are registered with Diraya with a unique identification number. The system allows the patients' data to be synthesised and viewed as a single electronic health record.

Imaging network project, Valencia

The Imaging Network project aims to develop a fully interoperable digital imaging system connecting 27 hospitals and around 900 primary care centres in the region of Valencia, Spain. The approach is to connect radiodiagnostic services with hospital information systems (HIS) and radiology information systems (RIS). Once fully established (roll-out is in process), the network is expected to improve diagnoses by enabling groups of specialists to view images simultaneously. It may also reduce repeated hospital visits by improving information flows between providers.

TmAPEx – Telemedicine Network for Primary Care in Extremadura

The Telemedicine Network for Primary Care in Extremadura (TmAPEx) enables primary care centres in rural areas to consult with specialists in distant reference hospitals. This improves their diagnostic capacity and saves patients' time and money, avoiding long-distance travel to hospitals. Evaluations for two participating penitentiary centres in 2007 showed that the number of visits to reference hospitals was reduced by 50%. Consultations can be in real time (via videoconferencing) or deferred; real time consultations account for close to 90% of cases.

Ykonos – immediate access to radiological clinical information and medical images

Ykonos is a regional digital imaging network in the region of Castilla-La Mancha, Spain. Through Ykonos, health professionals can access the radiological information and medical images of any patient. Radiological images are digitised and stored in an integrated system through PACS (Picture Archiving and Communication System) and RIS (Radiology Information System). The network comprises 18 hospitals, ten centres of specialised diagnosis and treatment, eight primary care centres and a virtual teleradiology centre. The costs of establishing Ykonos amounted to about 20 million euro (2003-2007), while 15 million euro are budgeted for the period 2008-2012.

Paperless and filmless healthcare at Son Llàtzer Hospital, Palma de Mallorca

Son Llàtzer Hospital in Palma de Mallorca is an example of a paperless and filmless hospital where almost all procedures are undertaken electronically. Online applications comprise all departments, professionals, processes and tasks. The medical workstation is the core unit of the system architecture, allowing the health professionals to access the clinical history of a patient as well as related clinical and administrative data. Patient data can also be processed through wireless portable tablet computers and Personal Digital Assistants.

Sweden

Klamydia.se – fighting the spread of sexually transmitted diseases

Via the Swedish website Klamydia.se, citizens can order a Chlamydia test package free of charge and access their laboratory results – without having to visit a clinic to test whether they are infected.The convenience and anonymity of the procedure results in an increased number of people getting tested and (if infected) treated – thus counteracting a further spread of this sexually transmitted disease.

Chlamydia, caused by the bacterium Chlamydia trachomatis, is one of the most common sexually transmitted infections worldwide. It is highly contagious and can affect both males and females; it can also be passed from an infected mother to her baby during childbirth. The number of cases of infection has been increasing in recent years. Infected people often have no symptoms and therefore do not know that they are infected. Left untreated, however, Chlamydia can cause severe problems and lead to infertility. Against this background, Klamydia.se was introduced in an attempt to counteract its further spread and to gather more information on the disease.

Residents of four Swedish counties can, if they suspect an infection, visit www.klamydia.se and order a free personal test package. Upon completion of the test, users return an envelope containing a urine sample to the laboratory. They are informed by e-mail when their test results are available. Results can be accessed at the klamydia.se website by entering a personal code, which is created for each test individually and will never be revealed. If the user does not check his/her results after one week, a reminder will be sent. If the results are negative, the case is closed and all personal information about the test person is deleted. If the person is infected, she or he will be informed accordingly and reminded that treatment is mandatory by law. In this case, the person's file will not be closed until she or he consults a physician, who will then in turn inform klamydia.se that treatment has started. If a Chlamydia positive-tested person fails to seek medical attention within two weeks of obtaining positive test results, the database will send a final reminder to do so. If this final attempt fails, the case will be referred to the local centre for disease control.

Klamydia.se started in Västerbotten County in 2004 as a joint project of the Institute for Public Health and Clinical Medicine and the Institution for Clinical Microbiology at Umeå University, funded by the National Institute for Public Health. In 2006, it was implemented in the Västra Götland region by the Department of Communicable Disease Control.

