

**The Development of Electronic Health Messaging
Services in Denmark, and Lessons for Ireland**

By

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in partial fulfilment of the requirements for the degree of
Master of Science in Health Informatics*

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Declaration

I declare that work described in this dissertation is, except where otherwise stated, entirely my own work, and has not been submitted as an exercise for a degree at this or any other University.

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Summary

The quality, efficacy and safety of healthcare depends amongst other things, on the rapid and accurate communication of both exceptional and routine patient information to the point of care, wherever that may be. The electronic communication of such information in a standardised format, is often referred to as health messaging, and is a vital step in the establishment of the electronic patient record.

The main objective of this research was to review the approach taken to the development of health messaging services in Denmark, a recognised centre of excellence, and to identify how the lessons learned can be applied to Ireland.

This was achieved by conducting qualitative research by means of documentary analysis and use of semi-structured interviews and fact sheets, from a public service provider's viewpoint. The resulting descriptive report outlines the international context and major trends, details the development of health messaging services in Denmark and Ireland, compares and contrasts both to identify relevant implications for Ireland, and sets out the main conclusions and some key recommendations.

Denmark has adopted an ambitious but incremental approach, and developed an extensive range of health messaging services, used by the majority of public/private healthcare providers. Ireland commenced its regional projects 11 years later than Denmark, and has developed a more modest range of services between primary and secondary care.

It was concluded that there is a compelling business case for health messaging, and significant benefits have been achieved in both countries (e.g. improved patient safety/care, timeliness, quality, efficiency, resource utilisation). Messaging services have a central role in building and maintaining a cohesive health service, and are of particular importance within the hospital sector. In Denmark, the establishment of MedCom as an impartial prime-mover, negotiator and co-ordinator was significant. The many valuable lessons identified, validate Ireland's approach in many areas and prompt necessary changes in others.

Recommendations include the need to identify a senior national business sponsor, and to establish a national messaging Programme Board and programme that will facilitate the co-ordination of multiple regional/local projects to develop additional services. High priority objectives identified and relevant lessons learned in both countries should be considered when determining the best way forward. A new project unit with appropriate independence, modelled on MedCom, should be established to lead and co-ordinate this development programme.

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Abbreviations

CAREDOC – Carlow Emergency Doctors-On-Call Limited

CDA – Clinical Document Architecture

CDC – United States Centre for Disease Control

CEN – Comité Européen de Normalisation (European Committee for Standardisation)

CENELEC - Comité Européen de Normalisation Electrotechnique (European Committee for Electrotechnical Standardization)

CEO – Chief Executive Officer

CIDR – Computerised Infectious Disease Register

CMOD – Centre for Management and Organisational Development (Dept of Finance)

CoCo – Continuity and Co-ordination in Primary Health Care project

CPR – Civil Registry Number

CSV – Comma Separated Values

DATHs – Dublin Area Teaching Hospitals

DKK – Danish Krone (exchange rate of 7.35 DKK to 1 EUR used)

DHDN – Danish Healthcare Data Network (recently renamed to SDN – Sundhedsdatanettet)

DoHC – Department of Health and Children

DSI – Danish Institute for Health Services Research

EC – European Commission

ECR – Emergency Care Record

EDI – Electronic Document Interchange

EDIFACT - Electronic Data Interchange for Administration, Commerce and Transport

EHB – Eastern Health Board

EHIC – European Health Insurance Cards

EHR – Electronic Health Record

ECDC – European Centre for Disease Control

EPR – Electronic Patient Record

ERHA – Eastern Regional Health Authority

ESOs – European Standards Organisations

ETSI – European Telecommunications Standards Institute

EU – European Union

FAME – Common Medication Card project

G-EPR – National Board of Health's, National Basic Structure for Electronic Patient Record project

GDP – Gross Domestic Product

GP – General Practitioner

GPIT – National General Practitioner IT Group

GPEL – GP Electronic Links

GMSPB – General Medical Services Payments Board

gVPN – Government Virtual Private Network

HCRS – Healthcare Reimbursement Scheme

HeBE – Health Board Executive (comprising CEOs of former Health Boards)

HIQA – Health Information Quality Authority

HL7 – Health Level Seven

HSE – Health Service Executive

HPSC – Health Protection Surveillance Centre

ICGP – Irish College of General Practitioners

ICD-9 – International Classification of Diseases, 9th Revision

ICD-10 – International Statistical Classification of Diseases and Related Health Problems,
10th Revision

ICT – Information and Communications Technology

IDTS – Indicative Drug Target Scheme

IMO – Irish Medical Organisation

IPIMS – Integrated Patient Management System

IPU – Irish Pharmacy Union

ISDN – Integrated Services Digital Network

ISO – International Organisation for Standardisation

ISP – Internet Service Provider

IT – Information Technology

KITH – Kompetansesenter for IKT i helse- og sosialsektoren (Norwegian Centre for
Informatics in Health and Social Care)

KPLL – Copenhagen General Practitioner’s Laboratory

LIMS – Laboratory Information Management System

LMP – Local Messaging Project

LOINC – Logical Observation Identifier and Names Codes

MESH – Medical Subject Headings

MHB – Midlands Health Board

MWHB – Mid-Western Health Board

NCHD – Non-Consultant Hospital Doctors

NDSC – National Disease Surveillance Centre
 NEHB – North Eastern Health Board
 NHN – National Health Network
 NHO – National Hospital Office (HSE)
 NIMIS – National Integrated Medical Imaging System
 NP – National Project
 NSAI – National Standards Authority of Ireland
 NWHB – North Western Health Board
 OECD – Organisation for Economic Co-operation and Development
 OiO – Offentlig Information On-line (Public Information On-line) standard
 PACS – Picture Archiving and Communication System
 PAS – Patient Administration System
 PCCC – Primary Community and Continuing Care (HSE)
 PCRS – Primary Care Reimbursement Service
 PCTs – Primary Care Teams
 PICNIC – Professionals and Citizens Network for Integrated Care project
 PSTN – Public Switched Telephone Network
 QUANGOs – QUasi-Autonomous Non-Governmental Organisations
 RHCN – Regional Health Care Network
 RHIO – Regional Health Information Organization
 RIS – Radiology Information System
 SDN – Sundhedsdatanettet (new name for DHDN - Danish Healthcare Data Network)
 SDOs – Standards Development Organisations
 SDSD – Sammenhængende Digital Sundhed i Danmark (Digital Health Denmark)
 SEHB – South Eastern Health Board
 SHB – Southern Health Board
 SIP – Standardised reporting from the Primary sector
 SMS – Short Message Service
 SNOMED-CT – Systematized Nomenclature of Medicine - Clinical Terms
 SOA – Service Oriented Architecture
 SSI – Statens Serum Institut (the National Poliovirus Laboratory in Denmark)
 TCD – Trinity College Dublin
 VANS – Value Added Network Services (i.e. electronic post-office)
 VPN – Virtual Private Network
 VRL – National Virus Reference Laboratory

WHB – Western Health Board

WISE – Working In Synergy for Europe project

XML – Extensible Markup Language

Chapter 1: Introduction

The availability of quality healthcare, delivered in an efficient and effective manner, is hugely relevant and important to us all. As a result, there is an on-going debate in Ireland and most other countries internationally about many health related issues, for example:

- The difficulty in getting timely access to health services when needed, with long waiting lists and different treatment for those with private health insurance (i.e. improved access);
- Increasing awareness of the high number of medical accidents/incidents and hospital acquired infections;
- Inadequate capacity to provide necessary treatments and services when needed, and sometimes controversial use of the private sector to increase this capacity;
- Increasing numbers of chronically ill and elderly citizens in need of multi-disciplinary treatment and care (e.g. diabetics);
- Increased mobility of citizens leading to their use of health services in other countries to provide treatments, and use of the Irish health services by visitors/immigrants from other countries;
- Continually escalating costs due to medical inflation, increased availability of new high-technology treatments/drugs involving expensive specialist/equipment etc;
- Funding of health services, determination of just how much money is needed to provide an acceptable service, and who should pay (i.e. state, citizen, private sector);
- Shortage of essential medical staff (e.g. nurses) and recruitment constraints.
- Need to rationalise and modernise the public health services, with its mix of centralised and decentralised services.

At the same time, society's expectations have risen due to increased prosperity, education and the routine experience of accessing services in other sectors of the economy without experiencing similar difficulties and frustrations. For example, it is possible for most individuals to book a holiday/flight on the internet, and to use a telephone, credit card or cash machine almost anywhere in the world.

In the current environment, it is believed that there is a responsibility in the first instance, on staff in the Health Service Executive (HSE) to try and identify ways in which these and other identified problems could be resolved or mitigated. This is particularly the case if such issues

have already been addressed successfully in other countries, and where they can be applied to Ireland in a controlled and incremental way so as to minimise risk of project failure.

1.1 The current health communication problem in Ireland

The healthcare industry is very information intensive, and the volume of data that must be recorded and managed is growing exponentially each year. The health services are typically fragmented, with treatments being provided in a variety of care settings, ranging from specialist hospital-based units, health centres/clinics and practitioner's surgeries to the patient's home. Care is often provided by a variety of healthcare professionals, some of whom may not know the patient particularly well. They therefore rely heavily on the information in the patient's chart to inform them of pertinent details that may impact on the patient's diagnosis, treatment and outcome (e.g. medication, allergies, patient/family history).

A recent European Commission (EC) report suggests that hundreds of thousands of deaths worldwide each year are attributed to medical accidents and adverse incidents, and that the **majority** of these are due to communication difficulties and a lack of patient history information. In the USA, it is suggested that inappropriate medical decisions account for more deaths than motor accidents, breast cancer or AIDS, (Colasanti, 2006). These findings are highly significant.

In this environment it is clear that the quality of care and efficacy of treatments provided often depends greatly on the rapid, reliable and error-free communication of relevant patient information to the point of care, wherever that may be. The current predominance of paper/fax based processes in Ireland and the lack of integration between IT systems, even within a single hospital, are major problems that can adversely impact on patient care in numerous ways.

With an ever increasing level of specialisation and division of labours, there is a significant and rising volume of routine communication between healthcare providers and their support services (e.g. general practitioners, consultants, laboratories, radiology) which accentuates this communication problem, (Mariboe, 1996). As General Practitioners (GPs) are the gatekeepers to other treatment services, they receive a greater volume and variety of cross-sector communications than anyone else, (Fog et al., 1998). It is therefore necessary to address their particular communication needs as a matter of priority.

1.2 A potential solution - health messaging

It is possible to communicate such routine but important information electronically, once the need for patient confidentiality, information security and data protection are respected. This promotes seamless patient care between healthcare providers, and between day time and out-of-hours services, and supports care in the community.

According to the Organisation for Economic Co-operation and Development (OECD), there is international evidence that the co-ordination and quality of care would be improved by a wider use of ICT to improve the collection/dissemination of information relating to patients and provider performance. This particularly applies to the ‘handover’ points, where responsibility for a patient’s care is transferred from one healthcare sector/provider to another, (Hofmarcher et al., 2007). According to Ilias Iakovidis, Deputy Head of Unit-eHealth, European Commission, DG Information Society “*Electronic communications is the cornerstone of effective and quality health services and is highly advantageous not only to professionals but certainly also to the patients*”, (Hulbaek, 2003).

However, before such electronic communication can take place, the sender and recipient must agree in advance, the structure (syntax) and meaning (semantics) of the data being exchanged. This allows the recipient to confirm that the communication is intended for them, to understand its purpose and to take any necessary action based on its content (see Figure 1, (Andersen, 2006)).



Figure 1: No real communication or understanding without semantic interoperability

Such communication of structured patient and clinical information between healthcare providers is often referred to as electronic health messaging.

It would be impractical to agree a “common language” bilaterally where there are large numbers of healthcare organisations involved in exchanging many different types of information, as this would be too difficult and time consuming. It therefore makes sense to adopt an international messaging standard which provides ‘templates’ for many of the different communications possible (e.g. laboratory results, referrals). In theory, this facilitates the exchange of data with any healthcare provider whose IT systems conform to the same standard, linking many independent systems to form a coherent healthcare system and providing “all to all” integration.

In practice it is often necessary to customise these international standards for national use, and to reach agreement on any optional aspects (e.g. data items, file naming, code values including patient/clinician identification, use of classifications). The more detailed the definition of national standards, the less likelihood of local variations giving rise to communication errors and problems. These national standards must then be incorporated into each healthcare provider’s IT systems before they can communicate with other healthcare partners.

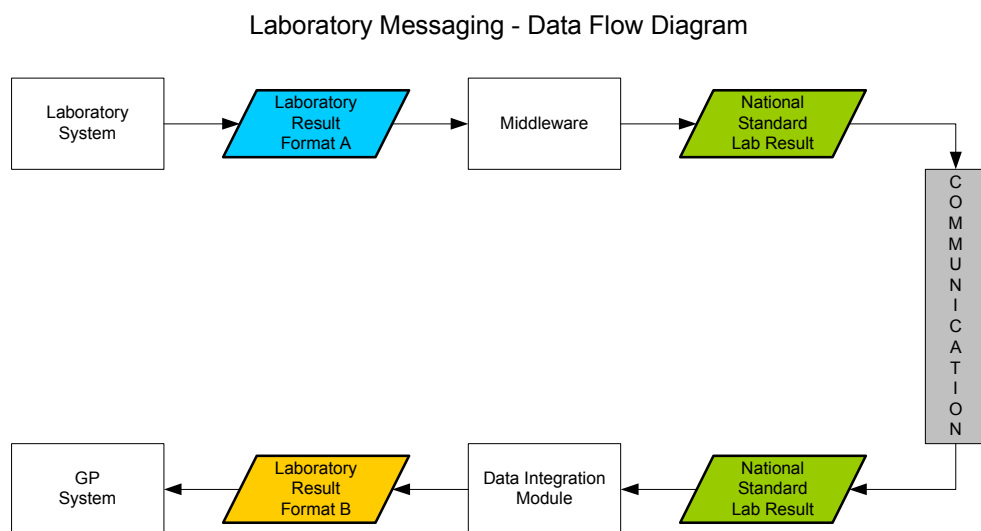


Figure 2: Laboratory messaging – typical data flow diagram

A practical comparison of paper-based and messaging-based processes for the communication of laboratory results from a hospital medical laboratory to a patient’s GP, illustrates some of

the relative benefits and issues that arise. Once the relevant laboratory results are formally authorised within the laboratory IT system:

- When using the paper-based process, the results are printed on an official report, sent to the laboratory/hospital post room for processing, and posted out to the GP. Depending on the efficiency of this process, the GP typically receives the reports 2-3 days after they have been authorised. The GP practice secretary then transcribes all or part of these results into the GP's practice management system for subsequent review by the GP. The printed lab reports are then manually filed away on the relevant patient charts.

This process is slow, gives rise to transcription errors and often results in the recording of incomplete or inaccurate results.

- When using the electronic messaging process, the result is extracted electronically on a scheduled basis in proprietary format A (see Figure 2). It is transformed into the agreed standard format and made available for download (pull) or transmission (push) to the GP practice via the agreed communication methods. Once the result has reached the practice, typically within hours or minutes, the result is converted to proprietary format B so that it can be reviewed by the GP, matched and integrating into the electronic record for the patient, so that it becomes an integral part of that record.

As this process is considerably faster, treatment of the patient can begin sooner, potentially improving the effectiveness of that treatment and reducing stress for the patient. Also data can be validated before it is sent, to ensure that it contains all of the necessary data items for that communication, complies with the national standard and that each individual data item is valid. On receipt, the communication can be validated again to make sure that the data has arrived intact and can be processed successfully. The result within the GP's practice system is therefore complete, accurate and secure. As the data is structured it can be easily retrieved, analysed (e.g. trends) reported and re-used (e.g. in subsequent referrals). This potential re-use of data is highly significant. As the GP secretary no longer has to manually enter data or file printed reports, they can prioritise other work, reducing administration overheads and costs. There is also less interruption to work and increased productivity arising from fewer phone calls to the laboratory.

When there are abnormal results, it is normal practice in Ireland for the laboratory to phone the practice to highlight these, as an additional safeguard.

Another example of data re-use is where a prescription is created by a GP within their practice system, and sent electronically to the patient's pharmacy, and onto the national drug reimbursement service. As the data is only keyed in once at source and effectively re-used, and is legible to all, this reduces medication errors and eliminates laborious work.

It is possible and often desirable to apply additional safeguards to electronic communications that would not otherwise be possible for paper documents (e.g. automatic acknowledgements, tracking facilities, audit trail) and these facilitate the safe elimination of paper. The introduction of automated system-to-system communications (e.g. web services) between healthcare providers further improves speed, reliability and reduces support overhead.

Electronic messaging is widely recognised as being a vital component of the Electronic Health Record (EHR) concept, allowing coherent and clinically sensible portions of a patient's record to be communicated between care providers and combined to become a part of their EHR.

For communication of electronic messages to be possible between healthcare providers using different IT systems and technologies, there must be interoperability. The EC defines the interoperability of EHR systems as *"the ability of two or more electronic health record systems to exchange both computer interpretable data and human interpretable information and knowledge"*. They also state that semantic interoperability *"means ensuring that the precise meaning of exchanged information is understandable by any other system or application not initially developed for this purpose"*, (Reding, 2008). However, it must be stressed that achieving interoperability is difficult and challenging.

1.3 The research question(s)

When considering the selection of a theme for this research dissertation, it was important that it should be relevant to the author's work, of some practical value in addressing the above communication problem, and interesting to research.

For those reasons, and others outlined in Section 1.5, the primary research question/problem chosen was:

What approach has been taken to the development and implementation of health messaging services in Denmark, and how can the lessons learned be applied to Ireland?

This raised a number of additional research questions:

- *What is the current state-of-the-art for health messaging internationally, and what are the current major trends?*
- *How are health services organised and structured in Denmark, and how does this compare/contrast with Ireland?*
- *Where do health messaging services fit within the healthcare delivery organisations in Denmark and Ireland?*
- *What are the current and proposed EHR, eHealth, health messaging and ICT strategies for Denmark, and how do these compare/contrast with Ireland?*
- *What approaches have been adopted to the design, development and implementation of health messaging services in both Denmark and Ireland?*
- *How have these approaches worked in practice, and what lessons have been learned from these separate experiences?*
- *What business, technical and organisational issues have arisen, and how have these been addressed?*
- *How have existing health messaging solutions been designed and implemented from both a business and technical perspective?*
- *What standards have been chosen and what was the experience of trying to implement these standards?*
- *What proven benefits and/or deficiencies have been identified for patients and healthcare providers in each country?*

1.4 Research objectives

In order to address the above research questions, it was decided to conduct:

- a) A high level assessment of literature relating to operational national/regional messaging services and projects internationally, to develop an understanding of the current state-of-the-art and major trends (e.g. geographic scope, relevant standards, development strategies, interoperability);
- b) A high level review of how health services in Ireland and Denmark are organised and structured (e.g. national/regional focus, governance, public/private mix, primary/secondary /tertiary care models, GP & pharmacy contracts, funding models, level of investment), assessed through available literature;
- c) A detailed review of where health messaging fits within the health delivery structures, and how such services are organized (e.g. programme sponsor, governance, use of separate messaging agency, service/ICT staffing, level of investment & funding models), assessed through literature and semi-structured interviews;
- d) A review of existing and proposed EHR, eHealth, Health Messaging and ICT strategies and standards in Ireland and Denmark (e.g. level of maturity & investment, standards/coding, patient data retained nationally/regionally /locally, messaging strategy, information ownership & sharing strategy, information security, data protection), assessed through literature and semi-structured interviews;
- e) A detailed review of existing Danish and Irish messaging services and projects from a business perspective (e.g. geographic scope, level of maturity, message types implemented, transaction volumes, message providers/recipients, 1 or 2 way messaging, cessation of printing, information security, data protection, data ownership/retention, roles and responsibilities, contracts and service level agreements, support pathways including arrangements for GP support), assessed through literature, semi-structured interviews and fact sheets;
- f) A detailed review of existing Irish and Danish messaging solutions from a technical perspective (e.g. messaging/data standards, design principles, information security, middleware, data transformation & transport, use of open standards & web services,

interoperability, technical support), assessed through literature, semi-structured interviews and fact sheets;

- g) An overview of underlying ICT infrastructure and facilities used for messaging in both countries (e.g. originating & receiving IT applications, connectivity & networking, security infrastructure including authentication, encryption & non-repudiation, ICT maintenance & support services, implications for system procurement), assessed through literature, semi-structured interviews and fact sheets.

This research framework was refined as the research assignment progressed.

1.5 Motivation for selecting this topic

The author holds the position of IT Project Manager for Primary Care in the ICT Directorate, Health Service Executive (HSE) based in Kilkenny, and as part of this role is currently responsible for developing and providing health messaging services between secondary care and primary care in the South East (i.e. Carlow, Kilkenny, South Tipperary, Waterford and Wexford).

There is little doubt that the current health reform process will significantly impact on the future organisation and delivery of health messaging services in Ireland. For example, it has already been proposed that the existing regional health messaging services will be merged into a single national service in the short term. The resulting national messaging service will then need to be developed further to meet the requirements of the HSE and other stakeholders, and rolled out to areas not covered by existing services.

It is therefore important at this time to benchmark the development of messaging services in Ireland against countries like Denmark, where they have an international reputation as a leading centre of excellence worldwide for the development of health messaging services and supporting infrastructures. This should inform the proposed development programme and facilitate a pragmatic approach, based on relevant international theory, practice and real-life experiences. It is planned to circulate the completed dissertation to the HSE National Director for ICT and other senior managers and colleagues as an input to the review of messaging strategies and tactics.

1.6 Outline of dissertation

Every effort has been made to structure this dissertation report in a way that is clear and logical, following a 'top down' approach, so that any reader can follow the story of this research at an appropriate level of detail (i.e. work planned, completed, findings, and how these are relevant).

Separate chapters have been included for the international state-of-the-art, detailed review of health messaging services in Denmark, and review of health messaging services in Ireland for the following reasons:

- The level of research and analysis of each geographic area differed
- It would be easier to consider each in turn, before making comparisons
- It should allow the reader, to focus on specific area(s) of interest.

Chapter 1: Introduction

This briefly describes a number of current health issues and highlights the communication problem that arises between healthcare providers. It introduces the concept of electronic messaging and its benefits, and outlines the research questions and objectives, explaining the motivation for selecting this topic. It then briefly outlines the structure and layout of this report.

Chapter 2: Research methods and methodology

This outlines the approach taken to answering the research question(s), the research methodology adopted, the reasons for its selection and the work actually completed during the course of this assignment.

Chapter 3: International context and major trends for health messaging

This briefly outlines the international context, and identifies a number of major trends, strategies, standards and developments relevant to health messaging, based on a high level assessment of available literature.

Chapter 4: Health messaging services in Denmark

This outlines some relevant facts relating to Denmark, how the Danish health services are organised and structured, where health messaging fits within the health delivery structures, and how such messaging services are organized. It then describes the development of health messaging services and supporting infrastructures, based on a detailed review of available literature.

Chapter 5: Health messaging services in Ireland

This outlines some relevant facts about Ireland, the Irish health services and health messaging services. It then describes the development of health messaging services and supporting infrastructures, based on the semi-structured interviews and a review of the limited literature available.

Chapter 6: Implications for the Irish Health Service

This compares and contrasts healthcare and health messaging services in Denmark and Ireland, identifying important issues and focussing on lessons that could productively be applied to Ireland, from the author's perspective.

Chapter 7: Conclusions, recommendations and future work

This chapter summarises the conclusions and recommendations of this dissertation, and identifies areas where further research is needed.

Chapter 2: Research methods and methodology

This chapter outlines the approach taken to answering the research question(s), the research methodology adopted, the reasons for its selection and the work actually completed during the course of this assignment.

2.1 Approach

It was considered that it would only be possible to answer the detailed research questions by completing an in-depth study of the development of health messaging services in Denmark, by means of a detailed literature review. This approach was validated when initial research confirmed that the available English language literature was at a sufficient level of detail, and that Denmark had made substantial advances in this area and had accumulated significant knowledge and practical experience over the past 26 years.

It was considered necessary to research the evolution and current state of messaging services in Ireland and potential future strategies that might be emerging, so that valid and appropriate inferences and comparisons with Denmark could be made. Initially, the use of questionnaires was considered as a means of engaging with the messaging community in Ireland (and possibly Denmark), but there were concerns that this would limit the scope of this research.

In view of the very limited amount of literature likely to be available within the Irish context, it was considered more appropriate to conduct semi-structured interviews with a number of key individuals responsible for the development and provision of the existing health messaging services in Ireland. This approach would provide the richest source of qualitative data currently available, supplemented by available literature. It was not the intention to conduct a very comprehensive and definitive study of Ireland, although such a study would be extremely valuable, as this is beyond the scope of this particular research assignment.

The author then conducted qualitative research by the complementary means of documentary analysis and use of semi-structured interviews and fact sheets, from a public service provider's viewpoint, and produced a descriptive report.

It was the author's intention throughout this assignment to adopt a researcher's perspective, and to review and collate all materials gathered as objectively and impartially as possible. The ultimate objective was to highlight in a constructive manner, any issues that may need to be addressed, so that this research could be considered as a positive and useful development. It is hoped that other researchers will be encouraged to focus on health messaging, building on research that has already been completed, as this service area will become increasingly important in the provision of healthcare in Ireland, in the near future.

While it is desirable to adopt a positivist approach when assessing some spheres of life (e.g. scientific research) there is also a role for adopting an interpretivist approach, particularly when considering the humanities. When conducting this assignment, the author attempted to steer a middle ground, assessing the facts based on evidence but recognising that the interpretation of these facts and their potential implications was influenced by his own experiences, perspective and values.

2.2 Literature review

When completing a review of available English language literature, it soon became clear that the search terms for this relatively new subject area are not well established. This significantly complicated the review and increased the time and effort involved.

Initial searches using messaging related search terms like "*((electronic OR health) AND messag*)*" were unsuccessful, as such terms are now used extensively within Healthcare ICT (e.g. multi-media messaging, text messaging, MS Exchange mail). Searches using a variety of other criteria were equally unsuccessful as substantial numbers of irrelevant articles were retrieved.

2.2.1 International literature

The most closely related Medical Subject Headings (MESH) category found was "*Medical Records, Computerised*". Using this, a journal article reviewing all relevant literature between 1995-2005 from 3 major databases, Medline, ISI Web of Knowledge and IEEE Xplore was found (Cruz-Correia et al., 2007). The search string used in this research was "*((medical or clinical or patient) and record*) and (comput* or digital or electronic*) and (integrat* or link* or sharing or share or shared)*". The titles and abstracts were reviewed to identify 93 articles relevant to health messaging.

The author built on this research and searched the same 3 databases using the same search string for the years 2005-2007, finding 200+ additional articles. This combined research was reviewed using the titles and abstracts, and 151 articles referring to regional/national messaging services and related areas of interest (e.g. standards, security) were selected. References information was recorded on an “EndNote X1” database, and the full text articles secured to facilitate a high level assessment of the current international state-of-the-art and major trends.

2.2.2 Literature relating to Denmark and Ireland

A search of the same 3 databases for all years, focussing on Denmark and Ireland, was then completed using the revised search terms “*((medical or clinical or patient) and record*) and (comput* or digital or electronic*) and (integrat* or link* or shar* or interoper*) and (Ireland or Irish or Denmark or Danish)*”. On reviewing the title and abstract of 364 articles where the full text was available without cost, 51 articles were selected for further review.

The above search terms, and many other variations (e.g. “*MedCom and Health and (Denmark or Danish)*”, “*Healthlink and (Ireland or Irish)*”) were used to access many good quality health and government related publications on the internet, and to find relevant books and theses/dissertations in the Trinity College Dublin (TCD) and HSE libraries, (O'Rourke, 2004, Doogue, 2004).

The author had access to a number of strategic and technical documents relating to the development of messaging services in the South East, and the development of national messaging standards/solutions, through involvement with the Health Boards Executive (HeBE) Messaging Group. Colleagues from other messaging services/projects also provided some additional research material.

Repeated searches and collection of additional literature throughout the course of this assignment, has yielded approx. 438 relevant articles/reports. These were skimmed in order to compile a suitable reading list, and selected articles/documents were reviewed in more detail.

2.2.3 Evaluation of research materials

There is a considerable volume of excellent literature available about the Danish health messaging services. A series of reports published by the Danish Centre for Health Telematics titled “MedCom – The Danish Health Care Data Network” were particularly useful as they describe the messaging programmes/projects in some detail. These became key sources as they addressed many of the detailed research questions in relation to Denmark, whereas much of the other available literature did not.

By contrast, there is a very limited amount of research available about the Irish messaging services. Much of the existing research was conducted by existing service providers, was focussed on the needs of one specific service/organisation, remains unpublished and is difficult to access.

2.2.4 Achievements

To the authors knowledge, this is the first academic research into the strategic development of health messaging services in Denmark (or any other country), with a view to making comparisons with Ireland and identifying lessons that could be of benefit to health services and patient care in this country. It is also the first time that the development process and lessons learned in Ireland, have been documented.

2.3 Semi-structured interviews

During May 2008, the author conducted semi-structured interviews with 11 key national/regional decision makers and representatives of those responsible for the development and provision of the existing health messaging services in Ireland (see Table 1).

The majority of these individuals were members of the HeBE Messaging Group, tasked with the development of national health messaging standards and the co-ordination of regional health messaging projects, and have worked directly on health messaging projects/services for many years.