First evaluation results indicate positive impacts both in terms of healthcare and costs. The opportunity of conducting the test anonymously at home (and free of charge) reduces barriers for people being tested for Chlamydia. In a survey among 230 users of the service in October 2007, 73% said that they would either not have sought immediate and proper testing or would not have

Sweden

been tested at all if the online service had not been available. About 14,300 tests were conducted via klamydia.se between September 2004 and October 2007. 7.3% of those were positive. Pushing the treatment of people currently infected with Chlamydia is key to preventing the further spread of the disease and thus, eventually, achieving a decline in the number of new infections. On the cost side, the web-based procedure of the testing leads to cost savings. While the council has to pay 160 Euro for each visit to an STI clinic, a test ordered via klamydia.se costs only about 20 Euro. A further positive effect is that the data collected through the initiative is a valuable source for research in the field of sexually transmitted infections.

The project had to cope with some challenges, such as developing the logistics solutions for the medical test laboratories involved. Another challenge was to convincingly demonstrate the "business case" for healthcare providers prior to the start of the project, i.e. the positive effects and long term gains which the application promises to deliver. Finally, conflicts of interest had to be addressed, as the internet-based testing procedure was seen to be in competition with existing services.

Benefits

- Increase in people getting tested for Chlamydia: the anonymity of the web-based procedure reduces barriers for getting tested: 25% of users say they would not have taken a test otherwise.
- Cost savings: a test conducted via klamydia.se costs the Council 20 Euro compared to 160 Euro for a test conducted in a clinic.
- New data: improved empirical evidence for research on STIs.

Lessons learned

- The logistics of sending out a huge number of laboratory tests must be carefully planned.
- Some conflicts of interest must be anticipated; the web-based procedure competes to some extent with existing healthcare services.

ACTION – assisting carers using telematics interventions to meet older people's needs

ACTION is a home care service currently available in eight Swedish municipalities. It aims to maintain and enhance the autonomy and quality of life of frail and disabled people and their (non-professional) family carers by providing information, advice and support in the home. There is a local ACTION call centre in each of the municipalities, manned by nurses and aid consultants to the family-carers. Subscribers are provided with a videophone which can be used for communicating with the nurses and other ACTION families. ACTION started as a 3-year EU-funded research project (1997-2000) and became operational in 2004.

Sweden

Sjunet – teleradiology consultations between Sweden and Spain

Several hospitals in Sweden face a shortage of radiologists. Teleradiology can be the solution to this problem, as it enables radiology departments in different hospitals to connect and thus to provide services to each other. The hospitals of Sollefteå and Borås use Sjunet, the Swedish ICT network for healthcare teleradiology, to co-operate with radiologists located in Spain. The model is used for non-emergency examinations. After skilled radiology nurses have conducted the magnetic resonance imaging (MRI) in the Swedish hospital, the images are sent via Sjunet to the Telemedicine Clinic in Barcelona for analysis - the results arrive typically within 24-48 hours. Borås also sends computed tomography images. The service was introduced in 2003 and since then, the waiting time for MRI scans has been reduced by half.

Apoteket – ePrescribing

Currently 42% of all prescriptions in Sweden are transferred electronically from doctor to pharmacy via Sjunet, the Swedish ICT network for healthcare. The digitisation was enabled by a joint effort between each county council in Sweden and Apoteket, Sweden's national pharmacy. The prescription can either be sent to a specific pharmacy or to a national mailbox, which allows all 900 pharmacies in Sweden to pick up a prescription so that patients do not have to specify in advance where they want to collect the medicine. Technically, XML and Edifact are both used as standards for the message exchange in the prescribing process. A cost-benefit assessment of the service for the Stockholm County estimated that the annual net economic benefit of ePrescribing amounted to over 95 million euro in 2008.

Switzerland

Computerised patient record systems at the University Hospitals of Geneva

The clinical information system (CIS) at the University Hospitals of Geneva (HUG) illustrates in a profound way what electronic health records, combined with ePrescribing in a wider sense, can do for healthcare provision in a hospital environment.

HUG is a consortium of seven hospitals and more than 30 ambulatory facilities in the Swiss state of Geneva. HUG manages over 48,000 admissions and 800,000 outpatient visits each year, with a base of more than 2,000 beds and over 7,000 care professionals. Since 2000, a unified and shared patient-centred CIS is used in the complete HUG running on more than 7,000 PCs. More than 25,000 records are open every day, seven days a week, around the clock, with never less than 500 records accessed each hour. The system serves 3,000 care providers, including physicians, nurses, medical secretaries, social care providers and physiotherapists.

The CIS is mainly an in-house development. It is component-based with a message-oriented middleware distributed system. Several components or clinical systems, such as the Picture Archiving and Communication System (PACS), are industrial solutions that have been integrated into the CIS. Numerous interfaces, extracting data from different databases, have been built in order to allow customised viewing of data according to providers' needs and wants.

The CIS is patient- and user-centred in its input and output elements. Queries are managed according to access rights and interfaces based on the clinical role of the person performing the query, and are always restricted to a specific patient.

The system has links with private laboratories in order to receive lab results from outside the consortium. The records in the system, including lab results, reports, prescriptions and images, can be sent electronically to external addressees, such as private hospitals and general practitioner practices using a secured and authenticated network. Integration with other systems is planned.

The Computerised Patient Records (CPR) comprises administrative information, unified clinical documentation, order entry for all orders in ATC encoding (e.g. lab, drug, radiology, care), imaging in DICOM standard, laboratory, admission, discharge, and transfer information according to the HL7 RIM model. Clinical and nursing documentation are stored as 12 million documents as well as 130 million structured facts. There are over 13,600 document type categories, so the CPR is used for many other purposes than care, such as admission administration, billing, resource management, epidemiology, and clinical research.

Interoperability is a fundamental requirement. As all components are completely independent and can only communicate through standardised http/XML services or standardised XML messages, a common framework of protocols and semantic formalisations has to be used. Most of this has been achieved using existing standards whenever possible.

The system came into use in 2000. The cumulative breakeven from a socio-economic perspective was achieved in 2007 at some 60 million Swiss Francs. By 2009, the value of annual benefits is expected to be more than twice the value of annual costs.

Switzerland

Benefits

- Improved quality of care and patient safety, stemming from better informed decisions by care providers and various decision support features such as alerts and clinical pathways.
- Longer-term cost savings: by 2009, the estimated value of annual benefits is expected to be more than twice the value of annual costs.

Lessons learned

- Generation gap: older people took longer to accept and adapt, sometimes needing to learn some computer basics first. Younger people were more likely to be comfortable with computers.
- Selected use: doctors and nurses at HUG acknowledge that they do not use most of the functionalities of the CIS and need to learn more about what the system can do and how.
- Unexpected patterns of uptake: the CIS led to rapid increases related to new recruitment from the university's medical faculty.

Medgate – Swiss centre for telemedicine

Since its foundation in 1999, Medgate has become the leading Swiss centre for telecounselling (doctor to doctor) and teleconsultation (patient to doctor). More conventional centres only provide information to the patient. In contrast, Medgate can in 57% of all patient contacts successfully treat the patient and prescribe medicine via a mail-order pharmacy. A team of 90 physicians and medical assistants handles 2,000 patient contacts daily and takes care of around 2.8 million insured persons via telephone, internet and biometric monitoring.

Turkey

GCIS – Turkish Green Card Information System

In Turkey, the healthcare of citizens without social insurance is covered by a Green Card (GC) system. Since 2005, the records of GC holders and potential GC obtainers have been stored centrally in a GC Information System (GCIS). This system has significantly facilitated approval procedures for obtaining health services – a process that used to be paper-based before the GCIS was introduced.

The GCIS is a web-based system for managing health records and applications for health services. Prior to the implementation of the GCIS, Green Cards were distributed by local administration, and the related data was stored only locally and in paper-based format. This created problems whenever GC holders requested medical services at a location other than where they were registered. To address this problem, the Turkish Ministry of Health decided in 2004 to implement a central database where all GC holders would be recorded. The system became operational in 2005 and since then, more than 12 million records have been stored in this central repository. Approval procedures for providing health services to GC holders have become much more efficient; paperwork and the related administrative burdens have been significantly reduced.

The GCIS is also a tool for e-administration, as it facilitates the sharing of data between different government institutions and agencies. The database provides a single interface to the government software systems. For example, GCIS data is shared between the regional Green Card offices and the Population Administration Directorates, and with the Pension Fund General Directorate. The government also uses the data for socio-economic research and analysis purposes.

Benefits

- Improved health service coverage and reduced administrative burdens for Green Card holders: the GCIS facilitates and accelerates approval procedures for obtaining health services.
- Enabling tool for e-administration: the information system facilitates data sharing between different government institutions and agencies.
- Tool for analysis: the database facilitates the provision of health statistics and of socio-economic indicators.

Lessons learned

- Project implementation takes time: the time needed to set up and implement a central information system should not be underestimated.
- Capacity planning is important: the GCIS has to cope with a huge amount of data flowing into the system. It is important to anticipate capacity requirements.

FMIS – Family Medicine Information System for Turkey

The "Family Medicine Information System" (FMIS) is used by general practitioners to store their patients' health service records. Data is stored locally and then transferred to a central electronic health record (EHR) database located at the Ministry of Health. This central EHR database enables the production of national health statistics in an efficient way. FMIS also facilitates the retrospective and introspective analysis of health data and referrals between primary and secondary care services. Interfaces are compliant with the Health Level 7 (HL7) standard, version 3.