Each interview was conducted over the telephone or in person, and took approx. 70 minutes on average to complete. The aim was to summarise the individual’s own experiences and to clarify what they consider to be the key priorities for the way forward (see Appendix 1). The interviews identified a significant number of key points, covering a breadth of topics and

issues. While there were variations in the topics covered and the level of detail provided, they provided a rich and valuable insight into the development of messaging services in Ireland and related issues.

Table 1: List of key national/regional decision makers interviewed

<u>Name</u>	<u>Position</u>
Mr. Willie Anderson	General Manager, HSE ICT Directorate, Kells, Co. Meath
Dr. John Brazil	IT Manager, Health Protection Surveillance Centre
Ms. Gemma Garvan	Acting Project Manager, National Healthlink Project
Mr. Vincent Jordan	General Manager, HSE ICT Directorate, Galway
Mr. Tom Laffan	I.T. Project Manager, HSE ICT Directorate, Cork
Mr. Ivan McConkey	Management Services Officer, Primary Care Reimbursement Service, Dublin
Mr. Richard McMahon	Director of Information Systems – National Lead – PCCC, HSE ICT Directorate, Limerick
Mr. Michael Murphy	Systems Analyst / Application Support, HSE ICT Directorate, Limerick
Dr. Brian O’Mahony	National ICT Project Manager - General Practice, Irish College of GPs, Lismore, Co. Waterford
Dr. Eugene Thomas	HSE Primary Care Development Unit, North West
Mr. Fran Thompson	Director of Information Systems – National Lead - Corporate, HSE ICT Directorate, Kells, Co. Meath

The key points arising from each interview were documented and sent to the interviewee for review and approval. An anonymised and summarised report of the key points arising from the combined interviews was then drafted and circulated to all interviewees for feedback, and then included in this research dissertation, (see Sections 5.3 to 5.10).

2.4 Fact sheets

A representative from each existing messaging service in Ireland was asked to complete and return a fact sheet (see Appendix 2) to establish specific details about each service (e.g. message types, transaction volumes). This informed and greatly improved the effectiveness and usefulness of the semi-structured interviews (see Appendix 3).

Chapter 3: International context and major trends for health messaging

This chapter briefly outlines the international context, and identifies a number of major trends, strategies, standards and developments relevant to health messaging, based on a high level assessment of available literature.

3.1 Major trends

The growth of information and communication technologies (ICTs) continues at a significant pace, driving economic and social development worldwide. Increasing levels of computerisation, use of internet/networking, telecommunications and mobile devices/technologies throughout society, are driving fundamental changes to the ways in which information and services are provided.

For example, the ‘always on’ nature of the internet allows individuals to access both general and private/personal information (e.g. healthcare/banking records) at a time and place convenient for them. As a result, citizens/patients are becoming increasingly involved in their own healthcare. It also allows healthcare professionals to remotely access their patient’s electronic health, medication or emergency records, when appropriate. While this can be very beneficial, it also raise potentially significant legal, data protection, confidentiality, security, safety and support issues which need to be addressed in advance by the relevant service provider(s).

Such advances have impacted significantly on healthcare IT services/systems, and facilitated innovative developments such as health messaging.

A recent study (Cruz-Correia et al., 2007) found that, between 1995 and 2005, there has been a move from local hospital-based messaging/integration projects, to mainly regional projects (i.e. 59%), with some national projects reported from 2003 onwards (e.g. Denmark, Germany and Greece). In general, a broader range of patient data is being integrated with an ever increasing number of healthcare IT systems, using mainly web-based and messaging technologies. This has improved the accessibility of patient information across healthcare

sectors. However, as projects have used a variety of technologies, standards and architectures, further interoperability may be difficult to achieve without concerted action.

3.2 eHealth in Europe

A recent EC report suggests that by 2050, the number of citizens over 65 will have almost doubled, and that spending in OECD countries may have risen to 10-13% of Gross Domestic Product (GDP). This situation will not be sustainable, without significantly changing the ways in which healthcare services are delivered, (Colasanti, 2006).

Over the past 25 years, the level of ICT investment in healthcare in Europe has fallen behind other service sectors, despite the relatively high potential returns in this high-cost sector. This typically amounted to 1% of total revenue, increasing recently to 2% on average, but almost 80% of this related to generic ICT infrastructure (e.g. hardware, networking). As the eHealth market is set for explosive growth, the EC is assessing means of boosting investment in this area, (Colasanti, 2007).

The EC has supported and funded many research projects/initiatives over the past 2 decades, informing the development of numerous European eHealth strategies/plans.

For example, they developed a joint European strategy for the development of Regional Health Care Networks (RHCNs), based on feedback from 6 relevant projects conducted between 1995 and 1998 as part of the European Union's (EU's) fourth framework programme for health informatics. This strategy focussed on 18 action areas where there is a demand for IT systems using standard internet technologies (see Tables 2, 3 and 4), and described the characteristics and importance of each communication category, (Jensen et al., 1999). This provides a context for electronic health messaging (e.g. includes both clinical EDI and billing, regardless of the technologies/methods used).

Table 2: EU action areas for clinical communication

EU action areas for clinical communication	
Clinical EDI	Standardised and automatic e-mail communication of the most common, form-based messages
Secure e-mail	General, but encrypted e-mail for daily ad-hoc enquiries and results
Pull look-up	On-line WEB-based look-up in IT systems of laboratories and radiology systems
Booking	On-line WEB access to booking systems
Joint records	EPR systems used across sectors, departments and organisations
Telemedicine	Internet-based "push" or "pull" systems for remote diagnostics and expert assistance

Table 3: EU action areas for healthcare information

EU action areas for healthcare information	
Referral info	WEB-based information systems targeted at various specialised groups, e.g. general practitioners
Quality info	WEB-based information systems with information on quality in the provision of treatment
Citizen info	WEB-based information systems targeted at the citizen

Table 4: EU action areas for administrative communication

EU action areas for administrative communication	
Billing E-commerce	Standardised transfer of billing information EDI or WEB-based ordering and invoicing of goods and services

In 2004, the EC published an eHealth Action Plan and roadmap, which described eHealth as potentially the 3rd largest industry in the European health sector, and identified the interoperability of health records as a priority for Member States, (Colasanti, 2004).

In July 2008, the EC published a recommendation on the cross-border interoperability of electronic health record systems, which includes the aim of achieving European eHealth interoperability by the end of 2015. This is likely to have significant implications for Ireland. This recommendation recognises the vital need to connect citizens, services and systems, in

order to provide good healthcare and facilitate the free movement of patients/professionals and eHealth products/services across Europe. It sets out the basic principles, steps required and potential challenges (e.g. legal, technical) of communicating patient data across borders, with appropriate safeguards, (Colasanti, 2008).

It is suggested that the communication of health messages across Europe will be difficult to achieve, considering the different cultures, languages, strategies, clinical/data standards, infrastructures and technologies in use.

3.3 Standards

Considerable on-going standards development relating to eHealth is completed by a variety of international Standards Development Organisations (SDOs) and consortia (see Table 5).

Table 5: Examples of relevant International Standards Development Organisations

Organisation Name	Abbreviation
European Committee for Standardisation	CEN
European Committee for Electrotechnical Standardization	CENELEC
Digital Imaging and Communications in Medicine	DICOM
European Telecommunications Standards Institute	ETSI
Health Level Seven	HL7
International Electrotechnical Commission	IEC
Institute of Electrical and Electronics Engineers	IEEE
International Health Terminology Standards Development Organisation	IHTSDO
International Telecommunication Union	ITU
International Organisation for Standardisation	ISO
Logical Observation Identifier and Names Codes	LOINC
Organization for the Advancement of Structured Information Standards	OASIS
World Wide Web Consortium	W3C
World Health Organisation	WHO

On October 11th 2006, the health informatics technical committees from ISO (TC 215) and CEN (TC 251) signed an agreement/charter with HL7, to work together towards achieving Global Health Informatics Standardisation. Their goal is to develop one harmonised set of standards for each business need, published through the ISO. Other SDOs (e.g. IEEE,

DICOM, IHTSDO and LOINC) are reported to be considering participating in this joint initiative, with IHTSDO identified as being of high priority interest for this work, (Dickerson, 2008, Molenaar et al., 2007).

In 2007, the EC issued a mandate (M/403) to the three official European Standards Organisations (i.e. CEN, CENELEC, ETSI). This mandate was to jointly examine existing international standards for eHealth, analyse related needs, develop an appropriate standards development programme by December 2008 (phase 1), and to execute the approved work programme in 2009 and 2010 (phase 2). The “eHealth-INTEROP” project was initiated in January 2008 to address this mandate, (Lehouck, 2008, Golyardi and Slagter, 2008).

There are a number of standards that are of particular importance for health messaging. The EDIFACT (ISO 9735) standard was developed in 1987 and is the dominant structure (syntax) worldwide, (Jensen, 2001, Meeuwen, 2008). HL7 was also established 1987, with an initial focus on interfacing requirements. Their version 2 standards are the most widely used within the hospital sector, particularly in the USA but to a lesser extent in Europe/worldwide. They specify both the meaning (symanctics) and structure (syntax) of information to be communicated, and can be adopted with an alternative syntax (e.g. XML - eXtensible Markup Language), (Jensen, 2001, Ribick, 2008, Kalra, 2006). XML is the current de-facto standard for the exchange of ‘general’ data. Both EDIFACT and HL7 are working to provide versions of their standards that use the XML syntax. Figure 3 (Jensen, 2001) shows the EDIFACT, HL7 and XML syntax for a patient’s name and identification number.

In 2001, CEN/TC 251 established a task force called EHRcom, to develop their EN 13606 pre-standard for EHR communications as a definitive European standard. They set out to produce an EHR architecture (e.g. reference/exchange models), supporting the interoperability of systems/components that would interact with EHR services. The ISO/TC 215 has consolidated a number of these technical standards into International Technical Specifications, (Kalra, 2006).

```

EDIFACT:
PNA+PAT+PatCpr+++SU:PatEnavn+FO:PatFnavn'
PNA+PAT+1405602165:CPR:IM+++SU:Jensen+FO:Henrik'

HL7:
PID|1|PatCpr|PatFnavn^PatEnavn<cr>
PID|1|1405602165^CPR^IMI|Henrik^Jensen<cr>

XML:
<Patient>
<PatCpr></PatCpr>
<PatFnavn></PatFnavn>
<PatEnavn></PatEnavn>
<Patient>

<Patient>
<PatCpr>1405602165</PatCpr>
<PatFnavn>Henrik</PatFnavn>
<PatEnavn>Jensen</PatEnavn>
<Patient>

```

Figure 3: EDIFACT, HL7 and XML syntax for patient ID and name

3.5 Conclusions

The healthcare environment is rapidly evolving, partly driven by ICT innovations and advancement. In this environment, it is important that the level of investment in eHealth should be increased, to match that of other sectors. The EC and international SDOs have been very active in developing and promoting the use of standards and achievement of interoperability, as being high priority objectives. At a regional level, where most projects are conducted, interoperability has often been achieved using a variety of technologies, standards and architectures. This is likely to make further interoperability difficult. The absence of global standards for the next few years at least, is likely to constrain international developments.

Chapter 4: Health messaging services in Denmark – the state-of-the art

This chapter outlines some relevant facts relating to Denmark, how the Danish health services are organised and structured, where health messaging fits within the health delivery structures, and how such messaging services are organized. It then describes the development of health messaging services and supporting infrastructures, based on a detailed review of available literature.

To illustrate what they have achieved, it was estimated in 1996 that approx. 30 million routine communications were being sent each year in Denmark, making up 90% of all structured communications to and from GP practices. This was estimated to cost DKK 1 billion (€136 million) per year, as the vast majority of this was paper based, (Mariboe, 1996). During 2007, more than a decade later, almost 44 million communications were exchanged electronically. Many additional and related services (e.g. eHealth Portal, inter-hospital communications) had also been developed and implemented, re-using MedCom's messaging standards and components, to provide further demonstrable benefits, (Hulbaek et al., 2007). It is important to understand how this success has been achieved, and how it may be replicated in Ireland.

4.1 Some facts about Denmark

Denmark is a small wealthy country with a population of around 5.45 million people, which is dwarfed by its immediate neighbours Sweden and Germany. Two thirds of its total 43,098 km² area is farmland, and only 8 urban centres have more than 50,000 inhabitants. It has a very long coastline of 7,314 km and includes 407 islands, so it has many characteristics of an island nation, including the fact that it rains every second day, (Plovsing, 2008)!!

Interestingly, Denmark is regarded as one of the countries worldwide that has the most equal income distribution (Plovsing, 2008).

While the Kingdom of Denmark includes the self-governing areas of Greenland and the Faroe Islands, these have not been included within the scope of this research.

4.2 Overview of Danish health service

According to the Ministry of the Interior and Health, 85% of health care is funded publicly through taxes, and there is free access to most health services for all citizens regardless of their ability to pay. Only 28% of the population are covered by private health insurance. Most healthcare providers (including clinicians) are salaried public sector employees, (Rasmussen, 2002).

In 2006, Denmark spent 9.5 % of GDP on healthcare, 0.6% above the OECD average (see Figure 4) and was ranked in 9th position of the 30 OECD countries in terms of annual spend. By contrast, Ireland was ranked 23rd , (Gurría, 2008b)

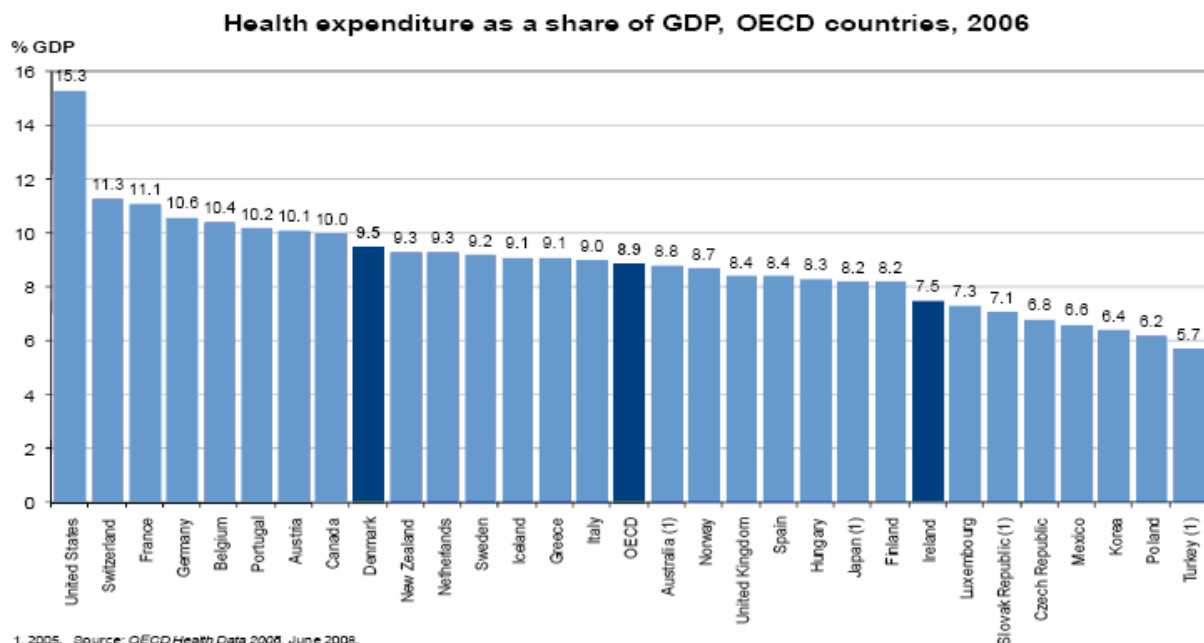


Figure 4: Health Expenditure as a share of GDP, OECD countries, 2006

All Danish citizens have a national civil registry (CPR) number. This 10-digit number includes their date of birth and sex, and is used for personal identification throughout the public and private sectors, (Sander, 2008).

4.2.1 Primary healthcare sector

The primary healthcare sector deals with patients that have general health problems.

Treatment and care is provided by some 3,400 GPs, 1,200 specialists, 1,400 physiotherapists and 2,700 dentists in their own private practices, and district nurses. GPs are paid by way of capitation and fees combined, (Rasmussen, 2002).

The GP has a 'gatekeeper' role and refers the patient to hospital and/or other specialist services for examination and treatment as necessary, ensuring that care is provided at the lowest possible level of specialisation.

The Healthcare Reimbursement Scheme (HCRS) contracts with self-employed practitioners to provide services to patients on behalf of the state. The 300 privately operated pharmacies only charge patients for amounts that exceed the public subsidy.

4.2.2 Hospital sector

The hospital sector is largely county based and publicly owned, and deals with patients that need more specialised and intensive treatment and care.

There are 3 large medical laboratories operating in Denmark (i.e. Copenhagen General Practitioner's Laboratory (KPLL), SSI and Medilab), and at least one hospital-based laboratory (e.g. Hvidovre).

Preventative treatment and services (e.g. health schemes, child dental care) are provided by both the Primary healthcare and Hospital sectors.

4.2.3 Structures and administration

The responsibility for running the health service is decentralised to the lowest possible administrative level, so that services can be provided locally. The regional authorities have the central role, supported by the Government and Local Authorities, but they all work in close co-operation.

In 2004, a reform bill was passed to change the way in which health services were organised and financed, and this came into effect in January 2007, (Bilde et al., 2005). This was the most ambitious and significant reform of local government since 1970, (Rasmussen, 2005).

When planning this reform, it was recognised that the existing health messaging services would play a significant role in maintaining effective communications between all of the healthcare partners during the transition to the new organisational structures, helping to maintain a cohesive health service.

4.2.3.1 National

The Government through the Ministry of the Interior and Health is responsible for developing legislation, national health policy and guidelines, and for setting national goals. They provide block (capital) grants to the counties. Their role is to “initiate, co-ordinate and advise” and to support the dissemination of information and experiences. They meet regularly with the Regional and Local Authorities to develop health care plans. They also license and authorise a limited number of private pharmacies, (Rasmussen, 2002).

The National Board of Health councils the Ministry of Health and other state bodies involved in providing healthcare, and is responsible for supervision of health personnel, (Lippert and Kverneland, 2003).

4.2.3.2 Regional

The 14 Counties and the Copenhagen Hospital Co-operation (Copenhagen and Frederiksberg counties combined) ran the public hospitals, up until January 2007. They funded the health service and had wide ranging powers to raise taxes and organise services without government interference, so they could make adjustments when necessary. The Counties were also responsible for the practicing sector. From 1993, patients could choose the hospital that they wanted to attend, (Rasmussen, 2002).

However, in January 2007, the 14 counties were replaced by 5 larger regions (see Figure 5) and they now run the hospitals, but without the powers to raise local taxes (Bilde et al., 2005).

4.2.3.3 Local

Up until the health reforms, there were 273 Local Authorities providing many local services to citizens, including healthcare and social services, (Rasmussen, 2002).

After the reforms, this number was reduced to 98 stronger municipalities, and they became the main access point to public services for citizens. They assumed more responsibility for providing health services and now purchase hospital services from the 5 new regions, (Rasmussen, 2005).



Figure 5: Denmark - The 5 new regions and number of inhabitants (1st Jan 2005)

4.3 Organisation of health messaging services

The development of health messaging services ultimately involves all healthcare organisations that need to communicate information electronically to any other organisation. However, the following ‘key players’ are involved in driving and co-ordinating the health messaging programmes:

4.3.1 MedCom

Following a proposal in 1992 from Funen County Council, MedCom was set up in 1994 as a project organisation to achieve electronic communications across healthcare organisations and to establish a coherent Danish Healthcare Data Network (DHDN) (see Section 4.3.2).

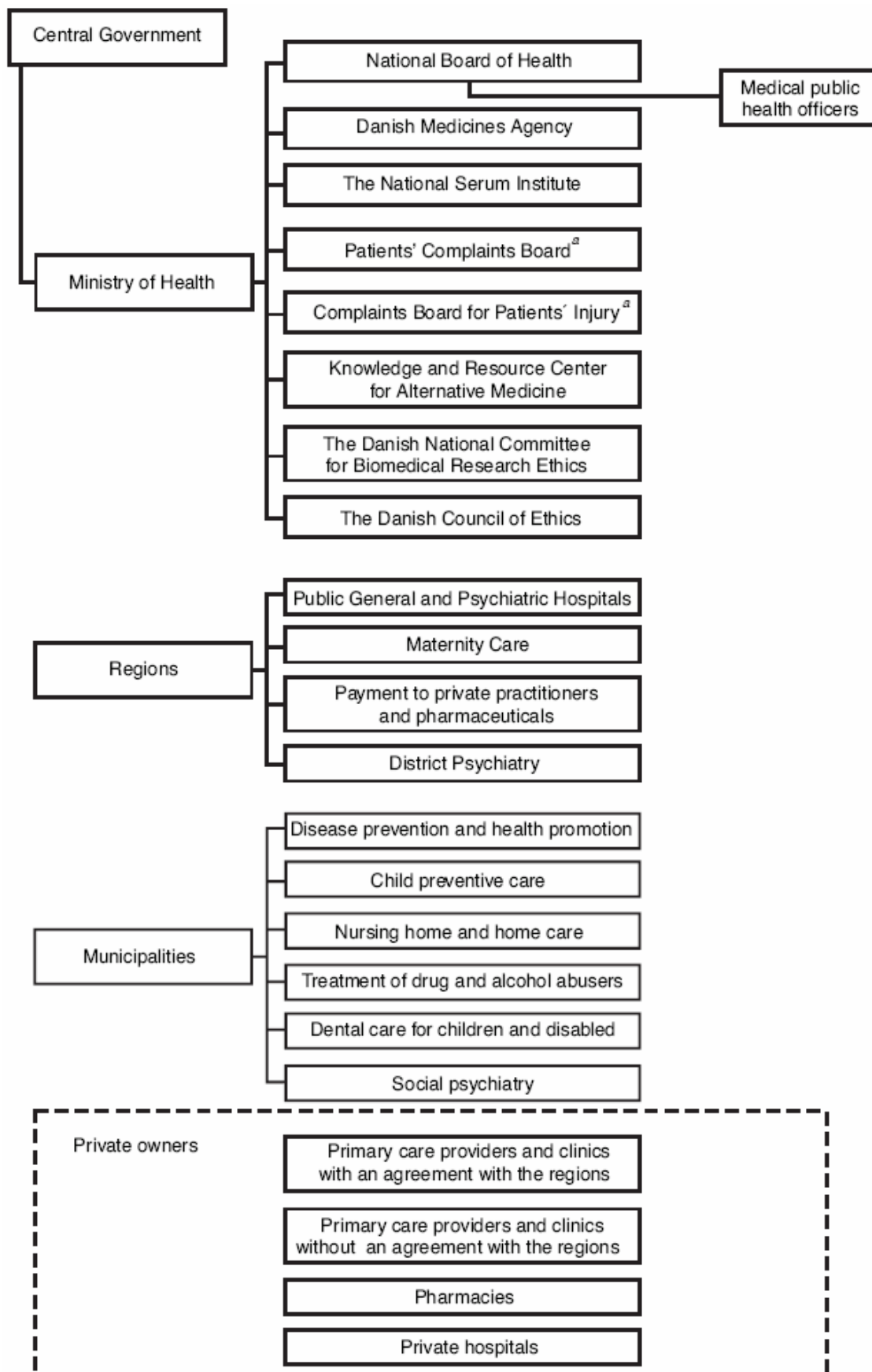


Figure 6: Overview chart of the Danish health system (January 2007)

Table 6: MedCom's original Steering Committee and financing organisations

<u>Organisation Name</u>
The Danish Ministry of Health (Chair: Vagn Nielsen, Head of Department)
The National Board of Health
The Association of County Councils in Denmark
Copenhagen Hospital Corporation
The Danish Medical Association
The Danish Pharmaceutical Association
Kommunedata I/S
Tele Danmark

MedCom was set up as a separate organisation in recognition of the need for an impartial ***“prime-mover, negotiator and co-ordinator”*** in this development process, (Jensen et al., 1999). As they did not use or supply products/services to the Danish Healthcare Data Network, they were considered to be an ‘honest broker’ in resolving any difficulties that arose. Their role was to be the key player and to strengthen local messaging projects (e.g. supplying standards, guidelines) rather than actively conduct such projects themselves.

Their terms of reference were to *“contribute to the development, testing, dissemination and quality assurance of electronic communication and information in the healthcare sector with a view to supporting patient focussed care”*, (Jensen et al., 1999). This was a broad remit which allowed them to broaden their scope/activities and to evolve over the years as necessary, to address new healthcare requirements and to avail of new ICT technologies and innovations.

They were established as a permanent organisation in 1999 and development continued in 2-3 year programmes, (Jensen, 2001). They went from having a project team of 6 in 1996, to having a staff of 27 in Dec. 2007 (see Table 7), (Mariboe, 1996, Hulbaek et al., 2007). They later became part of the Danish Centre for Health Telematics, but retained their national co-ordination role. This included acting as a link between the Danish National Board of Health, who are working to develop Electronic Patient Record (EPR) standards, and the implementation of these standards in the hospitals run by the Counties/Regions. They have built up a considerable amount of specialist expertise over the years, making them an obvious participant in many health related communication programmes.

Table 7: Comparison of MedCom staff numbers in 1996 and Dec 2007

<u>Job Title/Role</u>	<u>1996</u>	<u>2007</u>
<i>Project/Centre Manager</i>	<i>1</i>	<i>1</i>
<i>Assistance Manager</i>		<i>1</i>
<i>Head Consultant</i>		<i>1</i>
<i>Consultants</i>	<i>2</i>	<i>16</i>
<i>International Manager</i>		<i>1</i>
<i>Project Co-ordinator</i>	<i>1</i>	
<i>Support Staff</i>	<i>2</i>	<i>7</i>
<i>Total</i>	<i>6</i>	<i>27</i>

Medcom's development of the DHDN was identified as the "best practice" example during the eHealth 2003 Ministerial Conference, and received "honourable mention" from European Commissioners Byrne and Likanen, (Hulbaek, 2003, Hulbaek, 2005). They also won the prestigious eHealth Europe Award from the EC in May 2004 for the Danish eHealth Portal, confirming their status as a centre of excellence, (Henrik Bjerregaard Jensen, 2006, Tangent *et al.*, 2005). In November 2007, MedCom was awarded the Danish Government's Digitisation prize in the co-operation category as a programme which creates "*value for both individual citizens and society as a whole*", (Hulbaek *et al.*, 2007).

4.3.2 Danish Healthcare Data Network (DHDN or SDN)

The DHDN is a logical (not a physical) data network, that connects all healthcare providers and support services, to facilitate effective communication. Its continued success is dependent on the healthcare IT systems connected to it (e.g. consistent use of standards). It was envisaged that this would facilitate a faster pace of development for new forms of communication, and that is exactly what happened. Recently, the DHDN was re-named to Sundhedsdatanettet (SDN).

4.3.3 Counties and Local Authorities

Each project to develop an individual messaging interface (e.g. communicate discharge letters from the Funen Hospital surgical team to GPs) is managed and conducted locally. This involves a considerable investment of resources from the Counties and Local Authorities (e.g. clinicians, technicians, service managers, ICT and support staff).

4.3.4 Private healthcare providers and their IT suppliers

While the private health sector in Denmark is relatively small in comparison with many other countries, they provide a huge range of healthcare services and products to citizens and patients. It is very much in the patients' interest, that their healthcare information can be exchanged efficiently with these partners, using electronic communications. For this to happen, all healthcare providers/partners must work together to incorporate national data standards and relevant functionality into their IT systems, and change their business processes to accommodate and make use of these new information flows.

4.3.5 Danish Centre for Health Telematics

This organisation was established in 1994 to control and develop the DHDN to meet local, regional and international needs. It includes MedCom and Fyncom, and has a central role in expanding electronic communications in health and social services, and developing the commercial marketplace for related products/services. The centre provides advice and support, and includes an international section that participates in several European projects. One of their aims was to develop consistent and detailed data definitions to ensure almost 100% data reliability, so that messaging services would operate effectively and provide a good return on investment, and this has largely been achieved.

4.3.6 Fyncom

The County of Funen was the first regional authority to commit to building a Regional Health Care Network (RHCN) called Fyncom. In 1994 they established this organisation and long-term programme on their own initiative, and included all existing/proposed electronic communications projects, (Jensen, 2006). They have since become part of the Danish Centre for Health Telematics, but retain their regional co-ordination role.

4.3.7 Connected Digital Health in Denmark (SDSD)

This cross-governmental organisation was set up to co-ordinate the national Health IT strategy 2008-2012 development programme, (Larsen, 2007).

4.4 Strategies and standards

In Denmark, the level of strategic vision and planning in relation to Government and Health IT is very mature and advanced, and there is a high level of commitment to the development and implementation of standards.

4.4.1 Government IT strategies

The Health Sector forms a significant part of the public service, and many different government departments are involved in the provision of healthcare services (e.g. prisons, armed forces) and social services (e.g. housing for the elderly) to citizens. It is very important to co-ordinate all of these services, and to exchange relevant information across sectors as accurately and efficiently as possible.

The Government of Denmark has produced significant national ICT strategies, and these have provided a framework for the health sector. These include an IT Policy Action Plan (1996), a White Paper on Enterprise Architecture (Rønnebæk, 2003), an Architecture for eGovernment in Denmark (Sander, 2004), and Measures to Promote Interoperability via Common Open Standards (Hindsberger and Lebech, 2006). They are actively working on the development of reference information models. One of their priorities is to develop operational directions for a national Service Oriented Architecture (SOA). The Public Information On-line (OiO) standard using web services architecture, sets out how service components can be integrated using these standards, (Lars Hulbaek Fog *et al.*, 1998, Lars Hulbaek, 2005, Marianne Rønnebæk, 2003).

4.4.2 Health IT strategies

Since 1991, the Government Ministries responsible for health have published national IT strategies every 3-4 years, setting out ambitious but pragmatic visions and targets for developments which could improve patient care and administrative efficiency. These strategies were typically developed in co-operation with user groups representing healthcare professionals, health informatics specialists and software vendors. From the outset, they recognised the importance of electronic communications between different health sectors/providers, and prioritised the MedCom programme so that new health messaging services would eliminate inefficient paper based communications.

Each national strategy (see Table 8) was typically accompanied by action plans which identified fundamental business, organisational and ICT components necessary to deliver on these strategies. These set out specific and realistic deliverables and targets to be achieved. The plans were then backed up by good leadership, appropriate organisation structures and resources, greatly increasing the likelihood of their success.

Table 8: National IT Strategy reports in the Healthcare Sector

Year	Document Name	Published By	Main Focus
1991	IT across (Sector) Boundaries	Danish Institute for Health Services Research (DSI)	Highlighted the need for increased cross-sector communication (Fog et al., 1998).
1996-1997	Action Plan for EHR.	Ministry of Health.	Requirement for EHR standards and common terminology (Andersen, 2006, Lippert and Kverneland, 2003).
1999	National Strategy for IT in the Healthcare Sector 2000-2002.	Ministry of Health.	Improve communications between all healthcare partners, and use of health messaging (Tangent et al., 2005, Jensen et al., 1999). Hospital IT systems to be based around EHRs (Andersen, 2006).
2003	National Strategy for IT in Health Care 2003-2007 (Pedersen et al., 2003).	Ministry of the Interior and Health.	Importance of shared information for provision of seamless care and patient involvement (Andersen, 2006).
2007	National Strategy for Digitalisation of the Danish Healthcare Service 2008-2012 (Larsen, 2007).	Digital Health, Connected Digital Health in Denmark.	Digitalisation that directly supports staff, patients and cross-sector communication at a service level (SOA) (Hulbaek et al., 2007, Larsen, 2007).

4.4.3 Messaging Standards

At the outset of their national messaging programme in 1994, the health sector in Denmark decided to adopt the common Electronic Data Interchange For Administration, Commerce and Transport (EDIFACT) standard for communication, and to customize this for their own use. This United Nations standard comprises “*a set of internationally agreed standards, directories and guidelines for the electronic interchange of structured data, and in particular*

that related to trade in goods and services between independent, computerized information systems”, (Meeuwen, 2008).

Electronic Document Interchange (EDI) enables the exchange of structured information (e.g. discharge letter) between two parties in a fully automated way without the need to prepare for the communication locally. This is achieved by ‘system to system’ communication which does not require manual intervention, (Fog et al., 1998).

It was during the national MedCom I programme (see Section 4.5.3) that the initial national messaging standards were developed, and added to as needed (see Appendix 4).

4.4.4 Other standards

Denmark has clearly recognised the benefits of standards, has adopted a range of international terminologies and classifications (e.g. ICD-9, SNOMED-CT), and also developed their own national standards where appropriate (e.g. coding tables, lab display guidelines). Such standards appear to be in widespread use, and updated values are often disseminated using health messaging services. The XML standard has been adopted, for the public exchange of information.

4.5 Development programmes and projects

According to MedCom, Denmark was the first European country to implement a functioning, national healthcare data network, (Mariboe, 1996). However, this has not been confirmed.

MedCom has been very clear from the outset that *“Accurate , fast and secure communication of these messages has therefore not only become crucial for costs, better quality and patient services in the health care sector overall, but it is also essential for the creation of a coherent health care sector”*, (Mariboe, 1996).

The provision of health messaging services has enabled healthcare professionals to provide more consistent and coherent treatment to their patients, and to access pertinent information across different patient record systems. For social services, the earlier communication that a patient is about to be discharged from hospital gives them more time to prepare, so the care provided is more effective, particularly in the initial few days, (Tangent et al., 2005).

4.5.1 Local initiatives (Late 1980s)

In the late 80s, there was an increasing level of interest in electronic communications between healthcare providers. The Association of Country Councils initiated a number of pioneering projects, including those at the Vejle and Silkeborg hospitals, funded by a major communications company (i.e. Kommunedata). These innovators worked separately to pilot solutions that could reap the benefits of new technologies.

During 1989-1990, a landmark project was conducted in Amager to improve the level of communication between 11 GP practices and 10 pharmacies. This established the technical framework that was used in subsequent messaging projects, up to quite recent times.

In 1991 the DSI published a report called “IT across (Sector) Boundaries” which was instrumental in highlighting the need for increased cross-sector communication.

4.5.2 Large regional projects (1992-1994)

Following on from the Amager project, the County of Funen established a long-term programme in 1994 to build a Regional Health Care Network (RHCN) called Fyncom, and this encompassed all of their electronic communications projects, (Jensen, 2006). Two other large regional projects were subsequent initiated, the Odder project in Aarhus County and Copenhagen General Practitioner’s Laboratory (KPLL) project. All of these projects used the same technologies as the Amager project, and leveraged their experience.

In 1994, the Danish Hospital Institute conducted an evaluation of the Fyncom project. They calculated the average time saved in the dispatch and processing of different documents, resulting from the use of electronic messaging (see Table 9).

Based on these figures, they estimated the total opportunity and investment costs at DKK 2 per message (€0.27) in total for the recipient and the sender. These are roughly the same figures as those calculated by the Odder Project in 1993, (Mariboe, 1996).

Table 9: Average time saved per single electronic message

<u><i>Message Type</i></u>	<u><i>Minutes Saved on Dispatch</i></u>	<u><i>Minutes Saved on Receipt</i></u>
Discharge Letter	3.35	5.10
Prescription	1.20	<i>Not Stated</i>
Laboratory Result	<i>Not Stated</i>	3.70

4.5.3 MedCom I (1995-1996)

According to the Danish Centre for Health Telematics (Mariboe, 1996), this programme was initiated in 1994, following a proposal in 1992 from Funen County Council, “*to establish over a 2 year period a sustainable, coherent health care data network comprising the most frequently occurring messages in the health care sector and based on international EDIFACT standards.*”

The programme had a central budget of DKK 15 million (EUR 2.04 million) contributed equally by the state, the counties and the private sector. However, the counties and IT suppliers then invested a further DKK 100-200k per pilot project and DKK 20-50k per interface. The total investments by all parties was estimated to range from DKK 19 million (EUR 2.58 million) to DKK 24 million (EUR 3.27 million). It was anticipated that the benefits would over time offset these costs.

4.5.3.1 Phase 1

During the first phase, MedCom and their development partners (incl. IT suppliers) elaborated on the EDIFACT standard, to create their own national messaging standards.

As previous attempts by the large regional projects to develop functioning EDIFACT standards on paper had been unsuccessful, MedCom I adopted a different and more pragmatic approach. A standards group comprising health professionals, support staff and managers defined their requirements first, and then worked with health informatics/IT specialists to identify ways of meeting these requirements. This process developed good teamwork and included those involved in actually implementing the standards, ensuring that the resulting standards/solutions more closely met user’s expectations. Small pilot projects were then conducted to develop the necessary interfaces/solutions to prove the concept, and the standards were revised in the light of experience and feedback. Once it was assured that the revised standards were appropriate and consistent, MedCom published the standards and

encouraged their adoption, so that rollout of the relevant service(s) could commence. This extensive and iterative process became ‘tried and trusted’, as it resulted in practical standards that could be implemented effectively.

A number of EDI management, coding and simulation/testing tools were developed to help with this process, and provided free of charge to the suppliers involved.

MedCom developed and tested messaging standards for the six main information flows (approx. 30 million communications – see Table 10 and Figure 7). This was more difficult than expected, and it took quite some time and effort to reach consensus. While these standards were subsequently refined, they are still in daily use today.

These numbers exclude an estimated 1.3 million referrals from GPs to specialists, 3 million discharge letters returned, 10 million emergency service records, and referral/discharge messages exchanged between the local authorities, GPs and practitioners, bringing the estimated total to 50+ million messages per year.

4.5.3.2 Phase 2

In the second phase, MedCom initiated 25 regional pilot projects covering all 6 message types, and this involved all but 5 counties and some 200 key people. They ambitiously involved 24 healthcare IT suppliers providing 29 different systems (i.e. 80% of those used nationally and almost all GP/hospital systems), (Mariboe, 1996). This was very significant.

The first group of pilot projects, involving a small number of suppliers and GP practices, assessed each communication for the first time. It often took longer than planned before they were ready to start pilot operation. The second group (i.e. the rest) had a substantially easier task and could build on the work already completed. The standards were then revised in the light of experience.

4.5.3.3 Outcome

MedCom I finished on time and within budget, and 81% of the 76 planned interfaces were developed, tested and in everyday use. The developed interfaces represented 43% of the 175 interfaces needed to ensure that all systems could talk to each other.

Table 10: Volume of communications for each EDIFACT standard

<i>Message Type</i>	<i>EDI Reference</i>	<i>Million per yr (est)</i>	<i>Dispatched From</i>	<i>Received By</i>
Prescriptions	MEDPRE	16	GPs	Pharmacies
Laboratory results	MEDRPT	4.5	Medical Laboratories	GPs
Discharge Letters & X-Ray results	MEDDIS	4	Hospitals & Radiology Depts	GPs
Laboratory & Radiology Requests	MEDREQ	2.5	GPs	Medical Laboratories & Radiology Depts
Referrals & X-Ray requests	MEDREF	2	GPs	Hospitals
Billing	MEDRUC	0.23 (30m bills)	GPs & Pharmacies	National Health Insurance

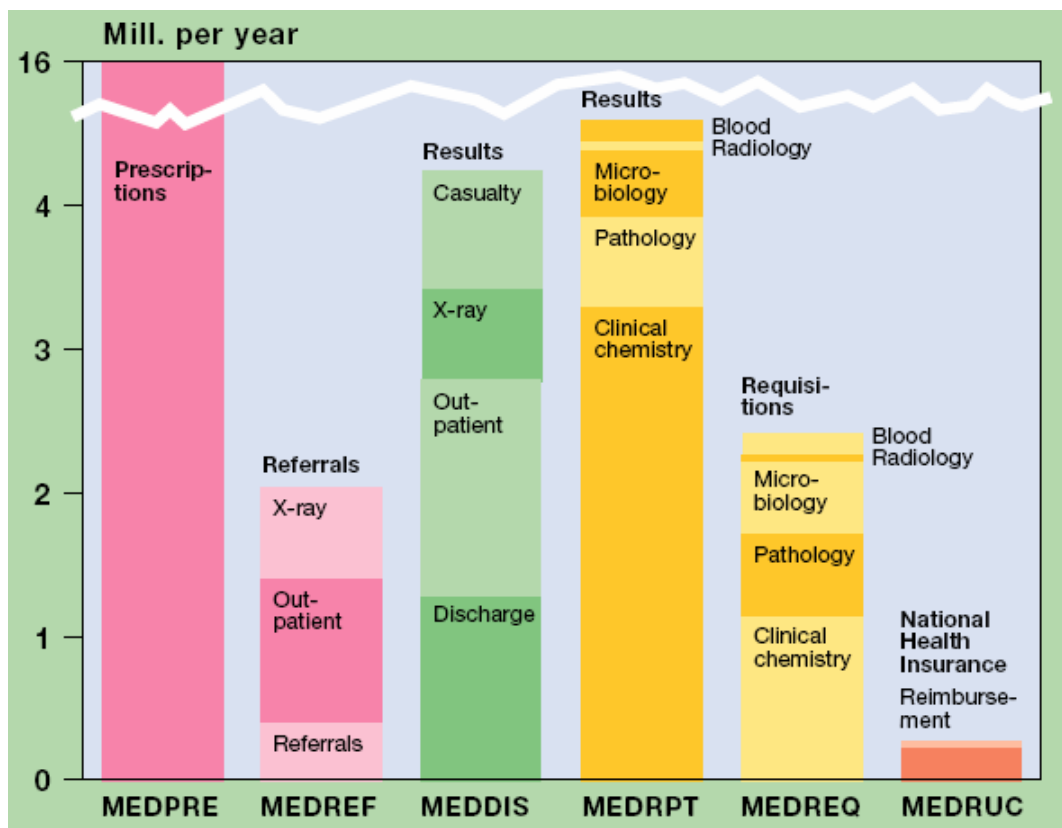


Figure 7: Number of Communications for each Message Type annually

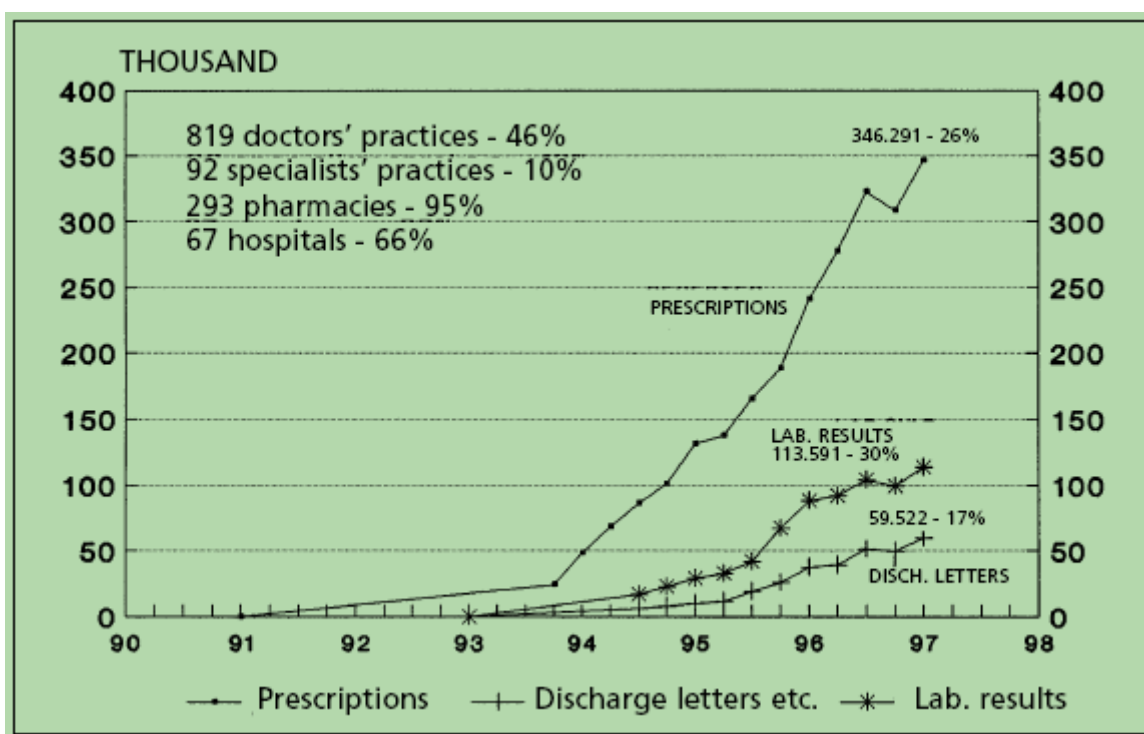


Figure 8: Transaction volumes and connections achieved

4.5.4 MedCom II (1997-1999)

The Danish Centre for Health Telematics (Fog et al., 1998, Jensen et al., 1999) were concerned that the uptake and use of the developed standards was quite slow, so this led to the initiation of a further 3-year programme. The main objective was to achieve a “*massive dissemination*” of electronic communications by the year 2000, but there were other objectives (see Table 11).

Table 11: Other MedCom II objectives

<u>Objective Name</u>
Waiting list information for GPs
Electronic communication of death certificates
Electronic scheduling/booking facilities
Gathering of data for clinical databases
Gathering and reporting of statistics and administrative information (e.g. patient ids)
Image and multi-media communication
Standards associated with the introduction of electronic care records

As this list included objectives not related specifically to messaging, this was a broadening of scope, illustrating a strong desire to push out the boundaries of what was possible.

The total budget was DKK 25 million (EUR 3.4 million) contributed equally by the state, the counties and the private sector, supplemented to some extent by groups with an interest in specific initiatives. It was calculated that, assuming a low average time saving of 4 minutes per message, this could lead to an annual release of resources worth DKK 250 million (EUR 34.01 million) in the healthcare sector. This excluded savings on postage and other benefits (e.g. service, clinical and security improvements).

4.5.4.1 Dissemination projects

A total of 175 projects were initiated to ensure widespread adoption and daily use of the national EDI standards, each one covering one message type within a county. These projects impacted hugely on the county councils, as all clinical services/departments within all of the hospitals nationally had to change their work processes within 3 years. This was a very significant undertaking. The scope of this work often included the procurement and implementation, or upgrading, of supporting IT systems. The national laboratories were also affected to a lesser extent.

MedCom was involved in promoting the advantages of messaging and co-ordinating these projects. The establishment of co-operative agreements with each local project was considered to be a cornerstone for effectively managing this programme. They also developed a web-based console called “EDI-top” which presented clear, concise and comprehensive statistics and programme/project related information to all those involved in the dissemination projects. This included amongst other things:

- A ‘league table’ of counties
- Message volumes per county & message type (see Table 12)
- A list of suppliers certified to send/receive specific message types
- Specific deadline commitments

This information was published widely when they realised what a powerful motivational tool it was for improving services, and for encouraging co-operation and compliance (e.g. by publicly identifying underperformance by any stakeholder).

Table 12: The EDI League Table (Oct 1999)

Total %	County no.		Discharge	Referral	Lab. results	Lab. requests	Billing	Prescriptions	Notes	Prescriptions	Billing	Billing	Letters	Referrals	All messages
55,1	1	Funen County	35672	1576	41225	539	86	66316	16254	2479	426	0	3841	0	46
52,4	2	S.Jut. County	22248	195	17769	0	111	43301	4604	1659	303	3	2887	20	0
50,6	3	N.Jut. County	17765	606	46290	0	73	85964	19039	4517	531	0	3019	0	0
49,1	4	Vejle County	21349	1078	19709	566	109	53557	11160	2750	409	25	1267	5	0
46,6	5	KPLL			28729	0									
45,9	6	Viborg County	10975	8	18426	0	172	38418	4523	1464	202	2	1201	0	0
38,3	7	Roskilde Co.	5283	318	12542	0	70	27206	7502	2045	257	14	1038	1	0
34,2	8	Ribe County	0	2	9933	0	125	31899	9180	1741	285	0	835	1	0
33,9	9	Århus County	34025	71	27428	0	80	85720	19768	4744	23	0	1779	2	0
32,4	10	Storstr. County	7733	94	9640	0	19	31544	9655	1414	294	0	559	2	0
30,7	11	V.Zeal. County	4361	15	13222	1	58	35252	4916	1597	393	0	886	41	0
24,1	12	Bornh. County	839	0	2233	0	0	8982	0	0	0	0	237	0	0
23,4	13	Fr.borg County	40	0	14975	221	159	35360	301	1201	350	37	677	9	0
21,5	14	CHC	7318	0	8194	0	250	25473	5373	5063	0	0	3618	0	0
16,7	15	SSI			19988	0									
15,6	16	Ringkøb. Co.	123	0	9271	0	41	28746	1447	1362	0	3	1168	0	0
12,8	17	Copenh. Co	35	0	0	2	176	38893	10193	3504	495	63	2847	0	0
0,0	18	MediLab			0	0									
		Tot. mess. DK	167766	3963	299574	1329	1529	636631	123915	35540	3968	147	25859	81	47
All messages in Denmark: 1,300,349															

4.5.4.2 Local Authority projects

In May 1997, the municipal healthcare sector agreed to participate in MedCom II, largely due to their positive experiences in Funen county. They were particularly keen to integrate their information with other healthcare providers (e.g. hospitals, GPs), to improve communications between local authorities, and to automate communications affecting:

- children and the elderly (e.g. admissions)
- home help services (e.g. discharge letters)
- pharmacies (e.g. medicine claims)
- national authorities (e.g. invalidity pensions)

For patients, the improved contact between hospitals and home helps schemes brought about the greatest benefits (e.g. advising district nursing services when a patient's hospital treatment would be completed and/or providing care reports). These projects involved the development of additional EDI standards, a new web browser facility for viewing messages (for small organisations) and conducting a small number of pilot projects. The project involving pharmacies was stopped due to legislation changes. A number of sub-projects were also completed. For example, a national XML project was initiated by the Danish EDI Council

and Fishel & Lorenz, aimed at developing new solutions and converting some existing EDIFACT solutions (e.g. birth notifications) to XML. This leveraged MedCom's knowledge and experience.

4.5.4.3 Ultra Rapid Prescription project

In order to ensure that prescriptions were being communicated to the pharmacy within an acceptable timeframe, it was necessary to analyse and optimise the existing work processes, systems and technologies. This involved troubleshooting the whole DHDN to achieve the targets set.

4.5.4.4 Other pilot projects

A number of additional pilot projects were conducted, and there are outlined in Table 13.

Table 13: MedCom II - Other pilot projects

<u>Project Name</u>	<u>Project Description</u>
Dentist project	Linked dental practitioners to the DHDN for existing EDI services, and piloted communication of low-cost imaging and EDI updating of a national database
TeleMed project	Assessed new forms of communication (e.g. telemedicine, SMS, internet, e-mail) and the overall need in the health services, and conducted 10 pilot sub-projects before publishing an evaluation, (Fog, 1999). This aimed to extend the range of competing communication methods that could be chosen
Physiotherapy project	Linked practitioners to the DHDN for existing EDI services
Consultant Specialist project	Did likewise, but also included communication of letters to/from GPs (e.g. locum schemes, on-call, hospital relief).
Booking results project	Provided GPs with access to hospital waiting list and transfer information for the first time. As this information was only sent to GPs that provided an electronic referral, this provided an incentive and increased the use of EDI referrals.
MedCity project	Was to set up an experimental environment in which they could 'try out' new forms of electronic communication services that would complement existing messaging services. However, this project was not carried out.

4.5.4.5 Outcome

By the end of this programme, 193 dissemination projects had been completed, 18 more than planned. Messaging services were deployed to over 2000 organisations, including all hospitals, medical laboratories and pharmacies, two-thirds of all GP practices and 16 Local Authorities. In all, 1.3 million messages per month were being exchanged, comprising 44% of all possible messages (target 68%), (Jensen et al., 1999).

Many other initiatives and sub-projects were also completed during this period (e.g. national bar coding of lab specimens, uniform lab requesting modules built into GP practice systems, all on-call GP services sending electronic reports/prescriptions/bills, EDI telephone directory published).

It was difficult to progress lab requesting, due to the great demands made on the relevant IT systems and significant work practice implications for laboratories and doctors. The dissemination of referrals and billing to national insurance has likewise been very difficult to achieve, and there was strong criticism of the quality of discharge letters from clinicians. These problems were mitigated by working groups that teased out the issues, published guidelines and issued proposals which were then actioned.

4.5.5 MedCom III (2000-2001)

The main aims of this programme were to improve quality and dissemination, while continuing with evolutionary development. This work was funded from MedCom's permanent budget, supplemented at times by additional contributions and income, (Jensen et al., 1999).

4.5.5.1 Consolidation project

The dissemination of messaging services between hospitals, GPs and pharmacies was going very well, and had achieved considerable momentum. However, there were strong concerns raised about the quality of EDI letters being sent, to the extent that a root and branch review was required, (Jensen et al., 1999).

This involved harmonising the use of MedCom's standards, as this differed from supplier to supplier, and quality assuring/testing the sending/receiving applications to ensure compliance.

It was envisaged that this would reduce problems/errors, resulting in lower maintenance and support overheads/costs.

4.5.5.2 Telemed/internet projects

After the initial Telemed project, it was agreed that a secure national intranet would be created to facilitate new and competing forms of health communications (e.g. telemedicine, web “pull” lookup, secure e-mail, EDI). MedCom set out to prepare for this changeover, and to procure the services of a number of ISP suppliers that would construct the extranet and adopt a similar role to the existing VANS suppliers.

4.5.5.3 Hospital sector communications projects

It was estimated that just under 150 million form-based clinical communications take place within the hospital sector, as compared with more than 15 million communications between the hospital and primary healthcare sectors (i.e. almost 10 times the volume). This forms a very large proportion of the paper records retained by the hospitals, and consumes around 10% of available staff resource time, (Jensen, 2001). This is highly significant.

Figure 9 (Jensen, 2001) illustrates that the typical hospital treating department communicates externally in a very similar way to a typical GP or practitioner, as approx. 85% of communications relate to referral/report or request/result. This is in spite of the very different ways in which they all work.

It was accepted that hospital users would require more sophisticated and flexible facilities to access clinical information than EDI messaging could provide (e.g. on-line access to results/reports). While EPR and clinical systems provide such facilities, many different systems are used even within the same hospital. The case was made that existing messaging standards/services could be productively re-used to transfer structured data between such systems. Priority was given to the communication of on-line laboratory and radiology requests, appointment and result enquiries from treating departments, and EDI reporting of results. It is interesting that order communications systems normally provide this specific functionality.

It was recognised that the development and implementation of hospital/departmental EPR systems would be prioritised in the short to medium term, impacting on how data is structured, classified, communicated and integrated. It was therefore logical for MedCom to

act as a link between the National Board of Health's EPR standards development process and the implementation of EPRs in hospitals.

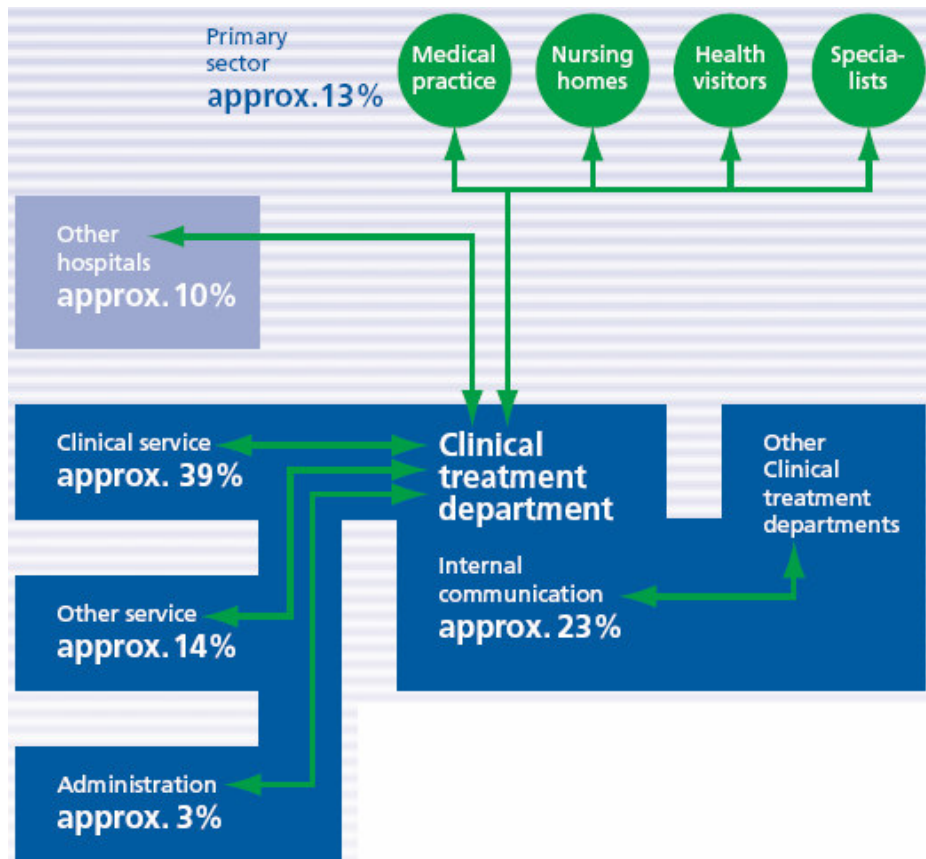


Figure 9: An analysis of the communication needs of a hospital treating department

4.5.5.4 Local Authority projects

This project involved the large-scale dissemination of EDI messaging services piloted during MedCom II (e.g. admission/discharge advices to health-visitor service). Other initiatives from MedCom II were brought to dissemination stage (e.g. treatment/nursing reports from hospitals to local authorities, birth notifications, doctor's forms, web-based EDI systems for small local authorities). There was some uncertainty about these projects as the National Association of Local Authorities had not yet committed to join the permanent MedCom programme.

4.5.5.5 Outcome

By the end of this programme, approx. 2,500 (75%) of health service providers were using the DHDN for messaging, and 50 (almost all) healthcare IT systems had successfully implemented MedCom's standards. In October 2001, more than 2 million EDI communications took place, more than 60% of all communications in the primary healthcare

sector. This led to an estimated annual release of resources of DKK 500 million (EUR 68.03 million), (Jensen, 2001).

4.5.6 MedCom IV (2002-2005)

This programme was a natural continuation of MedCom III aimed at further evolution, innovation and establishing the foundations for new electronic communications.