United Kingdom

Choose and Book – in West Essex Primary Care Trust

Choose and Book is a national solution of the National Health Service (NHS) which combines electronic booking and patient choice. In the Harlow locality, all ten GP practices serving a population of about 87,000 are now operating the service effectively to support patient choice.

The objective of Choose and Book is to allow the patient to book his or her appointment at the most appropriate time and date in order to reduce the number of appointments where patients do not attend. It enables a more flexible and responsive healthcare service, fitting around people's individual lives. Furthermore, appointments are booked electronically to reduce time spent by healthcare professionals on referral appointments and to improve the security and confidentiality of patient data transferred between different healthcare institutions.

All ten GP practices in the Harlow locality, serving a population of 87,145, are now operating the service effectively to support patient choice. This means that, since January 2006, patients referred by their GP to a specialist are able to choose from at least four hospitals or other healthcare providers commissioned by their Primary Care Trust. By calling the Choose and Book Appointment Line or www.nhs.uk, they receive information about healthcare providers. Based on this information, they choose a provider and book their appointment through the internet, the Appointment Line or via their GP practice. Patients are issued with guidance on how to book appointments at the point of referral.

Choose and Book was developed nationally as part of Connecting for Health, an agency of the Department of Health supporting the NHS to introduce new computer systems and services. The initial requirement focused on a simple electronic referral system based on e-mail, with no real-time, multi-channel connectivity. When the functionality for choice was added, a web-based booking system was required to operate with several different ICT facilities in hospitals and GP practices. Choose and Book complies with N3, the NHSmail secure email system for the National Health Service, National NHSiS Clinical Data Standards, National ICT Security Standards and Policy and the National Framework Contracts for Hardware Provision.

United Kingdom

Benefits

- Increased convenience to patients: appointments and admissions are made in consultation with the patients in order to find a suitable date and time for both parties.
- Increased feeling of certainty: prompt electronic appointment booking provides patients with more and immediate certainty.
- Time and cost savings due to a reduction of the administrative burden.
- More effective management of referrals.

Lessons learned

- Resistance to process change: continued use of traditional appointment process by GPs, consultants and other staff slows down uptake of the service.
- Overreliance on piloting was found to defer benefits realisation.

ePharmacy at Chelsea and Westminster Hospital

The ePharmacy system at the Chelsea and Westminster Hospital in London includes electronic prescribing, dispensing, distribution, stockmanagement, and procurement of drugs. 65% of all dispensary transactions are performed by a dispensing robot. The robot is provided with the information for each prescription. It then picks the items from stocks and either transfers them to the dispensary staff for dispatch to wards, or hands them to the appropriate patients waiting at the dispensary. The system warns prescribers if prescribing a medicine that interacts negatively with another, or when the patient is allergic to a medicine.

Development of an electronic patient record at Homerton and Newham hospitals

In 2004 Homerton and Newham, two NHS hospitals in London, jointly implemented an Electronic Patient Record (EPR) solution with several exceptional modules, such as an accident and emergency patient pathway, a maternity services record, and a patient administration system with booking and waiting lists management. The hospitals use the EPR to work collaboratively across several specialities. Having a shared solution for two hospitals required meticulous process mapping.

Scottish ambulance communication solutions

Scottish Ambulance uses innovative eHealth services such as cab-based mobile data transmission, access to the patient community health index, telemetry and telemedicine. The cab-based terminals system links front line ambulance crew with two mobile data terminals to the command and control systems. One terminal deals with incident messaging, satellite navigation and mapping. The other deals with electronic patient records and access to emergency care summaries, standard operating procedures and clinical databases. As of 2007, all ambulances were equipped with terminals.

NHS Direct Online

NHS Direct Online (NHSDO) is a web portal offering information about health and healthcare. The service is complementary to the NHS Direct call centres, which focus more on symptomatic response to users. The portal offers a health information enquiry service, a health encyclopaedia, a best treatments website, self-help guide, details of local NHS services and various interactive tools. The number of visitors to NHSDO has risen from about 1.5 million in 2000 to some 24 million in 2008 (forecast).

NHS Scotland Emergency Care Summary

The NHS Scotland Emergency Care Summary (ECS) system provides a summary of demographic, allergy and medication information for patients in Scotland from GP practices. The ECS enables out-of-hours, A&E, and the national call centre clinicians' access to important patient information in emergency care situations.

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