4.5.6.1 Telemed/internet projects

The main objective was to establish a new healthcare data network by joining together existing regional data networks and the VANS suppliers via the internet, using encrypted VPN connections (see section 4.8.3 Connectivity and Networking). As parties were free to choose either network, it had to be possible to communicate structured messages unimpeded across both. A prototype data network was developed and tested in daily operation by various pilot projects, and dissemination commenced in 2004, (Hulbaek, 2003).

In 2002, a trial inspired by the EU CoCo project (see Section 4.5.8.1) to communicate pathology and skin images via EDI, was a resounding success. It was envisaged that it would also be possible in the future to include medication update files, electrocardiograms, sound and graphics files, (Hulbaek, 2003).

Medcom IV and future programmes were expected to develop additional services for EDI based messaging, web access, patient monitoring, secure clinical e-mail, booking, telemedicine and healthcare information systems, (Hulbaek, 2003). Of these, only EDI based messaging is directly within the scope of this research assignment.

The Association of County Councils initiated a project to establish a public healthcare portal (Sundheds.dk) to facilitate communications with the patient, between the patient and their healthcare provider(s), and between healthcare professionals. This is relevant because they adopted MedCom's standards for data exchange, leveraging this work to develop another range of innovative services. They also tested the presentation of messages in the receiving systems, but the extent of this testing is unclear, (Hulbaek, 2003). The eHealth portal was launched in late 2003, (Hulbaek, 2005).

The development of a web laboratory requesting facility (WebReq) allowed doctors to request tests on a central website, assisted by clinical decision support functionality. A standard EDI message would then be sent to the relevant national laboratory, along with a copy for themselves. The laboratory result would be reported in the normal way via EDI message, (Hulbaek, 2003).

4.5.6.2 Local Authority projects

The Danish Centre for Health Telematics (Hulbaek, 2003) reported that, other than lab requesting, this was the only other area requiring further development and dissemination projects.

In Sept. 2002, only 17% of the population were covered by EDI admission and discharge messages between local authorities and hospitals, so a target was set to increase this coverage to 75% of the population by the end of 2004 (including private hospitals). As it was also essential to expand the use of ‘warning of completion of treatment’ and correspondence messages, another target was set to disseminate these to counties serving 75% of the population by the same deadline.

The correspondence messages was identified as being of particular importance as it allowed for the inclusion of ‘free text’ or multimedia content, and could meet a large number of needs between parties where communication of structured data was not yet possible (e.g. follow-up, queries relating to treatment – see Figure 10). As dissemination progressed, it was recognised that this may help to meet communication needs arising from the health reforms.

However, the dissemination of the ‘warning of completion of treatment’ could only progress to a limited extent, as few hospitals were in a position to provide these communications.

In 2002, it became mandatory for parties to return a positive or negative acknowledgement for each primary message received. A new EDI communication was developed to transfer patient records from one GP’s IT system to another, and supported by all GP software vendors.

There were other related initiatives that the programme had to support (e.g. Ministry of Science XML database, EPR standards, Common Language used to describe functional capacity of patients, Public Healthcare Portal, central LAE-forms municipal server).

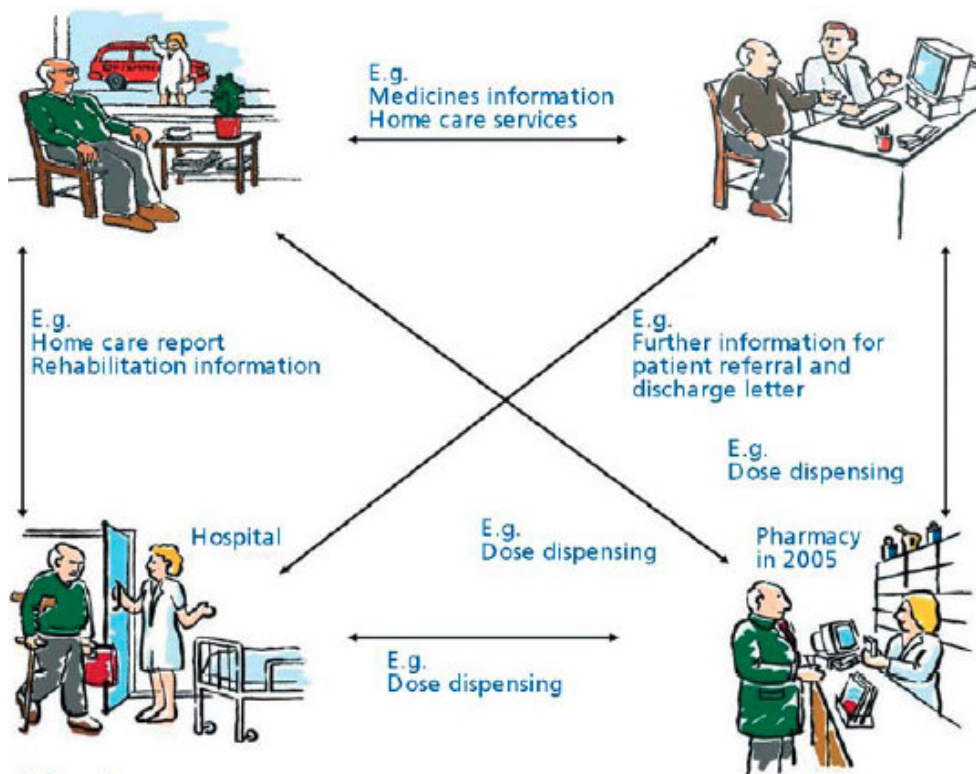


Figure 10: Correspondence message used for secure clinical communication

In April 2003, the local authorities and GPs agreed a new contract and grant aid package. This committed GPs to adopting MedCom’s standards by 1st Jan 2005 at the latest, and providing additional eHealth services to patients (e.g. e-mail consultations). Grants were also provided to other specialists/practitioners to establish EDI communications and use all available message types, and this was very effective. Also, the national laboratories agreed to only communicate with certified systems, providing a further incentive.

4.5.6.3 Hospital sector communications projects

The proposal to use structured electronic messaging for the integration of EPR systems was prioritised. The “Mini-IRSK” project set out to implement a small number of heavily used EDI based message types within the hospital sector, in a short timeframe (i.e. discharge letters, referrals, lab results, correspondence), (Hulbaek, 2005).

At the same time it was clear that Medcom’s existing EDI standards would need to be broadened, to communicate with new EPR systems being developed to comply with the national ERP standards (i.e. G-EPR basic structure, OiO Public Information Online), (Hulbaek, 2003).

The “XML EPR Communication” programme re-developed all 36 of the existing EDI based standards, using XML syntax, for internal hospital sector use. The intention was to adopt an accelerated approach to the development and dissemination of all XML message types ‘at once’ leveraging their previous experience. However, this programme was similar in scope and size to the original Medcom programmes conducted from 1994 onwards. It was considered to be “*ahead of its time*” and was terminated in favour of the more modest Mini-IRSK project. However, the new XML standards were adopted by a number of projects in 2005, and also used as the basis for a national web services standard ‘MedComWS’, (Hulbaek, 2003, Hulbaek, 2005).

An automated test facility was developed by MedCom and published on the internet, so that all suppliers could test their own EDI and XML based communications, and web services interactions. They could also see how these messages could be displayed (using stylesheets), convert EDI messages to XML and visa-versa, and download documentation on the XML standards. This facility worked so well that it was copied in Norway, (Hulbaek, 2005).

4.5.6.4 SUP project

The aim of this project was to provide hospital users with secure internet access to county/inter-county EPR/PAS records. This re-used existing facilities to extract and transfer patient data in Medcom’s XML standard format, from local IT systems to a central database and web application. This would become part of the Public eHealth Portal (Sundhed.dk). This was based on a project already conducted by the counties of Aarhus, Viborg and Vejle, (Hulbaek, 2003).

4.5.6.5 Outcome

By the end of this programme, more than 3 million electronic communications were being exchanged each month, more than 1 per second (see Tables 14 and 15, and Figure 11). This was an increase of 50% since Oct. 2001. It was suggested that no other country could match the achieved level of coverage or usage, (Hulbaek, 2005).

Table 14: Organisations using EDI Communication and % usage (Dec 2005)

Spread	Number	% on EDI	All on EDI by
General practice	2140	97	1.1.05
Specialists full-time	583	74	1.1.07
Specialists part-time	132	53	1.7.07
Physiotherapists	348	63	1.1.06
Chiropractors	117	52	1.7.06
Dentists	680	50	1.1.06
Psychologists	44	7	1.1.06
Pharmacies	331	100	
Local authorities	271	44	
Hospitals	64	100	
Electronic communication total	3.1 million messages per month. 80% of all communication in the primary healthcare sector.		

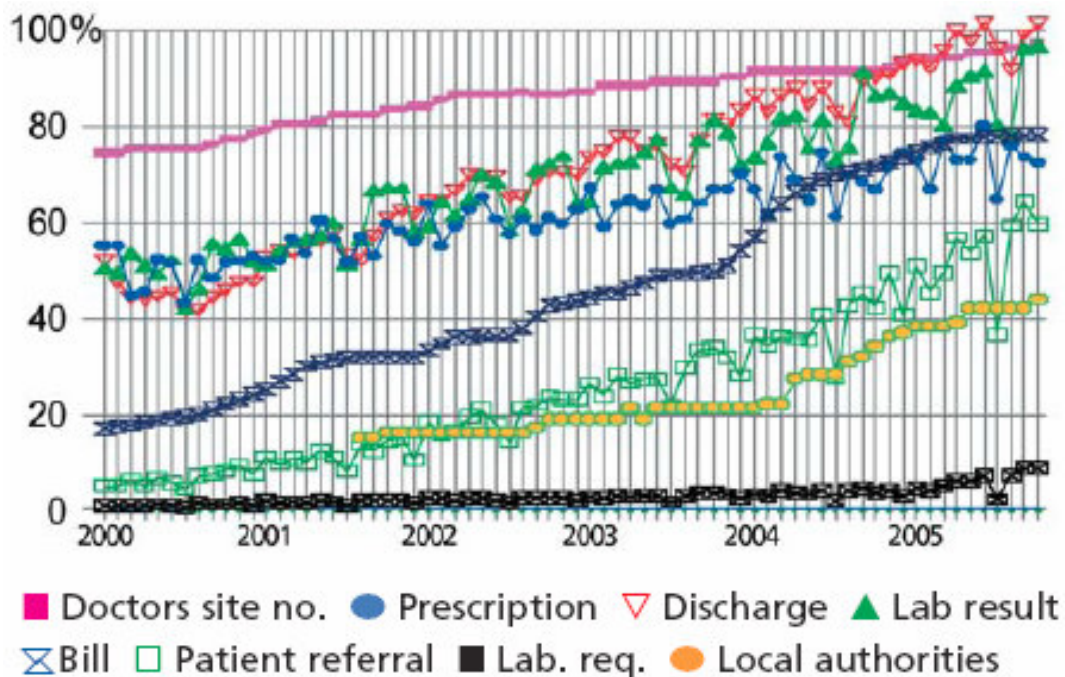


Figure 11: Percentage of possible messages (Dec 2005)

Table 15: What the Counties can do now (Dec. 2005)

What can the counties do now?

Overview of EDIFACT messages in operation in the individual counties and CHC

Green indicates that the messages are underway and have been disseminated to more than 50% of possible messages. The numbers in the boxes indicate what percentage of messages are sent electronically.

Yellow indicates that the message has been started and is being disseminated.

Red indicates that the message has not yet been put into use.

04.11.2005	Counties															KPPL	SSI	Capio
	N.Jutl.	Viborg	Århus	Ringk.	Ribe	Vejle	S.Jutl.	Funen	W.Zea.	St.Str.	Rosk.	Fr.borg	CHC	Cop.	Bornh.			
EDI-doctors %	96	100	97	90	98	100	100	99	97	97	97	95	94	94	100			
EDI-Spec. H-doctors %	74	78	74	76	56	86	100	79	82	71	71	76	67	65	75			
Discharge letter	98	100	97	90	50	100	100	99	97	97	97	95	94	94	100			
Outpatient letter	98	100	70	90	50	100	100	99	80	97	97	51	51	0	100			
Casualty letter	96	100	97	90	*	100	100	99	97	97	97	80	65	45	100			
Image-diagnostic letter	96	100	59	90	98	100	100	99	97	97	59	95	94	5	100			
On-call GP service letter	96	100	97	90	98	100	100	99	97	97	97	95	94	94	100			
Specialist letter	74	78	74	76	56	86	100	79	82	71	71	76	67	65	75			
Physiotherapy letter	30	25	40	18	40	40	8	15	25	8	18	14	40	45	16			
Booking result	70	87	30	0	0	91	50	93	76	45	51	0	0	2	100			
Admission referral	70	70	53	0	0	91	69	93	76	45	51	20	11	8	100	1		
Image-diagnostic referral	70	87	49	0	65	91	52	93	76	55	51	1	2	1	100			
Specialist referral	20	35	20	6	5	20	25	6	28	20	2	2	1	1	9			
Clinical chemistry results	96	100	97	80	98	100	100	99	97	97	97	95	94	94	100	94	55	27
Pathology results	96	100	97	90	98	100	100	99	97	97	97	95	94	84p	100			
Clinical microbiology results	96	100	97	90	98	100	100	99	97	97	97	60	94	94	100		55	
Clinical immunology results	0	100	0	80	98	100	0	99	0	97	97	45	0	0	0			
Clinical chemistry request	0	16	7	0	2	4	0	0	41	0	0	0	1K	1K	0	1		0
Pathology request	5	47	0	0	2	80	0	80	0	0	35	54	1	0	0			
Clinical microbiology request	1	44	5	0	2	2	0	0	0	0	0	2	0	0	0		1	
GP billing	97	93	64	77	70	100	89	95	92	81	59	80	77	66	100			
Specialist billing	60	57	48	59	33	69	64	52	54	26	33	35	45	48	25			
Pharmacy billing	97	100	77	100	100	100	100	85	88	84	100	100	86	88	66			
Dentist billing	62	11	15	24	25	84	19	47	53	16	28	33	31	41	16			
On-call GP service billing	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100			
Physiotherapist billing	44	11	61	29	71	53	17	31	47	11	30	20	55	70	16			
SSI billing	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		100	
Capio Diagn. billing	100	100	100		100	100	100	100	100		100	100						56
KPPL billing									100			100	100	100		100		
GP prescription	95	95	85	78	82	92	95	89	80	77	75	62	45	53	95			
On-call service prescription	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90			
Pos. ackn. hosp. ref.				\														
Pos. ackn. X-ray ref.				\									\	\				
	N.Jutl.	Viborg	Århus	Ringk.	Ribe	Vejle	S.Jutl.	Funen	W.Zea.	St.Str.	Rosk.	Fr.bor.	CHC	Cop.	Bornh.	KPPL	SSI	Capio
28	2	0	1	4	2	0	2	2	2	2	1	1	3	3	2	0	0	1
108	5	7	9	6	7	4	6	4	4	8	7	10	9	11	7	2	1	1
294	21	22	18	17	20	24	20	22	23	17	20	18	15	14	18	2	3	1

4.5.7 MedCom V (2006-2008)

This programme was a further continuation of MedCom IV, and was conducted during an extensive health reform and re-structuring process, (Hulbaek, 2005).

As responsibility for certain health services (e.g. rehabilitation, health centres) shifted from the Counties to Local Authorities on 1st January 2007, MedCom helped to address the new electronic communication needs and to maintain continuity of care throughout the sector. This involved using the existing EDI and XML based messaging services (e.g. to transfer patient records, rehabilitation plans) and lookup facilities (e.g. Sundhed.dk, EPR/PAS lookup), (Hulbaek, 2005).

The programme was intended to run for 2 years, but was extended for a further year in recognition of the need for greater flexibility during the reform process. One of its main aims was to replace paper for most common communications by end 2007, (Hulbaek, 2005).

4.5.7.1 Local Authority projects

This programme included the continued development and dissemination of EDI and XML based messaging communications between home care services, GP practices, hospitals and pharmacies, (Hulbaek, 2005). The message types involved were admission notifications/replies/reports, discharge warnings/notifications/reports, correspondence, care reports, prescription renewals, home care status, birth notices and acknowledgements, (Hulbaek et al., 2007).

The communication of rehabilitation plans was piloted in July 2007. The messages sent by hospitals in one format (i.e. good rehabilitation plan) were converted by the VANs suppliers to another format that the recipient could process (i.e. correspondence). This worked well in practice, pending migration of all systems to the good rehabilitation plan format in 2008. A limited pilot project was also initiated in Nov 2007 to communicate LAE forms (e.g. sickness benefit, health status certificates) between GPs and local authorities, (Hulbaek et al., 2007).

This programme also included the adoption of new technologies by the local authorities (e.g. XML web services, SOA, telemedicine to the home, data brokers), (Hulbaek, 2005).

A new agreement with GPs signed in April 2006 mandated that only electronic laboratory requests could be used after August 2007.

4.5.7.2 Telemed/internet – Co-operation with Sundhed.dk

The level of co-operation between MedCom and Sundhed.dk has continued to increase as their work is interconnected and complimentary. In general, Sundhed.dk handles display and user administration activities, while MedCom looks after standards, web services, implementation and dissemination. The IT suppliers develop and test their own applications, (Hulbaek, 2005).

They are currently working together to provide (via Sundhed.dk): lab results enquiry, integration between IT systems and published lab guides, direct patient booking of appointments, date book and secure e-mail, (Hulbaek, 2005). This work includes the development of national display recommendations for laboratory results and classification of laboratory short names, for approval by the relevant clinical organisations, the Regions and the National Board of Health, (Hulbaek et al., 2007).

The healthcare portal (Sundhed.dk) facilities provided for healthcare professionals have not been extensively used, as they are not integrated with the IT systems that they use on a daily basis (including local calendar systems) and do not support electronic messaging. This is very significant, as it suggests that healthcare professionals in Denmark have become used to working in their local IT system(s), supported by automated electronic communications, and that they won't be encouraged to use new state-of-the-art facilities/systems unless their daily needs continue to be met.

A joint project has been launched to pilot this integration, involving the development of a new MedCom standard to integrate Sundhed's secure e-mail function with local communication modules. This experience should inform other government Digital Taskforce projects, (Hulbaek et al., 2007).

4.5.7.3 SUP/e-record project

This project was a continuation of the Medcom IV project to provide hospital clinical staff with secure internet access to centralised EPR/PAS records over the DHDN, using automated facilities to extract and transfer patient data in Medcom's XML standard format. The solution was to be modernised to address performance problems identified during the pilot, (Hulbaek et al., 2007).

It was proposed that a WEB-EPR solution be developed to integrate the central SUP/e-record databases with the eHealth portal (Sundhed.dk), so that this information could be made available to additional parties (e.g. GPs, specialists, on-call doctors, patients). This would accommodate the growing need for communication of patient data across systems and sector/county boundaries, and facilitate the provision of specialised care at fewer hospitals (e.g. regional/national specialties).

Data from 'old' EPR systems being phased out would also be stored in the SUP databases and accessed by hospitals via the DHDN, or by GPs/patients via Sundhed.dk, (Hulbaek, 2005, Hulbaek et al., 2007). By Dec 2007, 3.6 million records relating to 50% of the population had been transferred to the SUP database.

The Danish Data Protection Agency has approved a more secure and appropriate access method for hospital clinicians, involving use of a deeply embedded link within the hospital EPR/PAS system that provides additional information from the e-record as required, digitally signed and audited, (Hulbaek et al., 2007).

4.5.7.4 Consolidation and dissemination projects

It was considered necessary to establish a separate programme to focus on the continual consolidation, expansion and technical modernisation of MedCom's standards and the DHDN, due to the high level of usage and number of requests for new standards and communications. This was to include *ad hoc* dissemination projects, maintenance and enhancement of Medcom's standards, testing and certification of suppliers, administration and enhancement of the DHDN and automation and enhancement of monthly statistics functionality, (Hulbaek, 2005).

The Mini-IRSK project to implement a small number of heavily used EDI based message types across all departments within the hospital sector, should have been completed in 2005. However, some software was not delivered on time, some Counties did not progress their local implementations, and project staff were involved in the re-structuring, so the rollout was delayed. All hospitals now have the necessary facilities to support electronic communication, but dissemination has to date been slow.

The further dissemination of patient referrals, lab requesting (WebReq), requesting between laboratories and ECG standardisation were included within the consolidation programme, (Hulbaek, 2005).

4.5.7.5 Web Services and Service Oriented Architecture (SOA)

In co-operation with IT suppliers, MedCom drew up a “Good Web Services” proposal to support standards based communication between health service organisations, regardless of the IT systems used. This was based on the Government’s service oriented architecture (SOA) for the public sector, and use of XML and web services are key ingredients, (Hulbaek, 2005).

4.5.7.6 Common Medication Card (FAME) project

The aim of this ambitious project is to enable health providers to access up-to-date patient medication/prescription records stored centrally by the Danish Medicines Agency, to reduce medication errors.

It is envisaged that the local and centralised medication records will be synchronised using web-services, to ensure that the latest and most accurate information is available at the point of care. This has significant implications for the entire health sector, and may have medico-legal repercussions. Any doctor treating a patient can potentially change the patient’s central medication record, impacting on treatments being provided by other practitioners, and allowing peer-review of their own prescribing practices.

This is the first project to utilise the new national SOA based IT infrastructure, which plays a key role in the new IT health strategy. This solution has a common security infrastructure which provides for digital signatures, and runs on an upgraded DHDN/SDN, (Hulbaek et al., 2007).

There have also been on-going discussions between MedCom and the Danish Medicines Agency in relation to a number of other co-operation projects (e.g. connection of prescriptions server to the DHDN, transfer of medication data from hospitals, usage of interactions database), (Hulbaek, 2005).

4.5.7.7 Outcome

As this programme is still underway, it is not possible to predict its outcome. However, it is significant that considerable progress was made in spite of the health reform process. This can be measured by assessing the current position (see Section 4.6 Overview of Current Messaging Services).

4.5.8 International programme (1994-2008)

In view of the very positive experiences and benefits of co-operation when developing messaging services in Denmark, it was quite logical and natural for those involved to make contact with their colleagues in other countries (e.g. United Kingdom, Norway, the Netherlands) to exchange experiences and knowledge. It was anticipated that this would bring benefits to all involved, and this was clearly demonstrated over the years.

At first glance, the business case for Denmark's involvement in the earlier international projects appeared fairly weak. There was very little cross border communication of health related information, a significant investment of resources would be required and there would be few economic benefits. However, on further examination a stronger case emerged, as MedCom received funding for some work they were going to do anyway, and became more visible in this high-tech field. They learnt a lot, were able to influence the European standards, and made good contacts which helped them secure funding for other initiatives. They also gained R&D experience in future growth areas (e.g. telecommunications, telematics) and are now exporting RHCN related services to other countries.

The following diagram (Figure 12) shows the main international projects that MedCom participated in, (Jensen, 2006):

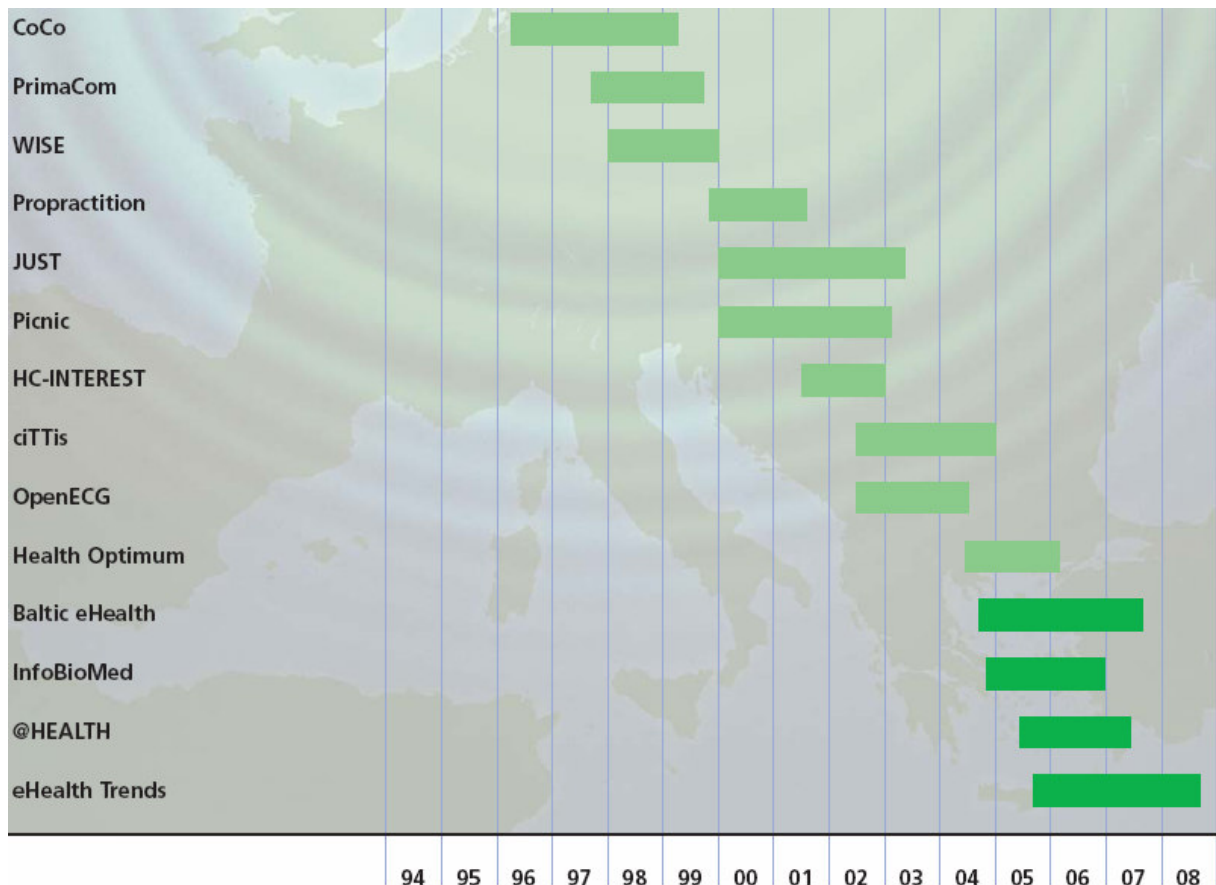


Figure 12: International projects that involved MedCom

Since 2006, MedCom was also involved in the R-Bay project (i.e. tele-radiology) and Better Breathing project (i.e. tele-consultation and remote monitoring of COPD patients). In view of the number and scope of these projects, only a small selection has been included in this report.

4.5.8.1 CoCo project (1996-1998)

In 1994, Funen County Council and MedCom participated in the EU's 4th framework programme for healthcare informatics. They proposed an EU project to build 10 Regional Health Care Networks (RHCNs) around Europe using the same organisational and technical principles as Denmark, and this became the "*Continuity and Co-ordination in Primary Health Care*" project. This project was awarded a substantial grant of ECU 4 million, making it the largest EU health informatics project at that time.

MedCom's aim was to include regions with the most EDI experience, so most of those involved were national test sites or leading services/projects, with an interest in building up national healthcare data networks in their own countries. From the outset, they set out to develop a single European CoCo messaging standard based on CEN, using MedCom's standards as the starting point.

4.5.8.2 WISE project (1998-1999)

The *Working In Synergy for Europe* project was set up to co-ordinate EU projects relating to Regional Healthcare Data Networks (including the CoCo project). This involved 13 organisations in 10 countries, and Denmark had a key role in setting out the strategy for electronic communication. They published a book outlining their experiences, (Petersen et al., 2003).

4.5.8.3 PICNIC project (2000-2003)

The large *Professionals and Citizens Network for Integrated Care* project conducted under the EU's 5th framework programme, was directed by the Danish Centre for Health Telematics, and involved regions and stakeholders from 7 countries. These included the General Medical Scheme Payments Board (GMSPB) and North Western Health Board (NWHB) in Ireland, and the South and East Belfast Trust, Northern Ireland, (Jensen et al., 1999).

The main objective of this project was to help regional healthcare providers implement internet based data networks that would support patient treatment and care, by developing an architecture and prototypes for a range of communications (e.g. open source web services, EDI, shared records, telemedicine, billing, patient information), (Petersen et al., 2003).

4.5.8.4 Nordic Health Care Network

In 2001, the national organisations responsible for developing healthcare data networks in Norway (KITH), Sweden (CareLink), Denmark (MedCom), Finland (STAKES) and the Icelandic Ministry of Health, established the "Nordic Health care Network" as a working group to foster close co-operation and to share ideas and experiences. This group typically meets every 6 months, and has documented several cases where knowledge or infrastructure has been re-used in one of the other Nordic countries (Hulbaek, 2003).

KITH in Norway and Carelink in Sweden were established in 1990 and 2000 respectively, and have adopted a very similar role to MedCom, (Hygen, 2008, Jensen, 2001).

4.5.8.5 Outcome

The participation in international projects, and sharing of experiences and ideas with other countries has benefited everyone involved in practical and demonstrable ways, (Hulbaek, 2003). In recognition of this, an independent and self-financing MedCom international division was set up in January 2007 to progress co-operative international initiatives. They

currently provide a number of services including the preparation of EU project proposals, managing of such projects and establishing international contact/work groups, (Hulbaek et al., 2007).

4.6 Overview of current health messaging services

In 2007, almost 44 million electronic communications were exchanged (see figure 13). By the end of that year, almost all healthcare providers in Denmark (i.e. 4,000+ organisations) were using electronic messaging services on a daily basis for most of their routine communications, (Hulbaek et al., 2007).

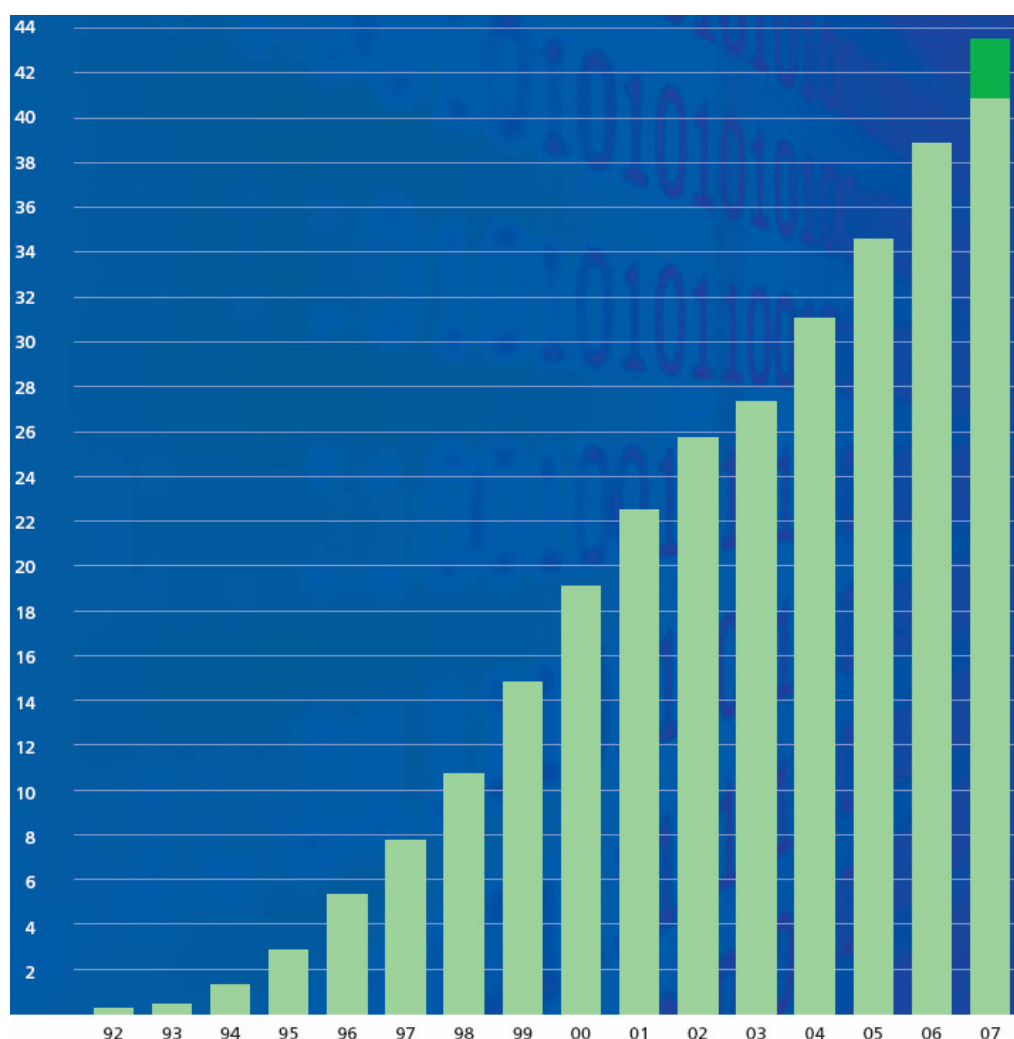


Figure 13: Messages (in millions) communicated in Denmark annually (Oct 2007)

The extensive range of information communicated between healthcare providers, and the level of dissemination and usage within each Region and County are clearly demonstrated in

Table 16. As you will note, in many cases electronic communication has been fully disseminated and completely replaced the paper, (Hulbaek et al., 2007).

Table 16: MedCom projects – % dissemination to the Regions/Counties (Dec 2007)

Dissemination > 50% Dissemination in progress Message cannot be sent	Regions and counties																	
	North Jutland		Mid Jutland			Southern Denmark			Sealand			Capital						
Position 1 december 2007	North Jutland	Viborg	Aarhus	Ringkøbing	Ribe	Vejle	South Jutland	Funen	West Sealand	Storstrøm	Roskilde	Frederiksborg	H:S	Copenhagen	Bornholm	KPLL	SSI	Capio Diagn.
EDI GPs %	98	100	98	97	99	100	100	98	99	98	98	98	99	98	100			
Full-time specialists %	87	87	84	88	90	95	96	93	94	94	95	92	89	89	75			
Discharge letter	98	100	98	97	55	100	100	98	99	98	98	98	99	98	100			
Outpatients discharge letter	98	100	70	97	55	100	100	98	70	98	98	51	51	5	100			
Casualty discharge letter	98	100	98	97	*	100	100	98	99	98	98	98	65	50	100			
Radiology report	98	100	98	97	99	100	100	98	99	98	59	98	94	35	100			
On-call GP summary	98	100	98	97	99	100	100	98	99	98	98	98	99	98	100			
Specialist discharge letter	87	87	84	88	90	95	96	93	94	94	95	92	89	89	75			
Physiotherapy discharge letter	45	55	45	45	45	45	45	45	45	45	45	45	45	45	45			
Appointment confirmation	70	95	67	0	0	91	85	93	66	80	55	35	0	5	100			
Admission referral	70	95	67	3	1	91	85	93	66	80	55	35	27	23	100			
X-ray referral	85	75	55	54	85	95	70	96	95	75	55	13	7	29	100			
Specialist referral	55	80	50	50	50	70	75	72	80	66	11	9	12	12	35			
Clinical chemistry results	98	100	98	80	99	100	100	98	99	98	98	98	99	98	100	99	55	65
Pathology results	98	100	98	97	99	100	100	98	99	98	98	98	99	84	100			
Clinical microbiology results	98	100	98	97	99	100	100	98	99	98	98	98	99	98	100		55	
Clinical immunology results	0	100	80	97	99	100	0	98	80	98	98	98	10	0	100			
Clinical chemistry request	0	87	91	0	98	100	89	0	95	98	100	98	88	88	100	80		2
Pathology request	2	81	96	76	87	98	88	98	76	97	29	99	94	0	100			
Clinical microbiology request	3	79	95	77	98	99	90	0	3	98	2	98	75	46	100		3	
GP billing	96	98	95	94	95	100	94	98	96	99	98	96	95	94	100			
Specialist billing	60	87	50	69	80	77	85	90	72	100	81	92	81	59	75			
Pharmacy billing	97	100	95	100	100	100	100	85	88	84	100	100	90	88	66			
Dentist billing	98	97	75	86	98	98	58	98	75	97	88	97	63	90	100			
On-call GP billing	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100			
Physiotherapy billing	99	96	69	78	99	71	72	98	76	100	68	94	62	72	62			
SSI billing	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100		100	
Capio Diagnostik billing	100	100	100		100	100	100	100			100	100						100
KPLL billing									100			100	100	100		100		
25 doctors' prescriptions	95	95	85	78	82	92	95	89	80	77	75	70	50	53	95			
17 on-call doctors' prescriptions	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100			
Pos. acknowledgement hosp. referral				\														
Pos. acknowledgement X-ray referral				\									\	\				
10	2	0	0	2	1	0	1	2	0	0	0	0	0	2	0	0	0	0
41	3	0	1	2	3	1	1	1	2	1	3	7	5	7	2	0	1	1
385	24	29	28	24	25	28	27	26	27	28	26	22	18	20	27	3	3	2

While it typically takes a long time to achieve extensive dissemination of messaging services (see Figures 14 and 15) the incremental results can be very significant. The huge recent

growth in laboratory requests was prompted by the April 2006 agreement with GPs (see Section 4.5.7.1 - MedCom V, Local Authority projects), (Hulbaek et al., 2007).

MedCom – The Danish Health Data Network

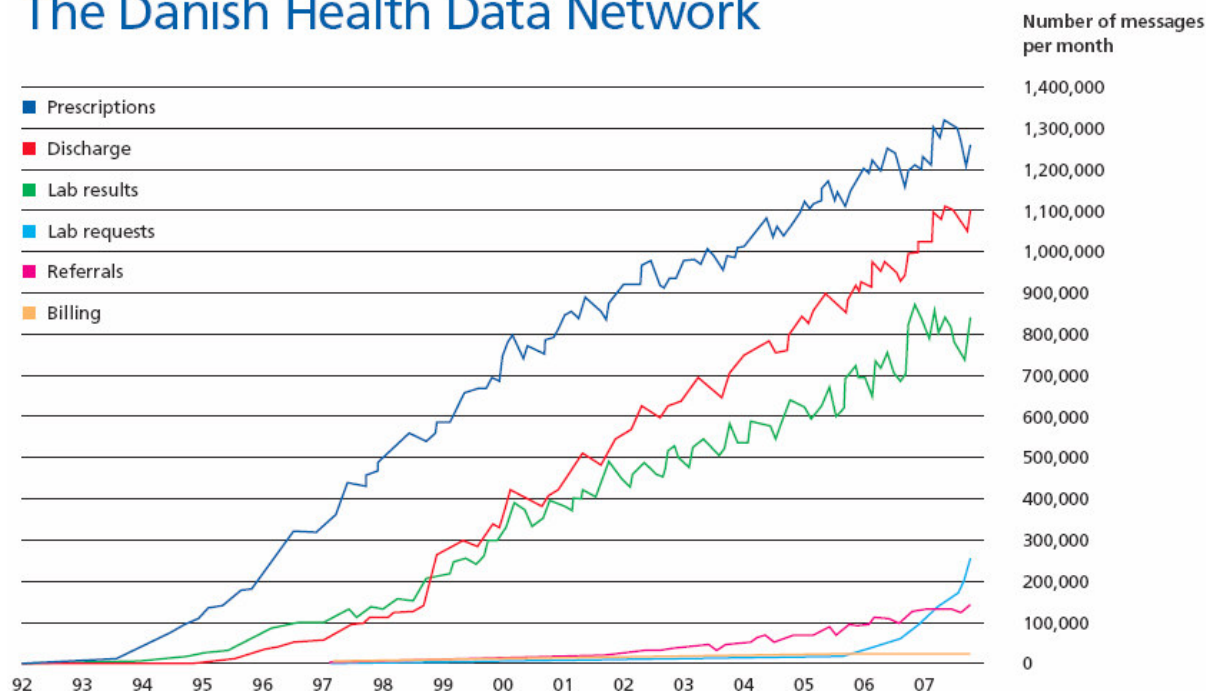


Figure 14: MedCom - Number of Messages per Month (Oct 2007)

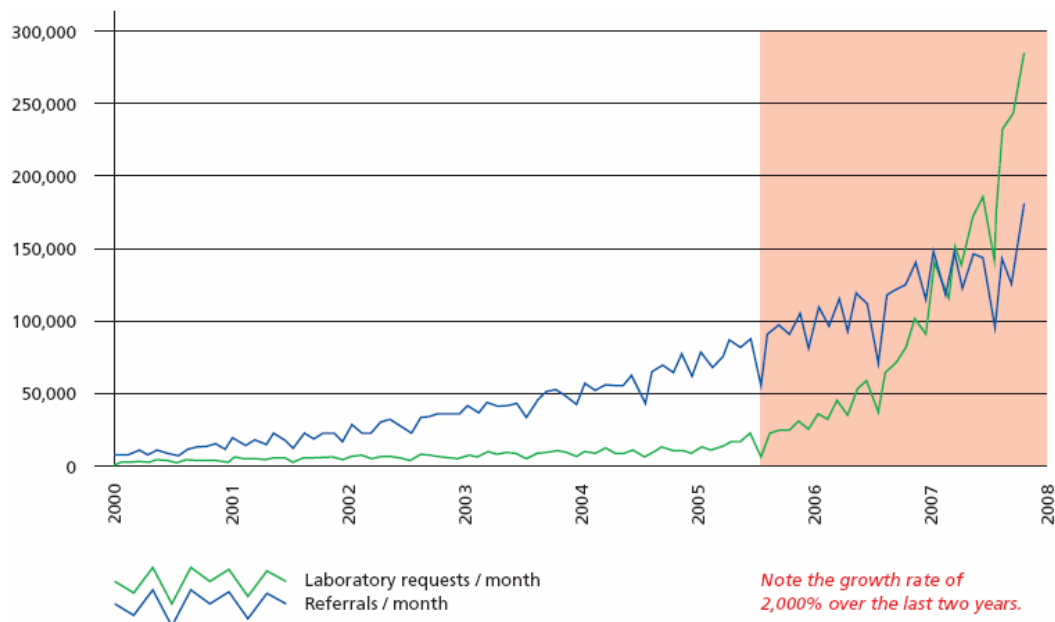


Figure 15: Expanding the use of WebReq - electronic lab requesting (Dec 2007)

4.7 Review from a business perspective

This section focuses on relevant business topics/issues that have not been adequately addressed in the earlier review of programmes/projects and current messaging services.

4.7.1 Reported cost benefits

In 2004, the EC, Information Society, Directorate-General commissioned a case study to see if eHealth brings direct cost benefits in addition to the qualitative benefits demonstrated by numerous other studies. The cost benefit analysis of electronic patient referrals in Denmark found that EUR 3.5 million would be saved annually if all referrals were sent electronically, reducing total costs by 25%, (Cannaby et al., 2004).

A later independent on-site study of MedCom reported the realisation of annual net benefits by year 3 (see Figure 16) and cumulative net benefits by year 5, with an estimated 97% productivity gain. They reported that 98% of the cumulative net benefits (i.e. EUR 568 million) accrue to the healthcare providers, while just 2% accrue to the patient, (Robinson, 2008).

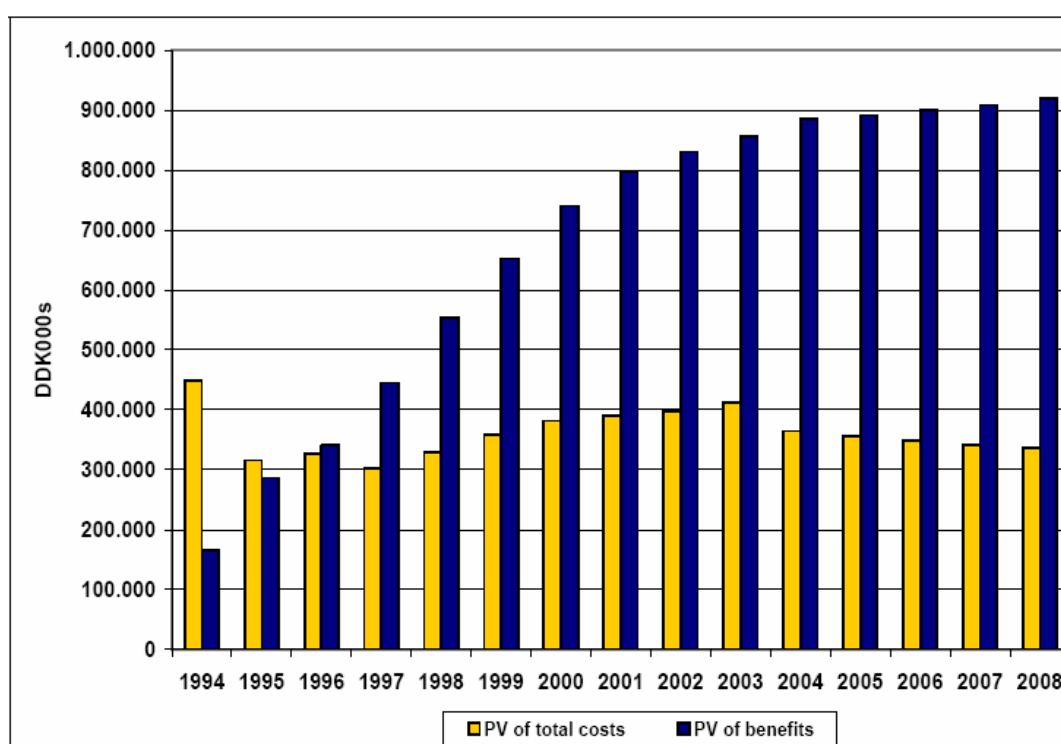


Figure 16: Present values of Estimated Annual Costs and Benefits - 1994-2008

4.7.2 Business sponsorship

From the outset, the MedCom programme had a high level of business sponsorship. The Steering Group was chaired by Vagn Nielsen, Head of Department, Ministry of Health, and

included senior representatives from all stakeholder organisations. The MedCom programme was often discussed in public by senior Government Ministers and other prominent figures (e.g. Birthe Weiss, Health Minister, Karen Jespersen, Minister of Social Affairs). Their communications and press statements cited practical ways in which the programme directly improved patient care and service delivery, and praised the good work being done. This helped to promote a positive culture and outlook towards the programme.

4.7.3 Development approach

MedCom adopted the same tried and trusted evolutionary approach used by the early initiators and large regional projects in the late 1980s and early 1990s, with some modifications so that it could operate on a national scale.

The overriding principals were to continue developing solutions to meet a real need, where backed up by agreed strategy, to re-use as much as possible, and to ensure co-operation and agreement between all parties. These principles were paramount, and led to the development of more secure and effective solutions, (Hulbaek et al., 2007).

The programmes were of 2-3 years duration and were controlled and funded by a Steering Group, representing all stakeholders. Each programme had a multi-annual budget, sub-divided into framework and project budgets. Any monies not spent at the end of a programme were returned to the financing parties. Each programme included many separate projects and sub-projects proposed and described by a broadly representative group, and approved by the Steering Group. Priority was given to treatment and nursing related communications, with a broad application, using proven low-cost technologies. The aim was to gain experience and deliver incremental benefits through a large number of practical projects.

The most commonly used message types were prioritised to yield the most significant benefits first, and to establish a sound platform for further developments. Figure 17 illustrates that the largest growth in transaction volumes were achieved in the first 6 years of the MedCom programme, and that growth rates have since been relatively modest, (Tangent et al., 2005).

Each project was then actively managed and conducted by the individual Regions or Local Authorities. All local/regional projects not completed within that period were terminated so

that the next programme could start with a clear slate. This provided an incentive to complete projects on-time, as otherwise it was necessary to re-apply for approval and funding.

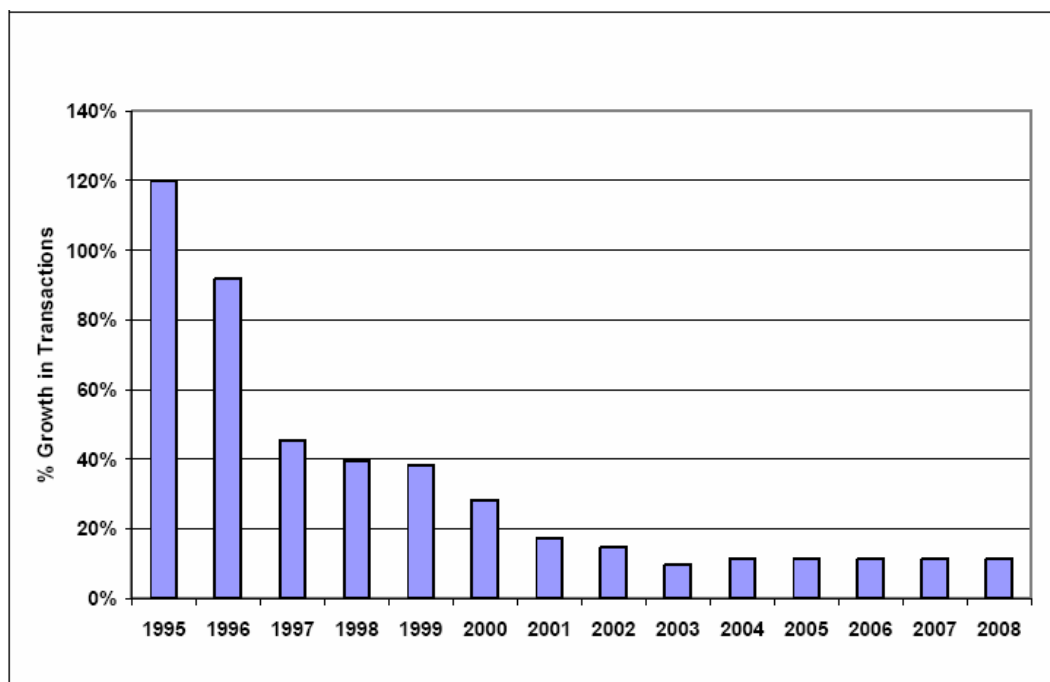


Figure 17: Percentage Annual Growth in Transactions 1994 to 2008

Throughout the development process, users had a very high degree of influence. Health professionals, support staff and managers defined their requirements, and afterwards worked with health informatics and technical specialists to identify ways of meeting these requirements, (Pederson, 2002).

Standards were developed as required, by those involved in their actual implementation. These standards were then piloted on a small scale to develop the necessary interfaces and prove the concept, and then revised in the light of feedback.

MedCom entered into co-operation agreements with each of the regional and local pilot projects, with the VANS suppliers, and with anyone else that they did business with. These formalised the agreed deadlines for delivery, and have been identified as a cornerstone for the successful management of the programme.

Working groups were set up as necessary, with a mix of clinicians and health informatics specialists, to address specific activities/issues (e.g. EDI standards group, codes/classifications group, lab requesting group). These included representatives from all stakeholder groups

affected. Many barriers were overcome by focusing on the treatment and care of the patient. Other co-ordination groups were also set up to improve communication (e.g. project management group). The principles of inclusion, consultation and user empowerment appears to overshadow concerns about the number of participants, and some groups were quite large. Some of these groups were so successful, that they continued to meet after their MedCom tasks were completed, to address other issues and co-ordinate their own activities.

Each organisation/practice could 'opt in' to the DHDN network, and decide the extent to which this connection would be used (e.g. to receive specific EDI communications). Once a new messaging service was piloted, the advantages of the service were promoted by MedCom and those involved, and healthcare providers were encouraged to use the new service. A slow take-up was common and this was actively managed through marketing, incentives and agreements to try to achieve the dissemination targets.

It was emphasised that electronic communications should be appropriate, clear, concise, relevant and complete to maximise the benefits, and to avoid healthcare providers being "buried" in unnecessary and irrelevant data.

4.7.4 Computerisation in primary care

In 1987, Pharmacies were obliged to record the medicines used by each patient, so virtually all were computerised by 1991. They have been described as the most advanced IT users in the health care sector, and were early adopters of electronic communication services.

The usage of EPR systems by GP practices was initially around 10% in 1990, but this increased to 70% in 1998 . In May 1997, it was noted that GPs increased their level of computerisation in counties where electronic messaging services were provided, indicating that this was a key driver, (Fog et al., 1998). By April 2008, the use of EPR systems within general practice had risen to 96.9% and the level of computerisation had increased to 98.9%, (Dobrev et al., 2008).

Figure 18 shows that it took 7 years to achieve 100% use of health messaging by pharmacists, but twice that time to achieve a similar level of use by GPs, (Tangent et al., 2005). This illustrates a link between the level of computerisation and speed of deployment.

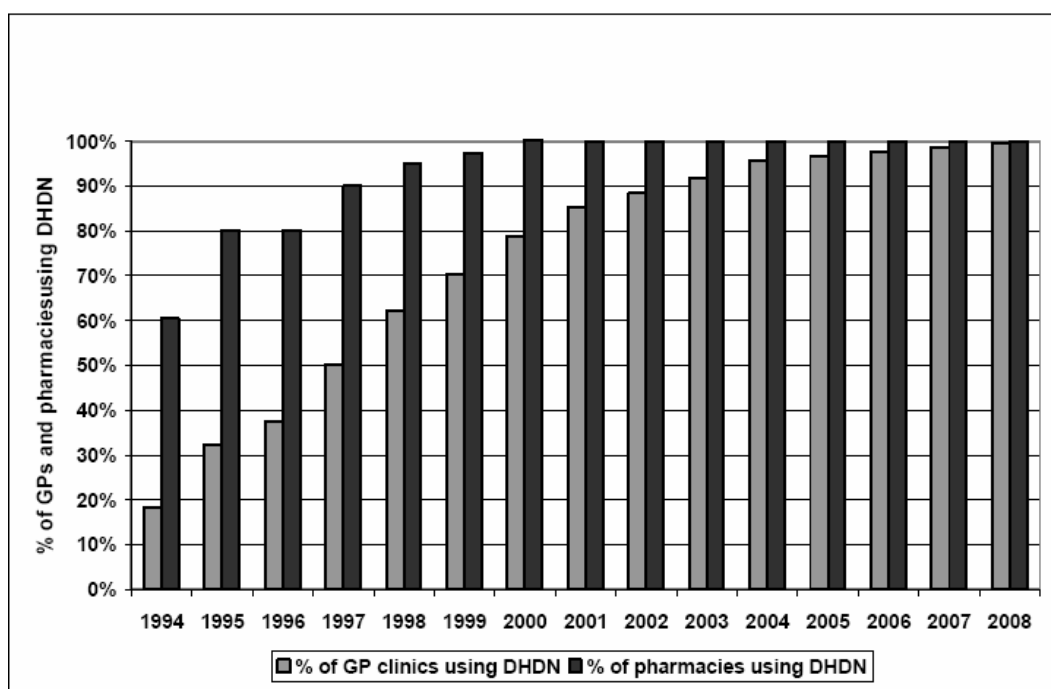


Figure 18: Percentage of GPs and Pharmacies using DHDN from 1994 to 2008

Between 1998 and 2000, a data consultant scheme for GPs was introduced by Funen County as an impartial service to improve the level of computer usage, quality and communication. During the dissemination projects, the practice consultants had a key role in increasing the number of connections to the DHDN, speeding up the dissemination process, and fine tuning the functionality and business processes in the local practices. This scheme has since been made permanent and rolled out to other regions.

4.7.5 Internet and broadband usage

The availability and use of the internet and broadband have increased substantially in Denmark since 1999 (see Figure 19). In April 2008, a large scale survey of general practitioners found that 98.9% had access to the internet, while 91% used broadband, (Dobrev et al., 2008).

4.7.6 Certification and marketplace

One of the benefits of a standardised approach is that any healthcare IT software vendor can develop messaging related functionality using MedCom's standards, and have this certified by MedCom to confirm that their system interacts correctly with the DHDN. This develops a marketplace where the healthcare provider can buy any certified system(s) safe in the knowledge that they will be able to immediately communicate with their counterparts.

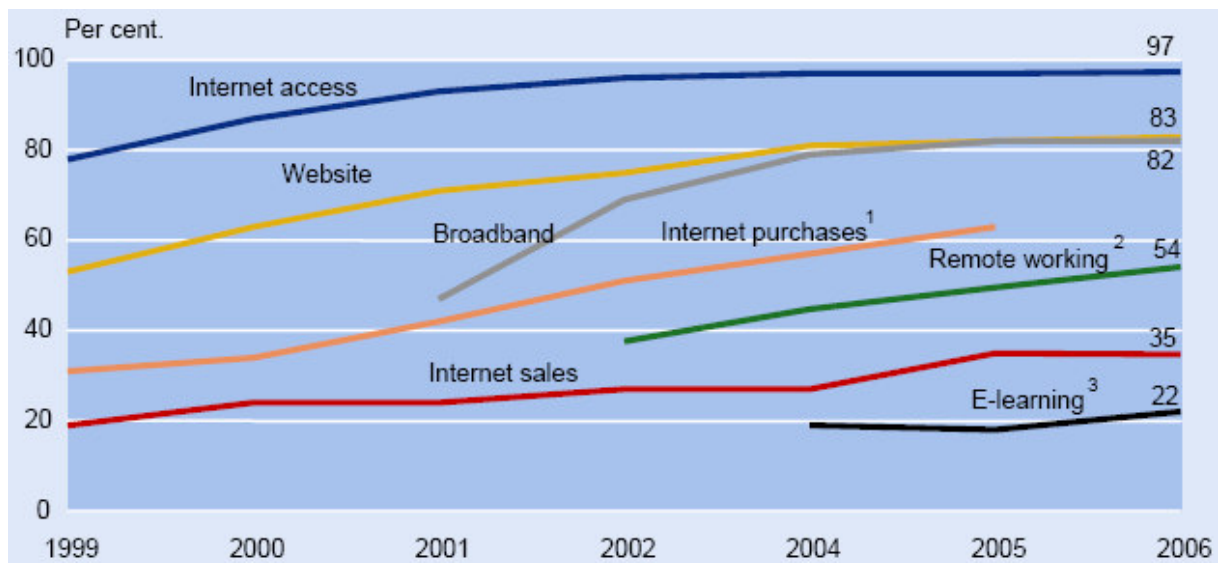


Figure 19: ICT use by enterprises 1999-2006

4.7.7 Data protection and information security

The literature review did not identify any data protection concerns arising from the use of electronic health messaging services. All communications take place over secure networks, between healthcare professionals involved in providing treatment and care to the relevant patients. Individual communications are encrypted in transit when transmitted over the internet, but not otherwise, and digitally signed where necessary.

4.8 Review from a technical perspective

This section focuses on relevant technical topics/issues that have not been adequately addressed in the earlier review of programmes/projects and current messaging services.

4.8.1 IT systems and interfaces

It was estimated during MedCom I, that 175 interfaces supporting the agreed standards must be developed in order for all healthcare IT systems to talk to each other, (see Table 17). As 132 of these impact directly on the 12 GP practice systems, this puts the main burden on these vendors. New releases of all systems must continue to support MedCom's standards, (Mariboe, 1996).

Table 17: Interfaces to be developed for healthcare IT systems (1996)

Total IT systems in Denmark	Required communications interfaces	Planned according to project specification of 14.11.94	Actually developed in MedCom's pilot projects	Target achievement in %
5 Hospital systems	10	9	8	89
5 Lab. systems	10	9	6	67
3 X-ray systems	6	6	6	100
3 Pathology systems	6	5	6	120
2 Microbiology systems	4	3	2	67
3 National health insurance systems	3	3	3	100
4 Pharmacy systems	4	1	2	200
12 Practitioners' systems	132	58	43	74
37 Systems in total	175	94	76	81

By Medcom III, it had become evident that significantly more interfaces would be required, to accommodate the 26 existing message types (see Table 18), (Jensen, 2001).

Table 18: Interfaces to be developed for healthcare IT systems (2001)

	No. of systems	Interfaces per system	Interfaces total
EPR systems	8	32	242
PAS systems	5	15	75
Radiography systems	8	6	48
Laboratory systems	3	4	12
Blood-bank systems	4	4	16
Pathology systems	4	4	16
Microbiology systems	4	4	16
Total	36	69	425

By Medcom IV, this number had increased to 596, after factoring in hospital-to-hospital communications (see Table 19), (Hulbaek, 2003). This confirms the difficulty in estimating the total volume of work required at the outset, and highlights another benefit of the evolutionary and incremental approach, as stakeholders can initially commit to a realistic objective and then expand their horizons in the light of their successes and desire for further progress.

Table 19: Interfaces to be developed for healthcare IT systems (2003)

	Number systems	Interfaces per system	Interfaces total
EPR systems	8	35	280
PAS systems	6	25	150
X-ray systems	8	6	48
Laboratory systems	6	8	48
Blood-bank systems	4	4	16
Pathology systems	4	6	24
Microbiology systems	5	6	30
Total	41	90	596

4.8.2 Data transformation and transport

An “EDI Manager” application, supplied by Dan Net and Kommunedata, converts data from feeder systems into the national EDI standard message format, or visa versa, and puts it into an electronic ‘envelope’ for delivery. This application completes the necessary automated validation (i.e. minimal syntax check), communication, logging and acknowledgement of messages. It was designed for use by GP practices and pharmacies, and is updated as necessary with revised rules/mappings by MedCom. Funding is provided to help towards its purchase. The available literature does not detail how XML based messages are processed.

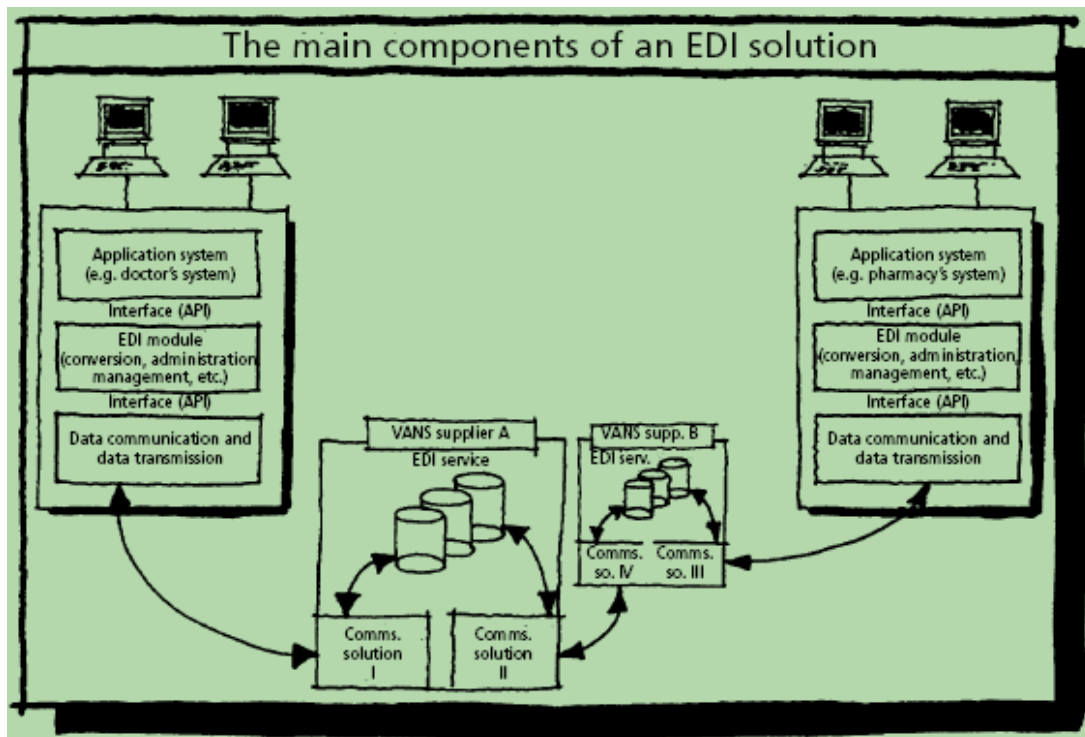


Figure 20: The main components of an EDI solution

4.8.3 Testing

An “EDI Tutor” simulation tool was initially provided by two large telecoms operators, Kommunedata and Dan Net. This application enabled any party to send structured EDI messages to themselves, and was used for testing and troubleshooting. It was available free of charge to software vendors involved in the MedCom programmes. This was subsequently replaced by a more advanced internet-based testing facility (see Section 4.5.6.3 – Hospital sector communication projects).

4.8.4 Connectivity and Networking

Since 1994, there has been a huge evolution and usage of networking technologies and infrastructures, and this has been a key enabler for health messaging services.

4.8.4.1 Health services network

At the outset of the MedCom programme, the existing health service regional/county data networks were joined together to form a single physical nationwide health services network.

4.8.4.2 Value Added Network Services (VANS) network

A separate external Value Added Network Services (VANS) data network was used for EDI based messaging services. This was provided by development partners Kommunedata and Dan Net, two large telecoms operators serving different geographic areas.

Each participating healthcare provider was provided with an e-mail mailbox (i.e. node) by the VANS providers, which stores all messages received until collected. However, unlike e-mail which is a person-to-person communication requiring manual intervention, EDI facilitates an automated system-to-system communication. This is very significant. The received messages are then integrated directly into the recipient’s IT system, and automatically deleted from the mailbox, following the classic ‘store and forward’ principle.

Figure 21 illustrates the variety of healthcare partners connected to the VANS network, and the key role played by the VANS providers in acting as a contact link between them. The VANS providers also publish key usage statistics every month, which are used to benchmark progress nationally, (Mariboe, 1996).

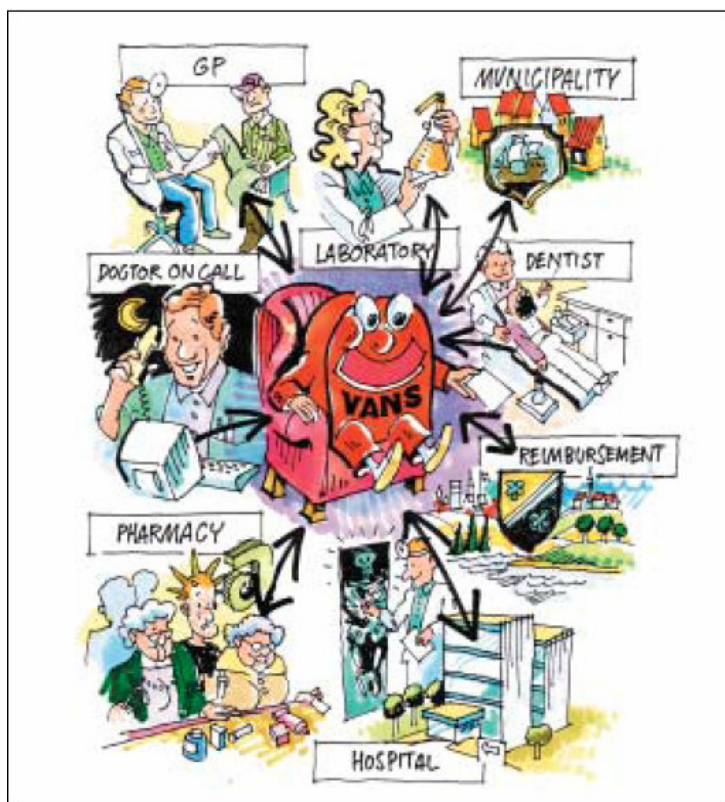


Figure 21: VANS provider acts as contact link between users of the network

4.8.4.3 Internet

The internet provides a proven and inexpensive way for healthcare providers to connect to the VANs network (even as a temporary measure) in order to avail of health messaging or other services. A “bridge” to facilitate such access was developed as part of the MedCom II programme. Patients and GPs also access the eHealth Portal (Sundhed.dk) via the internet, (Jensen, 2006).

4.8.4.4 Healthcare Data Network (HealthcareDIX)

There was a desire to create a new healthcare data network (called HealthcareDIX or SundhedsDIX) that would compete with the VANs network, using internet technologies. The existing regional data networks were joined together, using an encrypted ‘tunnel’ or virtual private network (VPN) connection across the internet, and similar connections were established with the VANS network.

This led to huge demands relating to infrastructure, user/systems administration and information security. Common rules had to be agreed and applied consistently across the regions (e.g. use of anti-virus software, firewalls, directory services, user authorisations and access, reliability, monitoring/audit, compliance with Danish Data Protection Agency

requirements). Structured EDI messages were to be sent on the new network as e-mails, with the message embedded as a text file in place of the e-mail text. Structured EDI and XML messages would apply the same ‘envelope’ standard, enabling both to be transported on either network.

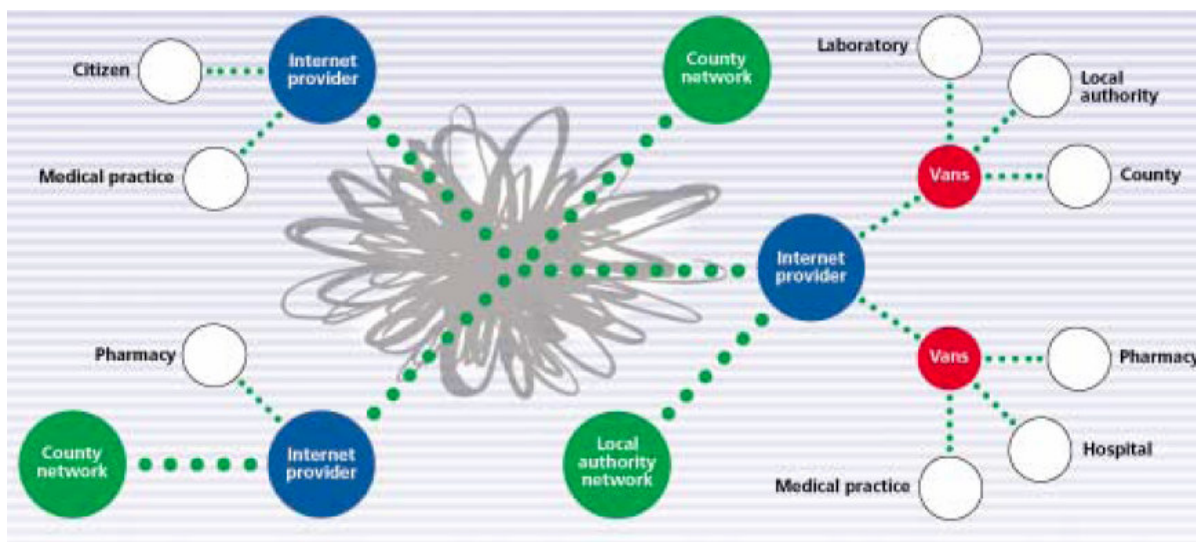


Figure 22: Design of new Internet based Healthcare Data Network

4.8.4.5 Healthcare intranet (SundhedIntranet)

In 2003, a national ‘closed’ Healthcare Intranet was constructed by linking the county/region intranets together, and establishing VPN connections to a national node (i.e. HealthcareDIX), (Hulbaek, 2003). This allows hospital users to access the eHealth Portal (Sundhed.dk) using certificates to ensure security, (Hulbaek, 2005).

4.8.4.6 Freedom of choice

It should not matter to anyone else, if an individual party changes the way in which they connect to any of the above networks, starts to use a competing network, or if they change their local IT system(s). As long as they continue to comply with the agreed standards, it should be possible for other users to continue as normal.

4.8.4.7 Parties connected to DHDN/SDN

Figure 23 shows the parties currently connected to the logical Danish Healthcare Data Network (DHDN or SDN).

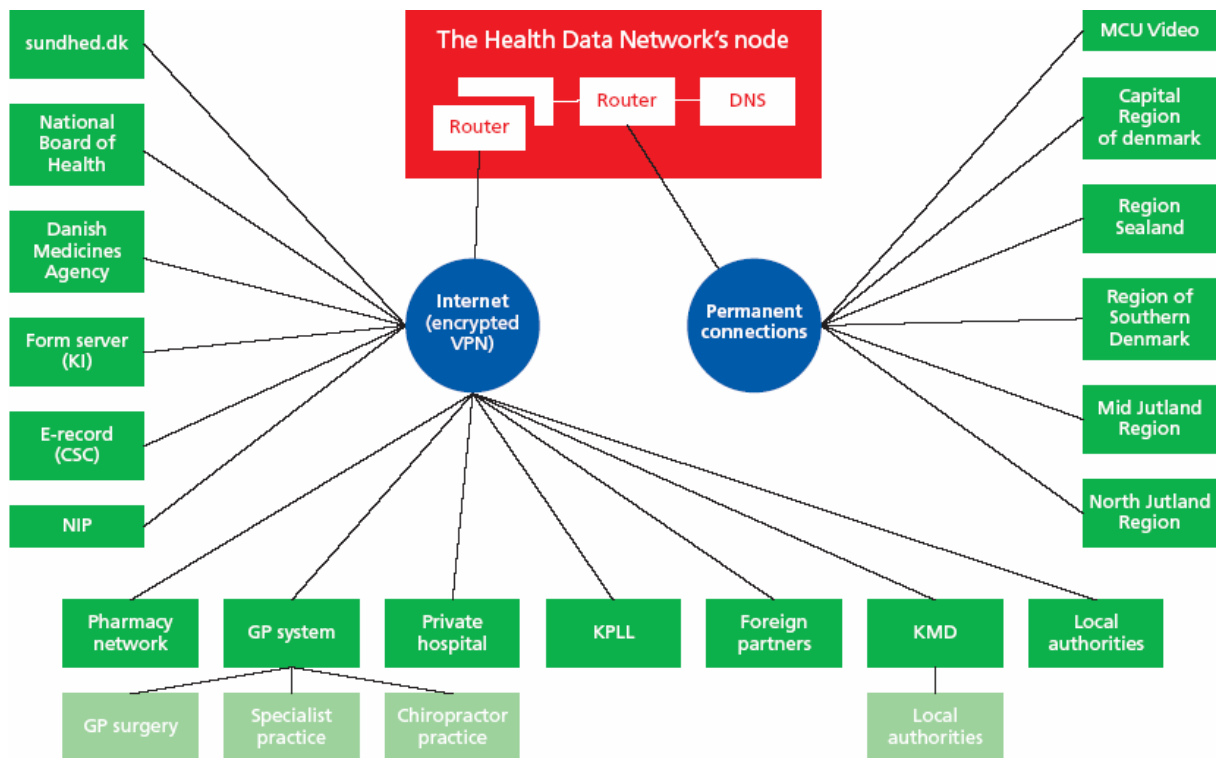


Figure 23: The Danish Health Data Network (DHDN or SND) in Dec 2007

4.8.5 Coding and classifications

An “EDI Codes” application, promotes the use of national coding classifications (maintained by the National Board of Health) and their electronic distribution. These include classification systems for discharge (ICD-10), drugs, surgery & treatment, radiological procedures and hospitals. MedCom has paid for the use of such classifications in their own projects, (Mariboe, 1996).

4.8.6 New Technologies

The pervasiveness of new technologies (e.g. internet, mobile devices/sensors) that can communicate documents, images and sound quickly and cheaply will considerably change existing business and communication processes, facilitating more treatments and care in the patient’s home and in general practice (e.g. telemedicine, remote monitoring). It is suggested that health messaging services are likely to evolve to utilise these new technologies.

4.9 Future priorities and plans

Future MedCom programmes will be highly influenced by the National Strategy for Digitalisation of the Danish Healthcare Service 2008-2012, finalised in Dec 2007, (Jensen, 2008).

4.9.1 National Strategy for Digitalisation (2008-2012)

MedCom will have a central role in the further development of electronic communications services, building on their successes of the past 15 years (e.g. central administrator for the health sector service oriented architecture (SOA), (Hulbaek et al., 2007). It is suggested that future solutions will be based on SOA and web-based services, involving every healthcare provider, carer and patient, to provide on-line access to information in a form that can be used to improve the quality of treatment and care to the patient.

4.9.2 Medcom VI (2009-2010)

MedCom has outlined its objectives for MedCom VI as follows (see Table 20), (Jensen, 2008).

Table 20: Objectives and proposed projects for MedCom VI Programme

<u>Project Name</u>	<u>Project Description</u>
Common Medication Card (FAME) project	Following the pilot phase in MedCom V, this service will be rolled out in 2 phases to a number of hospitals and local authorities (e.g. 10-15), involving almost all of the relevant IT suppliers, (Hulbaek et al., 2007).
SIP Reporting projects	The aim of this programme is to integrate GP practice systems with national registers utilising MedCom's standards and the DHDN/SDN.
SDN project	The renamed DHDN is to be expanded to include fixed high speed connections, improved monitoring and support.
MedCom standards projects	The maintenance and development of MedCom standards, and associated testing and certification of suppliers, must continue.
eJournal project	The continuation of the SUP/e-record project will continue with the close co-operation of all stakeholders.
Consolidation /dissemination project	Priority will be given to communications between practitioners and laboratories (e.g. requesting), and consolidation of self-service test facilities.
Municipality projects	These projects will continue to concentrate on communications between home care/hospitals, and GPs/pharmacies (e.g. rehabilitation plans, birth notifications, LAE Forms, referrals).
Telemedicine project	MedCom has programme management responsibilities for this work stream.

<u>Project Name</u>	<u>Project Description</u>
Patient index project	A project to develop an on-line web-based patient index is also planned, (Hulbaek et al., 2007).

4.9.3 Medcom V (2011+)

The priorities for this programme are unclear at this point, but they are likely to include a national rollout of the Common Medication Card (FAME) service in the remaining 85 local authorities and 30 hospitals, (Hulbaek et al., 2007).

4.10 Lessons learned and detailed conclusions

This section of the report identifies the main lessons identified and detailed conclusions, arising from the detailed literature review conducted:

4.10.1 Business case for health messaging

1. There is a compelling and undisputed business case for the development of health messaging services, and significant tangible and qualitative benefits have been achieved.
2. Health messaging has a central role in improving communications between healthcare providers across all sectors, creating a cohesive health service. It also facilitates national/regional specialties.
3. Health messaging played a key role in maintaining communications and continuity of care during the transition to new structures resulting from the health reforms.
4. Health messaging is of particular importance to the hospital sector, as communications within the sector are estimated to exceed communications between the hospital and primary care sectors by up to a factor of 10.
5. The development of health messaging services requires an on-going investment of resources, which can deliver benefits in the medium term.
6. Critical mass is needed before the anticipated benefits can be realised.
7. The developed eHealth Portal facilities are not extensively used, as they are not integrated with the IT systems used on a daily basis by healthcare professionals, and don't support health messaging. This experience has informed other Government task force projects.
8. A new MedCom standard is being developed to integrate the eHealth Portal's secure e-mail facility with local communications modules, suggesting that messaging is now the de-facto communication method.

9. MedCom has received internationally awards for their work in the area of electronic communications, and is a recognised centre of excellence for health messaging.
10. MedCom has proved that the elimination of paper can be achieved on a widespread basis, where each communication must be acknowledged, requests are routinely matched with results/reports, there is an appropriate audit trail, and documents can be digitally signed.
11. There is almost a complete overlap between the GP and specialist IT packages in the marketplace, suggesting that health messaging is a driving force.

4.10.2 National strategy

12. The development of health messaging standards, services and supporting infrastructures must be prioritised within national Health IT strategies.
13. There must be the political will to implement necessary organisational, cultural and business process change, and to enforce standards.
14. High level sponsorship at Ministry of Health level is important.
15. National multi-year strategies must be backed up by ambitious but realistic action plans.
16. Action plans should prioritise developments that meet a real need, backed up by strategy, emphasising re-using as much as possible.
17. Prioritise treatment and nursing related communications with a broad application, using proven low-cost technologies. This should yield the most significant benefits first, provide experience and establish a sound platform for further developments.
18. Action plans must be dynamic and reviewed/updated regularly in the light of progress and experience, so that corrective action can be taken at an early stage.
19. National Health strategies/plans should ideally be aligned/consistent with Government strategies/plans which prioritise electronic communications, supporting standards and infrastructures for the entire public sector.
20. The Danish Health Act 2004 came into effect in January 2007, so the MedCom IV and V programmes were conducted in parallel with a major reform of the health service.
21. Only successful initiatives and services should be rolled out nationally, and included in medium-long term strategies.

4.10.3 Programme/project governance

22. A committed and effective Steering Group involving all stakeholders is essential.
23. Good leadership, effective governance and timely decision making are essential.
24. An impartial project organisation like MedCom needs to drive and co-ordinate the national programmes, and to negotiate where necessary with all partners involved.

25. This 'lead' organisation needs a broad 'terms of reference' so that it can over time become involved in other eHealth related initiatives (e.g. eHealth Portal, EPR standards).
26. National programmes should be of 2-3 years duration.
27. Programmes/projects must be resourced appropriately.
28. Multi-annual programme budgets, sub-divided into framework and project budgets, are necessary, and monies not spent by the end of a programme should be returned to the financing parties.
29. It is considerably easier to manage large numbers of small projects, than to manage a very large and complex project (i.e. small steps, rather than 1 giant step).
30. Projects should be proposed and defined by a broadly representative group, and approved by the Steering Group.
31. Projects should be conducted locally by the regions/municipalities, but co-ordinated nationally.
32. Each project should implement a single message type within a region/county/municipality.
33. Projects typically involve a large number of different organisations, individuals and disciplines.
34. A considerable commitment, focus and effort is required of those involved in managing and conducting programmes/projects.
35. It is crucial to have formal co-operation agreements in place with all partners/projects to facilitate effective programme management.
36. The availability of in-house resources with suitable expertise is critical.
37. Effective and consistent programme/project management is required (e.g. terminate any programme or project not delivering the goods).
38. Projects not completed within the programme timescale should be terminated, so the next programme can start with a clean slate. This is an incentive to complete projects on-time.
39. Working groups should be set up as necessary to address specific activities/issues, to include specialists and representatives from all stakeholder groups affected.
40. Co-ordination groups should also be set up as necessary to improve communications.
41. The principles of inclusion, consultation and user empowerment should overshadow concerns about the number of participants in working/consultation groups.
42. Barriers encountered can usually be overcome by focusing on the treatment and care of the patient.
43. The widespread publication of usage statistics and project information is a very powerful motivational tool for encouraging co-operation, dissemination and compliance.

44. It is necessary to be honest and non-judgemental when evaluating programmes/projects in order to learn lessons, so that this knowledge can be applied to future endeavours.

4.10.4 Strategic development approach

45. The same tried and trusted evolutionary approach used by the early initiators was adopted for the national programmes.
46. This approach is firmly based on the principles of effective collaboration, co-operation and teamwork with all stakeholders.
47. A pragmatic approach that builds on achievements and successes works best.
48. All public and private healthcare providers, and their IT suppliers, should be involved.
49. Each healthcare provider must be allowed to opt in/out of receiving specific services.
50. Aim to capture data once at the initial point of contact and then communicate or re-use it as required (e.g. prescriptions). This eliminates the re-keying of data, greatly improving efficiency, accuracy and patient safety.
51. There should be incentives for achieving certification (e.g. grants). After a period of time, the laboratories only communicated with certified systems.
52. The combined use of incentives, contracts/agreements, marketing and penalties (to a lesser extent) to promote the widespread use of messaging services is very effective.
53. Participation in international projects is very beneficial, in spite of there being little communication of health data across borders.

4.10.5 Conducting projects

54. The initial pilots typically took longer than anticipated to complete.
55. A considerable on-going investment of resources is required from the regions, counties and municipalities (e.g. clinicians, technicians, service managers, ICT and support staff).
56. Within hospitals, there may be few direct benefits/incentives to encourage adoption of new work practices, (Hjort-Madsen, 2006).
57. Necessary organisational and business process change requires a will to change, and agreement to co-operate, and can take time.
58. The development and dissemination of services takes time, but this is unavoidable.
59. Some communications can be slower than others to take off (e.g. referrals, discharge letters, lab requesting), and active management is necessary to achieve agreed targets.
60. It is appropriate and necessary for healthcare IT suppliers to enhance their own systems to ensure compliance with national standards.

61. The correspondence message is of particular importance as it allows for the inclusion of 'free text' or multimedia content, meeting a large number of needs between parties where communication of structured data is not yet possible (e.g. arising from the health reforms).
62. It is possible to send a message (e.g. rehabilitation plan) in one format, and to automatically convert it to another format (e.g. correspondence message) that the recipient(s) can process.

4.10.6 Standards

63. Adoption of standards is a pre-condition for health messaging, and messaging also drives the use of standards.
64. The large regional projects proved that it is not possible to develop functioning messaging standards on paper only.
65. Health messaging services have a high degree of clinical acceptance and support, except when quality is compromised.
66. MedCom's more pragmatic approach, which combined standards development with pilot projects, became 'tried and trusted' as it resulted in practical standards that could be implemented effectively (see Section 4.5.3.1 – MedCom I, Phase 1).
67. This extensive and iterative process can be very time and resource intensive, and both consensus and quality can be difficult to achieve. The effort involved was underestimated.
68. Standards need to be defined in sufficient detail to be genuinely interoperable on a national basis.
69. Despite the many messaging standards developed to date (e.g. 36+ EDI standards), proposals for new standards are received on a regular basis.
70. The original EDI standards were used as the basis for newer XML and web services standards.
71. It is a Government and Health standard to use XML web services, as part of a SOA architecture, so more recent developments have adopted these standards.
72. Once standards become "permanent", all parties should be encouraged to migrate to them quickly.
73. Standards should not be changed until substantial use of them has been achieved, to achieve a 'critical mass'.
74. Existing standards, solutions and infrastructure should be re-used unchanged wherever possible, to provide additional communications/services (e.g. equivalent communication between other parties).

75. The developed messaging standards, systems and infrastructures were re-used to provide new forms of electronic communication, for example;-
- a. Populating national registers/databases,
 - b. Transferring data between hospital EPR systems,
 - c. Integrating systems with the eHealth Portal,
 - d. Archiving records from “old” EPRs to central database(s), where they can be accessed,
 - e. Transfer of patient records between GP practices.
76. An impartial organisation like MedCom should certify healthcare IT systems to ensure compliance with individual national messaging standards, upon request (e.g. certified for laboratory results, but not radiology reports).
77. Display guidelines for laboratory results were developed during MedCom V.

4.10.7 Technical approach

78. Automated system-to-system communication was mandated from the outset, and this was highly significant.
79. Two separate and competing networks (i.e. VANS, HealthcareDIX) were developed to provide freedom of choice and contingency. EDI and XML based messages travel unimpeded across both.
80. The Danish Healthcare Data Network (DHDN/SDN) is used to communicate both clinical and financial information between parties (e.g. laboratory results, reimbursement claims).
81. The continued success of the DHDN is very much dependent on the healthcare IT systems connected to it (e.g. consistent use of standards).
82. The security infrastructure facilitates the encryption of data transmitted over the internet, and use of digital signatures where appropriate.
83. An automated message testing/conversion facility for IT vendors developed and published on the internet. This was so successful, it was copied in Norway.
84. Resist the urge to adopt new technologies, where ‘old’ ones continue to deliver.

The lessons learned in this study of Denmark, mirror those found in other studies and evaluations, for example (Robinson, 2008).

4.11 Overall conclusions

There can be no doubt that the development of health messaging services in Denmark has been a resounding success. From modest beginnings, almost all public/private healthcare organisations (4,000+) now use electronic health messaging services on a daily basis, for most of their routine communication needs. Almost 44 million electronic messages were exchanged last year, virtually eliminating paper-based communications in the service areas supported. This has significantly improved the communication between healthcare providers, the cohesiveness of the health service, and most importantly the quality of treatment and care provided to patients.

The availability and maturity of health messaging standards, services and supporting infrastructures has also facilitated the development of new innovative forms of electronic communication. The Danish health service has therefore benefited multiple times from their investments. With 14 years experience of conducting large national programmes, all evidence would suggest that the MedCom programmes are still going in the right direction.

Further high level observations about Denmark have been included in Chapter 6.

Chapter 5: Health messaging services in Ireland

This chapter outlines some relevant facts about Ireland, the Irish health services and health messaging services. It then describes the development of health messaging services and supporting infrastructures, based on the semi-structured interviews and a review of available literature.

5.1 Some facts about Ireland

The Republic of Ireland is an island nation with 26 counties, an area of 70,273 km², and a population of 4.24 million. Only 4 urban centres have more than 50,000 inhabitants and two thirds of the total area is farmland, (O'Hanlon, 2007).

5.2 Overview of Irish health service

In 2006, Ireland spent 7.5 % of GDP on health care, almost 1.5% below the OECD average, and 78% of this was funded publicly through taxes, (Gurría, 2008c). In Ireland, there is free access to most health services for low income or elderly citizens with a medical card.

Healthcare professionals may work exclusively in either the public or private sector, or combine public contracts with their own private practices.

5.2.1 Primary care sector

The primary healthcare sector is usually the first point of contact for patients with general health problems. Treatment and care is provided by approx. 2,315 GPs, 552 optometrists, and 1,414 dentists in their own private practices or HSE health centres, and there are 1,530 licensed pharmacists operating within this sector, (Woods, 2007). GPs have a 'gatekeeper' role for other specialist services, and are paid by way of capitation and fees combined.

5.2.2 Community care sector

The Community Care sector is publicly funded and also deals with patients with general health problems. Following referral, services are typically provided by professional therapists (e.g. speech & language, occupational, physio), public health nurses and other allied health professionals. Care is typically provided in local health centres or the patient's home.

5.2.3 Hospital sector

The hospital sector is largely county based, with a small number of national/regional tertiary care centres. It deals with patients needing more specialised and intensive treatment and care. There are numerous relatively small national, regional and hospital based medical laboratories currently operating in Ireland.

5.2.4 Structures and administration

Up until 2005, health and personal social services were provided by autonomous regional Health Boards/Authorities, reporting to the DoHC. Healthcare services and supporting infrastructures were developed on a regional basis to meet regional needs and priorities, with local political responsibility and decision making. As Health Boards co-operated with each other only on a voluntary basis, it was quite common for different approaches and solutions to be adopted, leading to innovation but also some fragmentation and duplication of effort.

Arising from the Health Act 2004, the HSE was established on an interim basis, and formally established in 2005. The Health Boards and numerous other health agencies were consolidated into this national organisation. The transition to new national management structures, 4 administrative areas, and 32 local health offices (see Figure 24) required significant organisational change, and this is on-going, (Browne, 2008).

At a national level, services were organised into three “pillars”, the National Hospitals Office (NHO), Primary Community and Continuing Care (PCCC) and Population Health directorates, with supporting functions/services. It was envisaged that over time, this would facilitate better management, co-ordination and integration of the healthcare services provided to citizens.

The Dublin Area Teaching Hospitals (DATHs) and Voluntary Agencies operate independently, but are funded through the HSE. The Health Information and Quality Authority (HIQA) was established on an interim basis in 2004, and formally in May 2007, as an independent authority to drive quality and safety.

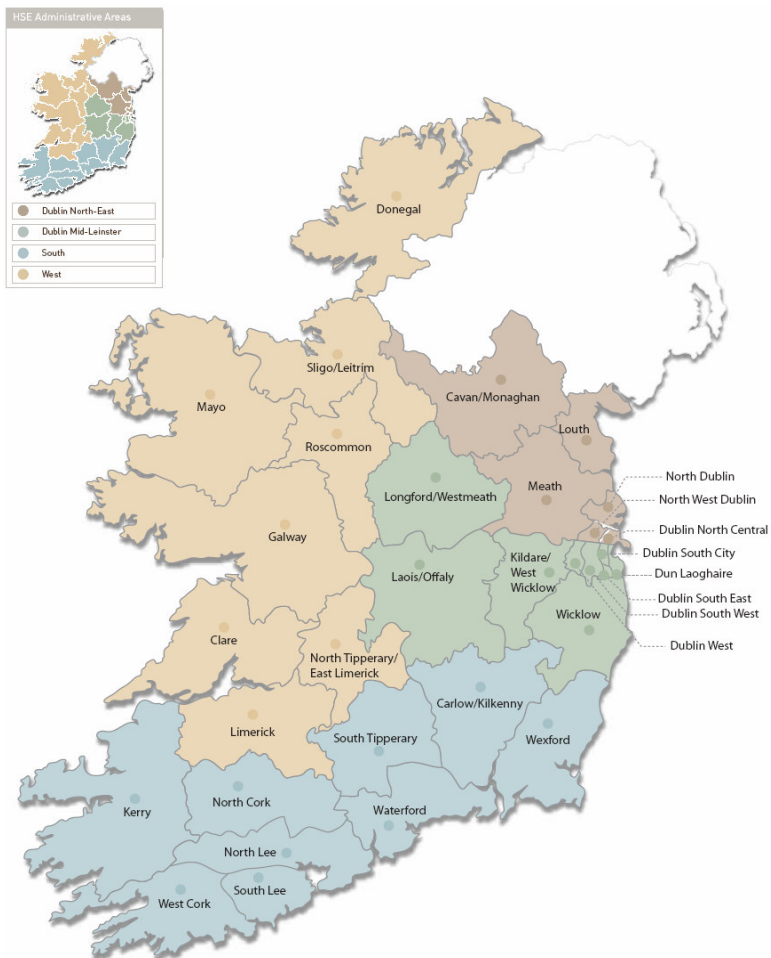


Figure 24: Map of Ireland showing HSE administrative and local health office areas

In July 2008, it was announced that further organisational changes will be implemented over the next 18 months to create a more integrated health service, with national direction and guidance but more local responsibility. At a national level, the NHO and PCCC directorates will merge to become an Integrated Service Delivery directorate, a new Clinical Care and Quality directorate will facilitate clinical leadership, new Planning and Communications directorates will be created, and Population Health staff will be re-assigned to the other directorates. At a local level, new Area Directors and Area Clinical Leaders will be responsible for all health services within their area, under the direction of one senior executive. It is not yet clear how many areas there will be, (Drumm, 2008).

5.3 Organisation of health messaging services

The development of health messaging services in Ireland has largely been driven by the former Health Boards, the National Healthlink Project, the Primary Care Reimbursement Service (PCRS) and the national General Practice Information Technology (GPIT) Group.

These organisations and other stakeholders worked together to develop national standards and common strategies, but often developed their own messaging solutions and supporting infrastructures, particularly in the early days when it was considered desirable and necessary to pilot different approaches and solutions.

5.3.1 National Healthlink project

The Healthlink project was initiated in 1995 by the Mater Misericordiae Hospital as a proof of concept to see if communications with GPs could be improved.

In 2000, it was proposed by the national GPIT Group, that messaging services should be provided to all GPs. The DoHC were quick to support and fund this initiative, and agreed that Healthlink should become a national project. Following the establishment of the HSE in 2005 and a period of uncertainty, the project has since been sponsored by the HSE and funded substantially from their annual ICT capital allocation.

From the outset, Healthlink has worked exclusively on the development and provision of health messaging services, initially within the former Eastern Health Board (EHB/ERHA) region (e.g. Mater, Beaumont and St. Vincent's Hospitals) and then expanding out to the former Mid-Western (MWHB), Western (WHB) and Midland (MHB) Health Board regions. Healthlink currently provide a range of messaging services to 1,236 GPs in 608 practices, (Anderson et al., 2008) confirming their position as the largest messaging service provider in the country. They are currently working to replace the existing regional service in the former North Eastern Health Board (NEHB) region.

From an organisational perspective, the Mater is a teaching hospital that was originally funded directly by the DoHC, and operated independently of the former Health Boards. Following the health reforms, they receive their funding via the HSE. Healthlink is a national project facilitated by the Mater Hospital. Their staff have Mater Hospital contracts and are included in their headcount, so they operate under the same constraints as everyone else in the public health service.

The regions that have partnership arrangements with Healthlink, rate the level of service provided and their responsiveness as being very good. While it can be difficult to get new work onto Healthlink's agenda, this is typically attributed to multiple priorities and limited resources.

Healthlink was shortlisted with 10 other projects for an E-Europe award in 2004, in the "eHealth administrative support tools and services for citizens" category, (Lalor, 2004). They were also commended at the 2005 Irish Healthcare Pharmaceutical Awards for their entry in the category "Best Use of Information Technology", (Lalor, 2005). St. Vincent's Hospital won a HSE national achievement award in the "Better Service Awards - Innovation" category for the Neurology project, which involved Healthlink (see Section 5.5.2.1).

The HSE wants to establish a national health messaging service to facilitate electronic communication between primary care and secondary care. It was agreed during 2007 that Healthlink would be developed as the new national messaging system/service, subject to appropriate governance arrangements being put in place. The implications of this decision are still being worked through.

5.3.2 Former Health Boards (now Health Service Executive)

All of the former Health Boards/Authorities have been involved to varying degrees in the development of health messaging services, and each typically set their own development priorities to meet local needs.

The former EHB/ERHA, MWHB, WHB and MHB chose to provide services in partnership with Healthlink, and their usage statistics are included above (see Section 5.3.1).

The former North Western (NWHB), Southern (SHB), South Eastern (SEHB) and North Eastern (NEHB) Health Boards chose to develop their own regional messaging services and supporting infrastructures. When combined, these services currently provide a range of messaging services to 739 GPs in 307 practice locations. While this is approx. 60% the number of Healthlink GPs, these regions communicated a greater volume of messages each year up to 2007, based on available figures from 2003 onwards, (Anderson et al., 2008). Considerable momentum was built up during 2002, but this tailed off almost completely in 2004 with the introduction of a new DoHC policy that all new ICT projects must be national when no structures existed to support such projects, the establishment of the interim HSE and uncertainty arising from the health reforms.

The development strategy adopted seemed to depend to a large extent on the timing of the decision, the maturity of Healthlink's service/solution, and the internal resources available within the former Health Boards to complete the necessary project(s).

5.3.3 Health Boards Executive (HeBE) Messaging Group

This national group was formed in 2002, primarily as part of an eGovernment (eHealth) initiative, which set the initial agenda for the group, (Thompson et al., 2002). It was established at an opportune time to benefit both from the natural progression towards increased co-operation between existing services, and the recognition that national standards were essential. As existing services were at different stages of maturity, this single governance structure was designed to bring them all together, with the ultimate long-term aim of creating a single national messaging service.

There was consensus that the Messaging Group and related Sub-Groups (e.g. standards, security, vendors) were well managed, productive and provided excellent value for money. There was a good mix of people/skills, and members were involved on a part-time basis to represent different agencies/services, for their specific expertise, or were contracted to do a lot of the work. While this worked well, speed of delivery was an issue.

Between 2002 and 2005, the Standards Sub-group developed numerous messaging standards based on HL7 v2.4 and XML, (see Section 5.4.4). These standards have been used successfully since, some for more than 6 years. As part of that process, the Messaging Group co-ordinated locally run pilot projects to prove these standards and to develop the messaging solutions/infrastructures still used today. Standards were then revised in the light of feedback, before being published and adopted more widely.

In 2004, the Messaging Group developed proposals for a second phase of the HeBE Messaging Project, which would involve a national approach to the development of key infrastructural components, (Peyton, 2005b). They developed a discussion document on the convergence of existing messaging services, and a functional specification for a national messaging service between primary and secondary care, (Peyton, 2004, Peyton, 2005a).

It is unfortunate that this project was brought to an end in 2005, and that the development of messaging standards and compliance monitoring ceased. However, it had become increasingly difficult to get strategic decisions ratified due to the uncertainty caused by the

health reforms. If the group had continued, it is likely that at least some of the current issues would have been addressed, and considerably more momentum maintained. There is also some anecdotal evidence that subsequent projects have not always complied fully with the existing standards, but this has not been confirmed.

5.3.4 National General Practice IT (GPIT) Group

The DoHC and Irish College of General Practitioners (ICGP) together established the GPIT group in the late 1990's, to develop and promote the use of ICT in general practice, to provide related training, support and guidance, and to develop an accreditation programme for practice management systems. They were instrumental in establishing the Irish chapter of HL7, and supporting necessary HL7 and XML training. Following the health reforms, the HSE and ICGP re-activated and re-structured the GPIT group in 2007, to comprise an education section with local facilitators/tutors, and a projects section to promote an integrated and effective approach to ICT development in Primary Care, (Meade and O'Mahony, 2008).

The certification of practice management systems in 1999 and 2003, while a welcome development, did not assess health messaging functionality. However, the more comprehensive requirements for the current certification process focused on core EHR functionality and interoperability, including the assessment of basic electronic messaging functionality, (O'Mahony, 2007). This important development can be built on in future years.

5.3.5 Private healthcare providers

Health messaging projects to date have mainly involved GPs and pharmacies, and their IT suppliers. Those involved in pilot projects were typically progressive and receptive. Their software vendors were generally very supportive, although some were more pro-active than others.

GPs value messaging services highly, and consider them to be essential for the continued effective operation of their practices. The early adopters were often the most technically advanced. They typically paid their software vendors to incorporate the necessary messaging functionality into the practice management systems, through once-off/annual fees.

5.3.6 Health Protection Surveillance Centre (HPSC, formerly NDSC)

In 2005, the former National Disease Surveillance Centre (NDSC) was incorporated into the HSE, and became known as the HPSC. The HPSC was established “*to improve the health of*

the Irish population by provision of the best possible information on disease including infectious diseases through surveillance and independent advice, epidemiological investigation, research and training.”, (O’Flanagan, 2008).

Electronic communication from microbiology laboratories around the country to the HPSC, is not achieved using health messaging but by transferring proprietary format data files. In spite of this, there are relevant lessons to be learned from their experiences, so these have been documented and included.

5.3.7 Primary Care Reimbursement Service (PCRS, formerly GMSPB)

The PCRS, formerly the General Medical Services Payments Board (GMSPB), is now part of the HSE Finance Directorate, and makes payments to self-employed medical practitioners that provide services to patients on behalf of the state.

The PCRS exchanges considerable volumes of data with pharmacies, GPs, dentists, opticians and other contractors, and offers a choice of ‘technology generations’ (see Appendix 5), exchange methods and file formats (e.g. manual forms, fixed format batch files, HL7 message files). Approx. 450 pharmacies currently use their health messaging services.

5.4 Strategies and standards

In Ireland, the level of strategic vision and planning in relation to Government and Health IT is relatively immature in comparison with Denmark, but is continuing to evolve.

5.4.1 Government IT strategies

The Department of the Taoiseach, Information Society Policy Unit, has overall responsibility for eGovernment/eHealth and the development of Ireland as an Information Society. The unit has published a number of relevant reports including ‘Implementing the Information Society in Ireland: A Framework for Action’ (McCarthy, 1988), ‘Implementing The Information Society In Ireland - An Action Plan’ (McCarthy, 1999) and ‘New Connections - A Strategy to realise the potential of the Information Society’, (Ahern, 2002). A new national action plan for the knowledge society will be published shortly.

5.4.2 Health strategies

The overall strategy for the Irish health system of the future is outlined within the national Health Strategy “Quality and Fairness – A Health System for You”, (Kelly, 2001). This strategy is complemented by a number of other strategic reports and action plans that address specific areas/issues, providing a framework of ambitious and wide ranging goals, objectives and actions to improve the health of the population and to create a world-class integrated person-centred health service.

On 10th July 2008, Professor Brendan Drumm, CEO of the HSE, circulated a staff briefing “Another important step towards fully integrated healthcare”, which began by stating;-

“At the heart of our Transformation Programme, launched in late 2006, is the development of integrated health care... Central to all integrated health services are health professionals working in teams. This involves health professionals, regardless of whether they are hospital based, community based or both, actively sharing information, planning care and arranging tests and treatments that are delay free and deliver the best value and convenience for patients and clients.”

This puts integration and effective communication between healthcare professionals at the heart of the health reform process, essentially arguing the case for health messaging and the use of national standards.

Initiatives like the co-location of public and private hospitals on the same site/campus, and the development of Primary Care Teams/Networks, are likely to give rise to significant communication issues which could be addressed by deploying appropriate health messaging, eHealth and ICT services (e.g. secure e-mail, shared document repositories).

5.4.3 Health IT strategies

Up to 2003, each former Health Board/Agency developed their own regional ICT strategies, and many of these were not formally published. However, a number of national ICT health strategies have since been developed and published (see Table 21).

Table 21: National IT Strategy reports in the Healthcare Sector

Year	Document Name	Published By	Main Focus
2003	Developing an ICT Strategy for Health: Agreeing and realising the Vision, Draft ICT Strategy project report for Consultation, (Harvey et al., 2003).	HeBE	Identified need for national, integrated, standards-based ICT services, and significant issues to be addressed. Recognised role of ICT in improving teamwork, inter-disciplinary communications and streamlining of processes.
2004	Embedding the e in Health: A Strategic ICT Framework for the Irish Health System, (Doherty, 2004).	HeBE	Set out a comprehensive national strategic ICT framework for Health. Included messaging and related interoperability standards, procurement of enterprise-wide message broker, and links with future Government interoperability framework.
2004	Health Information - A National Strategy, (Martin, 2004).	DoHC.	Set out the vision, strategy and action plan for information within the Irish health system. Specifically included messaging, information/data standards, connectivity and security.
2005	Primary, Community and Continuing Care ICT Strategy and Action Plan, (Secta, 2005).	DoHC / HeBE.	Defined strategic approach to ICT development for PCCC, to support the national Primary Care Strategy. Recognised GP messaging as a high priority project which had made good progress, with “real opportunity” for delivering value and “quick win” for entire health system. Recommended expansion to include other stakeholders, and non-clinical messages.
2008	Discussion Paper on proposed Health	DoHC.	This bill focuses on better use of personal health information for

Year	Document Name	Published By	Main Focus
	Information Bill, (Harney, 2008).		improved patient care and safety across the public/private sectors, while maintaining confidentiality and security, and includes the introduction of a unique health identifier. It notes Healthlink as an example of good practice.

These strategies were typically developed in consultation with stakeholders, set out ambitious visions and objectives for ICT developments, and were accompanied by action plans which identified key business, organisational and technical components necessary for delivery. They all recognised in different ways the importance of electronic communications, connectivity and standards for healthcare providers. Unfortunately, large portions of the strategies and related action plans have not yet been implemented. A new HSE ICT Strategy developed in 2007, is currently going through a complex approval process involving the HSE Senior Management Team, HSE Board, DoHC and Department of Finance.

5.4.4 Messaging Standards

The HeBE Messaging Group developed a number of health messaging standards based on HL7 v2.4 and XML, and these have been used successfully since (see Table 22 and Section 5.3.3).

Table 22: List of HeBE Messaging Standards

Standard Name	Date Published
Laboratory and Radiology Reports	July 2003
Referral and Discharge	November 2003
Admission, Discharge and Death Notification	January 2004
Appointment Scheduling	March 2004
Acknowledgements	June 2004
Batch File Protocol	December 2004
Errata to correct printing/writing errors	November 2005
Laboratory Order	December 2005
Addenda to provide supplemental information	December 2005

The combination of standards development activities and pilot projects to prove these standards, was seen as a critically important ingredient and reality check. The GP practice management system vendors were a major driving force behind this standardised approach, as they were reluctant to develop multiple proprietary interfaces for each individual service.

In February 2006, the author attended an EHR Standardisation Workshop on interoperability, hosted by the National Standards Authority of Ireland (NSAI). The aim was to revise the pre-standard ENV 13606 for EHR communications, for adoption by CEN as a formal European standard. However, this pre-standard was at a very early stage of development compared with the HL7 Version 3 standard, so the HSE did not participate further.

5.4.5 Other standards

The Irish health service has often been slow to recognise the value of standards (e.g. data coding, classifications, EPR reference models), and consequently few standards have been developed and used on a daily basis. For example, the absence of a unique patient identifier which can legally be used for all interactions with public and private healthcare providers, creates significant problems for those attempting to provide comprehensive, integrated and accurate information at the point of care.

The trend towards laboratory/hospital accreditation will have potentially serious implications for messaging service providers/users nationally. For example, in order to achieve ISO 15189 laboratory accreditation, it will be necessary to delay or cease the transmission of messages until the presentation of electronic reports within the GP practice systems have been audited to prove clinical equivalence with the official printed reports).

5.5 Development programmes and projects

The development of health messaging standards, services and supporting infrastructures in Ireland is widely considered to have been a success. It is therefore important to outline the development process and to identify lessons learned.

5.5.1 Local initiatives (Late 1980s-2002)

Even in the pioneering days of messaging, there was evidence of organisations working together on messaging related projects. All projects and messaging services/infrastructures during this period were funded by the former Health Boards, or the DoHC (i.e. Healthlink).

1995

The inaugural Healthlink messaging services were developed using proprietary standards and flat file formats for 9 different message types, and were e-mail based. GPs dialled in to collect their messages and viewed them using software that was provided by Healthlink, and installed in the practice. There was no integration of messages into practice systems at that time.

1996-1998

The Irish National Virus Reference Laboratory (VRL) was involved in a pilot project to electronically report 'Hepatitis A' results to the Public Health Dept within the former EHB. The former NEHB started their bespoke development of services in 1998 using proprietary standards and flat file formats for Radiology and GP out-of-hours Co-operative reports. In that same year, the NWHB developed a laboratory messaging service, based on the EDIFACT standard which was then the predominant European standard.

1999-2000

In 2000, Healthlink offered to provide messaging services for Beaumont Hospital and the former MWHB, so demand for their services increased greatly. As maintenance and support were becoming a considerable overhead, they researched web technologies and re-designed their front end application. A number of GP software vendors developed interfaces for these proprietary message types. However, most projects/services soon realised that national messaging standards were needed.

2001

The former GMSPB initiated a project to communicate reimbursement claims, exception/rejection lists and statements to/from Pharmacies. Later that year, the former SHB commenced a pilot laboratory messaging project which was completed successfully in 2003, and formally evaluated, (O'Mahony, 2003). It was suggested that this was the first messaging project in Ireland to use international standards (i.e. HL7 and XML). The former NEHB migrated their services to HL7 v2.2, and developed a GP Extranet to provide secure e-mail

and hospital booking facilities. The benefits of secure e-mail almost overshadowed those arising from messaging.

2002

In 2002, the former NEHB and NWHB set up a joint group to further the development of messaging, and to push for the establishment of a national messaging group. During this period, almost all existing services and the GPIT Group conducted their own research into relevant messaging standards. All organisations involved in health messaging were then invited to join the HeBE Messaging Group, and the final decision regarding messaging standards was made at that forum.

5.5.2 Large regional projects (2003 to date)

The Information Society (eHealth) initiative provided seed capital for pilot projects conducted by the former Health Boards and Healthlink between 2002 and 2004, and without this funding the messaging programme could not have progressed. Subsequently, the HSE ICT Directorate provided almost all of the capital funding for service/infrastructural developments. Revenue funding for maintenance, support and enhancement of existing services continues to be provided by regional budget holders (i.e. at former Health Board level).

5.5.2.1 Healthlink

The original messaging service operated successfully for approx. 8 years before being replaced in 2003 by “Healthlink On-line”, a web-based platform incorporating the new HeBE messaging standards. While Table 23 shows the participating hospitals and messages delivered in May 2007, further progress has since been made, (Garvan, 2007). Healthlink Online version 3 was released in November 2007.

A web-based laboratory ordering facility with clinical decision support functionality was piloted in October 2006, with the aim that such functionality could be incorporated into the GP practice systems, supported by a laboratory order message.

At the request of a neurologist in St. Vincent’s Hospital, a web based “Neurolink” service was developed and launched in December 2006. This allows GPs to submit on-line referrals for their patients, including details of complaints/symptoms, and to receive a next day response giving advice on their treatment or next steps. This significant improvement has increased the number of patients seen from 2936 in 2004, to 5290 in 2007, and reduced waiting time for

new patients from 1 year to under 10 weeks, (Connolly, 2008). This service has since been rolled out to a consultant neurologist in St. James' Hospital in May 2008. There is a great need to expand this service further, and to communicate other referral types and inbound message types between GPs and hospitals.

Table 23: Participating hospitals and messages delivered via Healthlink (May 2007)

Hospital	Lab	Radiology	OPD Appt	Discharge Summary	Discharge Note	A&E Attend	Death Note	Waiting List	Neurology Referral	Lab Order / NACK
Mater	√	√	√	√	√	√	√	√		√
Beaumont	√	√	√	√	√	√	√	√		Ж
St. James's	√	√	√	Ж			Ж		Ж	Ж
Connolly	√									
St. Vincent's	√	Ж							√	
St. Colm-cille's	√									
Naas	√									
Limerick	√									
Ennis	√	Ж								
St. Joseph's Nenagh	√	Ж								
UCGH	√	Ж								
Mayo	√	Ж								
Roscommon	√	Ж								
Portlaoise	√									
Mullingar	√									

√ = Live Ж = Planned

In July 2008, Professor Tom Keane, National Cancer Programme Director, requested Healthlink to develop a similar service for cancer referrals. Having developed a proposal for the full range of referral types, Healthlink is planning to pilot the first referral type with St. James' Hospital in the autumn. Healthlink is also working to communicate hospital laboratory results with 'cancer triggers' to the National Cancer Registry of Ireland, and planning is to pilot this in St. Vincent's Hospital, (Garvan, 2008b).

An automated web services application allowing organisations to push/pull messages has recently been developed, based on technical specifications from the former SEHB. This is now available in pilot/test mode to facilitate vendor testing, starting with available 'outgoing' message types from hospitals, and later moving on to 'inbound' messages from GPs (e.g. referrals). The GP software vendors have received documentation and commenced work, so it is hoped that this functionality will be included in the next release of the most widely used systems.

5.5.2.2 Mid-Western Region

The former MWHB focussed on providing a laboratory messaging service in partnership with Healthlink. This was piloted in December 2002 and has been of major benefit to GPs. A GP Co-op messaging service recently developed by Healthlink is being piloted in their GP Out-of-Hours service (i.e. Shannondoc). Having commenced “live” operation in May 2008, initial feedback has been positive.

5.5.2.3 Midland Region

In January 2006, the Midland Region in partnership with Healthlink, commenced their pilot laboratory messaging service, to communicate results from the hospitals in Portlaoise, Tullamore and Mullingar to local GPs. This service continues to operate well and feedback to date has been good. As they plan to implement the national Clinisys laboratory system shortly, and to subsequently replace their existing Radiology and PAS systems, further electronic messaging developments are unlikely to be prioritised in the short term.

5.5.2.4 North Eastern Region

During 2003/2004, the former NEHB developed a new laboratory messaging service and amended their existing Radiology and GP Coop services, to avail of the new HeBE messaging standards. Their Primary Care Teams (PCTs) have identified messaging services as being important, and these services are now likely to be provided in partnership with Healthlink.

5.5.2.5 North Western Region

Over time, the technologies/systems supporting the former NWHB’s laboratory messaging service started to become obsolete, and there were difficulties with the GP software vendor, so GPs accessed the service less frequently. Other regions had since developed messaging services using HL7, so they migrated from EDIFACT to HL7. In 2004, they received funding to develop a radiology messaging service, but this progressed slowly. A formal accreditation process provided the necessary incentive and piloting commenced in May 2008. A GP Co-op messaging service is considered desirable, but it is perceived that all new developments must be national.

5.5.2.6 Southern Region

Following completion of the pilot laboratory messaging service in 2003 within the former SHB, an assessment was conducted into how cessation/reduction of printing of laboratory reports could be achieved. This identified the work necessary to facilitate such change

without adverse risk to the patient (e.g. legal opinion, auditing, consensus on equality of paper/electronic results, acknowledgements), (O'Mahony, 2004a). A project to communicate radiology reports was subsequently initiated and, while this took longer than expected to complete, pilot operations commenced in May 2008. Their next priorities are GP Co-op, laboratory ordering and discharge summaries.

5.5.2.7 South-Eastern Region

In 2003, a pilot project was initiated to develop a laboratory messaging service. By leveraging expertise gained in the former SHB, it was completed within a relatively short timeframe and formally evaluated, (O'Mahony, 2004b). There was a significant emphasis on standards, quality and auditing throughout this project. The achievement of ISO 15189 laboratory accreditation by the regional Microbiology laboratory resulted in a shifting of the project scope, and raised standards further. It has been suggested that this service is now the most quality assured nationally.

Following a formal options appraisal to assess messaging priorities, (O'Mahony, 2004c), a pilot project to exchange GP Co-op reports and acknowledgement messages was initiated. This was the first project to provide automated 2-way messaging using web services. All GPs receiving this service now rely entirely on electronic reports for clinical decision making, and faxing of results has ceased. A formal evaluation confirmed that this project was successful, (O'Mahony, 2006).

5.5.2.8 Western Region

In 2005, a laboratory messaging pilot project was initiated in partnership with Healthlink, and completed in Oct 2006. They then prioritised the cessation of printing, a difficult initiative to progress considering the potential issues involved (e.g. risk management, medico-legal). Following careful assessment of the reporting process, issues and contingency arrangements, a legal opinion was obtained and it was agreed that this initiative could proceed. A small number of GP practices in Mayo piloted a paperless service, supported by the laboratory, and the final audit was concluded in May 2008. The rollout to additional practices will commence in Aug/Sept 2008.

Radiology was prioritised next, once a new Picture Archiving and Communication System (PACS) and Radiology Information System (RIS) had been implemented in Galway to support both hospitals there. Additional sites will be implemented as part of the current

National Integrated Medical Imaging System (NIMIS) project. A pilot project to communicate discharge letters from Non-Consultant Hospital Doctors (NCHDs) in Galway to GPs is planned for Q3 2008. Following on from the piloting of the Healthlink Co-op messaging service in Shannondoc, it is intended that this messaging service will be piloted in their GP Out-of-Hours service (i.e. WestDoc) during Q3, 2008.

5.5.2.9 Health Protection Surveillance Centre (HPSC, formerly NDSC)

As advised earlier, the HPSC does not use electronic messaging services (see Section 5.3.6).

The feasibility of utilising international standards such as HL7, SNOMED and LOINC were examined by the former NDSC when designing and building the national Computerised Infectious Disease Reporting (CIDR) system. Unfortunately, a number of reasons precluded their use (e.g. suitable standard not available at the time, high licensing costs, considerable work involved in changing local systems).

5.5.2.10 Primary Care Reimbursement Service (PCRS, formerly GMSPB)

The pharmacy project initiated in 2001 progressed well and their 'Generation 2' solution was ready for implementation by late 2003/early 2004 (see Appendix 5). As no off-the-shelf reimbursement standard existed, they developed their own based on the HL7 Clinical Document Architecture (CDA) release 1 standard. Rollout was initially slow, as pharmacies had to purchase and implement necessary integration software. However, marketing improved and the PCRS informed pharmacies that there would be no payments for 'Generation 1' claims after 2008, so not surprisingly the uptake rate increased substantially.

Their 'Generation 3' version will be internet and web services enabled/based, allowing for scheduled and automated delivery of files on a daily/weekly basis. Eradication of the single 'end of month' file (50-70% of a pharmacy's income) should eliminate many existing problems related to claim rejections, corrections and payment deadlines. They are considering the communication of prescription 'scripts' using HL7 and web services in the near future. At this stage, data encryption and digital signatures are not included.

The PCRS is developing a messaging service to communicate eligibility confirmations, via web services published by the GPIT group, and one Dental system provider is developing

software to avail of this service. They recently developed a “real time” big-screen presentation system which shows in real-time, the volume of messages/files/claims received, processed and paid, and this has been very well received. Their infrastructure has evolved over the years, and is now better able to deal with scale and security. However, they are standardising over time to create a single integrated infrastructure.

Claims relating to the National Cervical Screening Programme are currently being processed in Limerick, but are being transferred to the PCRS. These are fixed/delimited file transfers with payment instructions, and there is no push for XML or other standards. The main question regarding such data transfers is whether they should be “batch” or “real time”. The proposed centralisation of immunisation payments (from each region) is likely to be a big change.

It was suggested that European Union countries will only accept electronic communications from a future date, and that this will impact on many government departments. The processing of European Health Insurance Cards (EHICs) impacts on the PCRS, as related fees for health services provided must be claimed or paid.

5.6 Overview of current health messaging services

By the end of 2007, approx. 1,466 organisations were using health messaging services on a daily basis for a subset of their routine communications. While approx. 4.9 million messages were communicated that year (see Figure 25), this includes some estimated figures, and excludes GP Co-op reports from the former NWHB, and Pharmacy reimbursement related messages, as annual figures were not provided. Claims relating to approx. 606,000 prescriptions and 1.76 million items were received by the PCRS from 450 pharmacies during May 2008, so the potential annual volumes are considerable, (Anderson et al., 2008).

Figure 26 (Garvan, 2008a) illustrates that almost all counties have access to some health messaging services. The original map has been modified to include South Tipperary within the South Eastern region, and to show that Sligo and Leitrim receive messaging services from the North Western region.

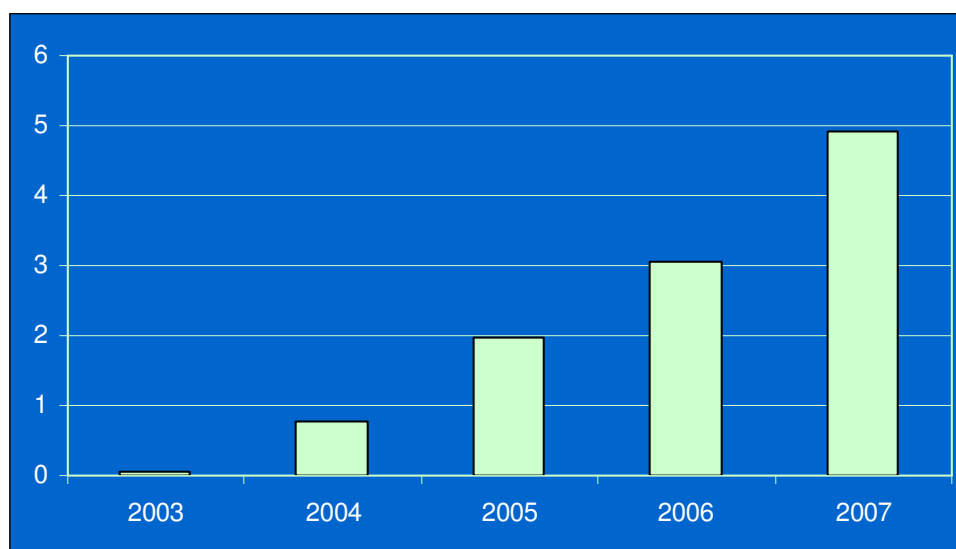


Figure 25: Messages (in millions) communicated annually in Ireland (Dec 2007)

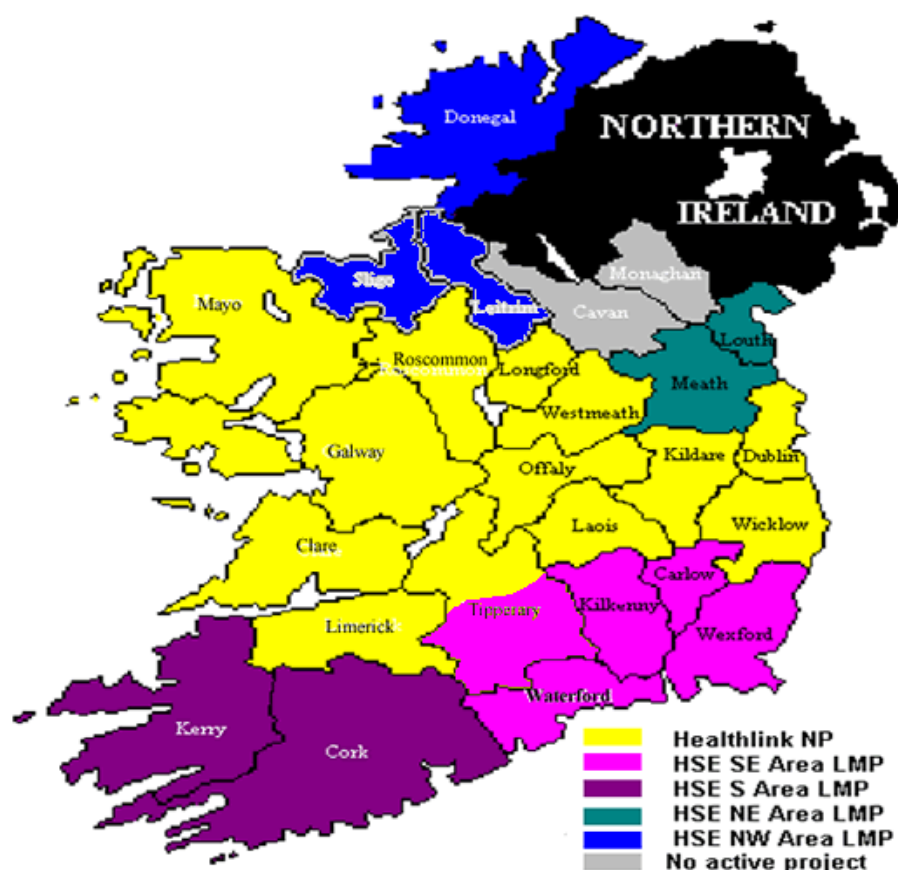


Figure 26: Existing Irish health messaging services/projects and Counties served

5.7 Review from a business perspective

This section focuses on relevant business topics/issues that have not been adequately addressed in the earlier review of programmes/projects and current messaging services.

5.7.1 Reported benefits

The relatively few formal project evaluations conducted, have all confirmed the achievement of significant benefits for patients, healthcare providers and their support staff (e.g. improved patient care, more accurate/timely reporting of results, increased efficiency). Without exception, those interviewed for this research expressed positive or very positive views about the business case, benefits and potential of health messaging.

5.7.2 Business sponsorship

Messaging projects have typically been perceived as being of most benefit to Primary Care. In all but one region/service, such projects were sponsored by a senior manager from the business or ICT, and a formal or semi-formal Steering Group was established to represent the key stakeholders. Consultation and engagement with stakeholders was identified as a critical factor. This ranged from excellent to fair, and was reflected in the level of 'buy in' and commitment achieved. Projects with low stakeholder involvement typically encountered significant problems which resulted in seriously delays to their projects.

In the national context, it was suggested that there has been no effective business sponsorship of health messaging, and this is highly significant. Proposals for new messaging projects are currently authorised by means of a formal and lengthy consultative/approvals process, involving the HSE and other stakeholders:

1. A national PCCC ICT Council, which reports to the HSE Corporate Steering Group, identifies, prioritises and reviews the formal proposals/business cases for relevant ICT programmes/projects in the light of national strategies and objectives.
2. A Corporate ICT Steering Group, comprising a subcommittee of the HSE's senior management team, then approves and oversees each major ICT development.
3. All ICT expenditure must then be approved in advance by the Dept of Finance, Centre for Management and Organisational Development (CMOD).
4. Some projects over €75,000 and all projects over €5 million are then subject to Dept of Finance peer review, before work can commence.

5.7.3 Development approach

Messaging projects were typically prioritised by the business (e.g. GPs, Primary Care Units) and driven by the ICT Directorate. Priority was given to treatment related communications

with a broad application and high volumes, using low-cost technologies. The aim was to gain experience and deliver incremental benefits through a large number of practical projects.

A tried and trusted evolutionary approach was developed over time, based on the development of standards as required, by those involved in their actual implementation, and the piloting of services before more widespread deployment, (see Section 5.3.3). This approach has worked very well.

Projects were typically of 1-2 years duration and funded on an annual basis. They were managed at a regional/service level by a senior ICT or Primary Care project manager, and multi-disciplinary teams were drawn from the clinical departments/services involved. A small number of services entered into formal co-operation agreements with GP practices and their software vendors.

Each GP practice must apply to use particular messaging services, once they have been piloted. In spite of being encouraged to use new services, it is common for extensive rollout to take time.

5.8 Review from a technical perspective

This section focuses on relevant technical topics/issues that have not been adequately addressed in the earlier review of programmes/projects and current messaging services.

5.8.1 IT systems and interfaces

A relatively small number of the total interfaces, required in order for all healthcare IT systems to talk to each other, have been developed. While this includes some regional/hospital IT systems, and the GP Out-of-Hours system used nationally, the majority of interfaces were developed for the 8 GP practice management systems used nationally (see Appendix 3). New releases of these systems must continue to support the agreed standards.

5.8.2 Data transformation and transport

At present, the Adastra GP Out-of-hours system used nationally, is the only system capable of directly producing primary message files that conform to the HeBE messaging standard. As a result, middleware or bespoke software is used by Healthlink and the regional services to transform data from the hospital/regional IT systems to the agreed format. The resulting

HL7XML message files, are then stored awaiting collection. Each GP practice then connects to their service provider on an agreed basis, and uses the provided application/extranet to manually/automatically download all available messages for their practice, (see Appendix 3).

The GP practice then reviews the relevant results/reports, matches them with the correct patient, and integrates them into the patient's electronic record, using facilities provided by their practice management system vendor. In the South East, messages to acknowledge GP Out-of-hours Co-op reports, are automatically returned to the service provider, and on to the Carlow Emergency Doctors on Call (CareDoc) service.

Within the HSE, the existing regional messaging applications, systems and infrastructures continue to be maintained locally by the ICT directorate and 'super users' from the clinical departments/services involved, in spite of the ongoing health reforms and national ICT reporting relationships introduced in April 2008.

At present, only HL7XML messages are sent to Healthlink, and these are validated and returned if they are invalid. It is likely that local middleware will still be needed and used to produce valid messages for the foreseeable future. It was suggested that additional messaging services will migrate to web services within the next 3 years, offering automated 2-way system-to-system communication, and reducing the importance of front-end applications.

5.8.3 Testing and audit

As no automated testing facilities have been developed to date, each software vendor conducts their own software testing. Overall systems testing, quality assurance and auditing is then completed by the relevant messaging project team(s).

5.8.4 Connectivity and networking

GP practices currently access messaging services using a variety of means, depending on their service provider. Healthlink and the former SHB supports secure access via broadband over the internet, whereas the other services support PSTN/ISDN dial-up access via local Radial Access Servers, (see Appendix 3). While separate security infrastructures work well for individual services, a national service would require a single infrastructure.

The regional HSE IT networks, developed by the former Health Boards, currently connect the majority of publicly funded healthcare providers, including the DATHs. These regional

networks are currently being linked together using the National Health Network (NHN) and Government Virtual Private Network (gVPN). Once that is completed, the main task will be to interconnect the private healthcare providers (e.g. GPs, pharmacies) to create a secure national data network for health messaging and other services.

5.9 Future priorities and plans

This section of the report objectively reflects the combined and summarised personal views and opinions expressed by the interviewees, during the semi-structured interview process. It should be noted that these views do not necessarily correspond with the formal positions of the HSE, Healthlink, PCRS, HPSC or any other healthcare provider(s) mentioned, or with the views of the author.

5.9.1 Overview of key priorities

Amongst the interviewees, there was considerable consensus about the objectives/initiatives with the highest priority (see Table 24). Where objectives were identified as a high priority by less than 30% of the interviewees, this has been included as a medium priority in order to make that distinction. Considering the semi-structured nature of the interviews, this does not mean that such objectives are not important. All other objectives were identified as having a low priority.

Table 24: Key Priorities for the Future in Ireland (not in order of priority)

No.	Description	Priority
1)	Address HSE organisational and political issues (e.g. business ownership, leadership, strategic planning, resourcing)	High
2)	Maintain existing services and local involvement of staff	High
3)	Develop a coherent development roadmap	High
4)	Establish a single national messaging service	High
5)	Roll-out high priority messaging services nationally (i.e. laboratory, radiology and GP out-of-hours Co-op)	High
6)	Converge existing regional services into the proposed single national messaging service	High
7)	Develop electronic laboratory test ordering and tracking facilities	Medium
8)	Set up independent standards development, monitoring and compliance body	Medium

No.	Description	Priority
9)	Expand the range of messaging services available (e.g. referrals, discharge summaries, waiting lists)	Medium
10)	Bring GP practices and messaging services onto a secure national network	Medium
11)	Achieve the cessation of printing	Medium
12)	Co-ordinate with other national ICT projects and procurements	Medium
13)	Bring the PCRS into the proposed single national messaging service	Medium
14)	Develop national GP portal to facilitate the communication of electronic messages	Medium
15)	Bring the HPSC into the proposed single national messaging service	Low
16)	Bring the Chronic Disease Registers (e.g. Cancer, Diabetes) into the proposed single national messaging service	Low
17)	Develop national health portal	Low

5.9.2 High priority objectives/initiatives

1) Address HSE organisational and political issues

The majority of interviewees suggested that there must be effective business/IT leadership, strong business ownership, and a focus on patient care in order to progress the further development of messaging services. A sound business case, should be developed and communicated to all stakeholders, to get buy-in from public/private healthcare providers, and expectations should be carefully managed.

It was suggested by most interviewees that the current main priorities are to stabilise the existing organisational structures, and to establish a single national messaging service, as it is difficult to plan otherwise. It is considered necessary to bring additional direction to the current impasse if the messaging programme is to be successful, and the current project/capital approvals process needs to be streamlined and stabilised. The national debate on the future organisation and development of services is likely to influence the decision making process. It was suggested that the ongoing health reforms have added to an environment in which it has been very difficult to conduct ICT projects effectively, impacting on delivery, morale and staff skill levels.

There was consensus that the messaging programme must be adequately resourced, or only small incremental changes will be possible. Messaging is a core activity for the safe delivery of healthcare in Ireland, and not an activity that should be outsourced to external service providers or consultants. Existing/new internal staff must be identified and developed, assisted by contractors with specialist messaging skills where necessary, to ensure that important needs continue to be met.

It was suggested that the re-structuring of the ICT Directorate is an added complication, but the movement towards a unified ICT infrastructure was generally seen as a positive development. The future appointment of a new HSE National ICT Director may impact on the current ICT strategy and level of engagement. There are also concerns that the ICT Strategy document currently being approved, may focus on high level principles rather than on specific objectives that can be implemented, and that health messaging may not be given the prominence that it deserves.

Some interviewees suggested that the protracted contract negotiations and ongoing disputes with GPs and pharmacies should be addressed, to provide an appropriate environment in which to foster increased co-operation between all parties. Electronic communications should be included in the current GP contract negotiations, and a new funding mechanism for GP computerisation is required, to replace the now discontinued Indicative Drug Target Scheme (IDTS) scheme.

2) Maintain existing services and local involvement of staff

The majority of interviewees commented that the existing services work well, and must continue to operate and be adequately supported by local messaging teams and clinical staff while working out the bigger picture, to safeguard service levels and patient care. The continued involvement of regional/local messaging staff is essential to maintain strong links with local hospitals, GPs and other stakeholders, and this has significant implications for existing/new services and issue resolution. The provision of advice/guidance to local stakeholders is critical to their engagement, and this cannot be obtained by mandate.

Some interviewees suggested that consideration should be given to establishing a representative national messaging group in the short/medium term, to co-ordinate and progress the messaging agenda.

3) Develop a coherent development roadmap

A number of interviewees suggested that a coherent development roadmap is required in the short term, to facilitate the assessment of local plans/proposals and to avoid being driven continually by small scale developments. Priorities will need to be agreed on an area by area basis, involving local decision makers, to take account of both national and local factors. For example, it would not make sense to initiate a Radiology messaging project in an area where the existing RIS system is ageing and due to be replaced as part of the NIMIS project.

It is clear from this research that the short/medium term messaging activities/plans need to be clarified, and that further co-ordination between the ICT Directorate, Healthlink and the PCRS is necessary to achieve this. It was suggested that the development of messaging services nationally requires a more strategic approach, where the ultimate vision and medium/long term goals are clearly set out, rather than the current tactical approach where services just evolve and are resourced based on short term needs. The latter approach is unsustainable for any prolonged period of time and is likely to accentuate existing issues, particularly where this impacts on staffing resources.

4) Establish a single national messaging service

As it was agreed in 2007, that Healthlink would be developed as the new national messaging system/service, subject to appropriate governance arrangements being put in place, most interviewees suggested that the implications of this decision need to be worked through as a matter of priority (see Table 25).

Table 25: Examples of Healthlink issues that need to be clarified

<u>Ref</u>	<u>Issues Description</u>
a)	Governance structures and funding arrangements
b)	Healthlink's legal status, and patenting/safeguarding of Healthlink brand
c)	The current status of existing applications, systems and infrastructures, and their scalability for national use
d)	Information security and contingencies
e)	Scope of messaging services to be provided (e.g. PCTs, message types) and resource/staffing implications
f)	The relationship/interaction between Healthlink and the other regional messaging services
g)	How the regional balance will be maintained (e.g. new developments, service levels)

It was considered important by most interviewees that 'terms of reference' should be agreed for addressing these issues, and that the relevant senior managers need to meet in the near future to formally agree the way forward. The HSE has already allocated funds to Healthlink for 2008, creating space for this engagement, so that more effective governance arrangements can be in place by January 2009. The outcome of these discussions will set the agenda for everything else. It is considered necessary to see this process through to completion if serious problems are to be avoided, and there are huge benefits for both parties in doing so. While it may be possible to proceed with small initiatives while this engagement is on-going, the foundations must be sound before moving on with further developments.

It was the view of most interviewees that there is a mutual dependence between the HSE and Healthlink, and that this is likely to increase in the future with the development and deployment of additional messaging services. It was suggested that the provision of messaging services is so critically important to the HSE, that they must have appropriate oversight/control over the proposed national service provider, infrastructure and future development strategies/plans. Appropriate and effective governance structures need to be put in place, to ensure that the HSE and Healthlink can work together to develop the messaging services most needed.

It is envisaged by most interviewees that Healthlink should have a formal Steering Group representing all key stakeholders (e.g. PCCC, NHO, GPs, laboratories, ICT, other services/users). This needs to be established during 2008, with the aim of reviewing the current issues/concerns, defining the vision, goals and priorities for messaging, and considering the work plans and service level agreements for 2009 and beyond. These plans then need to be incorporated into 2009 national service/resource plans. A number of sub-groups are likely to be spawned where specific expertise or deliverables are required. As the original Healthlink project to establish messaging services has now been completed, it would be appropriate to get CMOD approval for a new 3 year project, which includes the future-proofing of services (e.g. people, hardware).

Most interviewees that expressed a preference, suggested that Healthlink should be brought into the HSE, as a shared service. However, as it was recognised that this may give rise to industrial relations difficulties and may not be absolutely necessary at this stage, it was suggested that Healthlink staff should continue working for the Mater Hospital while an

agreed process facilitates an orderly transition to the HSE over a reasonable period of time (e.g. 3 years). However, there was consensus that the HSE and Healthlink need to work together in a joint initiative, and that this is the key message that needs to be communicated. It was acknowledged that Healthlink has done lots of productive work and yielded good results, considering their available resources.

It was suggested that Healthlink can provide messaging services where there is a need and a will for it to do so, in accordance with the HSE's wishes and schedule. As an existing service provider, there is nothing they would have to do to take on message delivery nationally. Healthlink has already spoken to the HSE about resources required to implement messaging in all areas, including regions with their own services, and to expand the service to its full potential. It was suggested that their preference would be to adopt the model used in regions where they are the current messaging service provider, where requests for new services are co-ordinated and prioritised locally. At present, a local/regional Project Manager with responsibility for messaging, liaises with different departments/services to clarify what they want to implement next, and sends the request(s) to Healthlink. This individual establishes the necessary local multi-disciplinary project team, and Healthlink feeds into this as the service provider. This model works well and would be suitable for more widespread use.

5) Roll-out high priority messaging services nationally

Most interviewees saw this as a key priority, to complete a national roll-out of electronic laboratory results, radiology reports and GP Co-op reports, before other messaging developments are considered. This would improve patient care the most and deliver the greatest benefits, without the distraction of trying to develop other services at the same time.

6) Converge existing regional services into the proposed single national messaging service

The majority of interviewees considered that the convergence and consolidation of existing regional services into a single national messaging service is essential, but needs to be handled with sensitivity for the personnel and technical issues involved (see Table 26).

Table 26: Examples of personnel and technical issues relating to convergence

<u>Ref</u>	<u>Issue Description</u>
a)	Many individuals in the regions have put considerable work and effort into developing the existing messaging services, often with little or no credit.

<u>Ref</u>	<u>Issue Description</u>
b)	The change should be an expansive process, with the emphasis on giving staff additional roles and responsibilities at a national level, rather than taking them away.
c)	There is plenty of work to be done and limited resources available, so people should be given opportunities to up-skill and to assume important roles in the process (e.g. coding standards, QA). It should not be seen as a Healthlink takeover.
d)	The key to how convergence works is dependent on how the people are managed.
e)	It is proposed to migrate services from the North Eastern region to Healthlink this year, as they have encountered some difficulties with their messaging infrastructure, and many GPs already have access to Healthlink for patients referred to the Beaumont and Connolly Hospitals.
f)	However, there are no plans as yet for the bigger implementations (e.g. Southern, South Eastern regions). These migrations need to be handled carefully, and Healthlink's available capacity needs to be assessed.
g)	Coding is going to assume greater significance in a national context (e.g. provider codes, recipient codes).

However, a minority of the interviewees suggested that the development of a national message broker and convergence of existing services is important, but not the “be all and end all” as it just facilitates message delivery. Most of the work will remain to be done in the regions. While this convergence will probably lead to efficiencies, it should not be seen to replace/supersede all other developments, and this may not be the right time to proceed. There was concern that the scope of the proposed convergence programme is as yet unclear (e.g. whether it includes message delivery only, standards development and/or implementation of a single interface). As only a small percentage of messages cross regional boundaries (approx. 5% in most regions), it was suggested that the business case for this development needs to be defined and communicated. The best ideas from all areas should be incorporated into the new service.

It was recommended by a number of interviewees that a review of the current position/status should be conducted to inform future plans. It is hoped that this research dissertation goes some way towards meeting this need.

5.9.3 Medium Priority objectives/initiatives

7) Develop electronic laboratory test ordering and tracking facilities

Some interviewees suggested that laboratory messaging services generate the highest volumes/benefits. While current services work well, there is a need to copper-fasten some aspects (e.g. laboratory accreditation, presentation of results) before developing laboratory ordering and acknowledgement messages to facilitate end-to-end tracking. While it would be ideal to provide GPs with facilities to order diagnostic tests/services electronically from within their practice systems, this may not be feasible. Providing such facilities from a GP Extranet, building on work already completed by Healthlink, or from within hospital/laboratory order communications systems, should also be considered. Decision support functionality could help clinicians to comply with agreed ordering policies/protocols.

8) Set up independent standards development, monitoring and compliance body

Some interviewees suggested that an independent body is needed to develop/refine messaging standards, monitor compliance and develop automated message testing and reporting facilities. The HSE needs to put policies in place to ensure that all exchanges of health information must use the available HeBE messaging standards, to facilitate interoperability between all public/private healthcare systems.

It was noted that the display of microbiology laboratory results within the CIDR system is currently a de-facto national standard, which could possibly be adopted by the GP Practice Management systems.

It was suggested that it may be worth considering migrating from the HL7 v2.4 messaging standard to a higher level (e.g. v2.7) if necessary to handle increased levels of complexity. In general, it would not make sense to migrate to HL7 v3, as this would be a huge change and there are few people with this expertise in Ireland. However, the adoption of the specific HL7 v3 CDA standard for exchange of clinical documents (e.g. discharge summaries) would facilitate more structured data (i.e. human readable and machine interpretable), leading to improved audit, tracking and reporting.

The communication of electronic results to/from the ECDC is at a very early stage, using XML and web services, and their own message formats/schemas. They may consider using the HL7 v2.5 standard adopted by the US Centre for Disease Control.

9) Expand the range of messaging services available

A number of interviewees suggested that the list of additional message types (e.g. referrals, discharge summaries, waiting lists) needs to be validated and prioritised by a GP forum, and to include the needs of PCTs. The PCRS are considering the communication of prescriptions using HL7 and web services in the near future, and it is likely that any proposed national client index system/service will also use messaging.

The “Neurolink” service developed by Healthlink has been successful in St. Vincent’s hospital, where the commitment of the local neurologist(s) has been excellent. However, concerns were expressed by a number of interviewees that this service may not be scalable nationally due to this dependence on neurologists that are already overburdened and in short supply. While this service is seen as a very positive development and a good step forward, it may not be the ultimate solution. The proposed expansion of this model for cancer, asthma and diabetes referrals was also questioned, due to its dependence on individual clinicians.

It was suggested that some additional message types (e.g. immunisation returns) could deliver significant benefits for the HSE by eliminating data entry, and savings could potentially be used to provide GP computerisation incentives, linked to appropriate targets (e.g. chronic disease & preventative care).

In the United Kingdom, an extract of the GP’s patient record can be stored on a central database as an ‘Electronic Care Record (ECR)’, and accessed with the patient’s consent from emergency care settings, as required. This is based on the ‘Scottish Emergency Care Summary’ and information is exchanged as a single HL7 v3 CDA document/message which includes the patient’s demographics, medication and allergies. It was suggested that an ECR could potentially be established in Ireland, and form the basis of an EHR if expanded to include a patient problem list, surgical history, medical history and social history.

It was also suggested that the provision of “vendor heavy” messaging services is more costly and less efficient than providing healthcare providers with tools on their desktop (e.g. web

services/browser) to facilitate “vendor light” access to services/information as needed. Ideally, the most appropriate solution should be adopted to meet the specific business need.

10) Bring GP practices and messaging services onto a secure national network

It was suggested by a number of interviewees that GP practices and messaging services should be brought on to a national network with a single security infrastructure. This could be achieved by connecting all parties over the National Health Network (NHN), the Government Virtual Private Network (gVPN), and/or via a secure VPN connection over the internet, using available broadband.

11) Achieve the cessation of printing

It is recognised by many interviewees that the cessation of printing has the potential to generate significant benefits for all stakeholders, particularly the hospitals, but that it is difficult to achieve. To date, this has only been accomplished in the South Eastern region for one service area, where GP Out-of-hours Co-op reports and acknowledgement messages are exchanged between CareDoc and GPs using automated web services, (O'Mahony, 2006). It is also being piloted on a small scale in the Western region for their laboratory messaging service.

All other interviewees that referred to this topic suggested that this step should not be considered without having implemented acknowledgement messages, appropriate tracking mechanisms and ideally electronic ordering (to close the loop), in the light of the potential clinical risks involved. It was acknowledged that many GP practices using messaging services, shred the printed laboratory reports upon receipt.

An evaluation report completed in the Southern region (O'Mahony, 2004a) identifies the key issues/tasks to be considered before switching off the paper, and it was suggested by a number of interviewees that this should inform the process. The printing and posting of laboratory reports is expensive, slow and wasteful, and the significant on-going requirement to print copy reports raises questions as to where the original went (e.g. data protection, inappropriate disclosure).

12) Co-ordinate with other national ICT projects and procurements

It was suggested by a number of interviewees that the national messaging service will need to co-ordinate with existing/proposed IT projects (e.g. IPIMS, NIMIS, LIMS) responsible for the procurement/implementation of systems that will need to provide/receive message content. Ideally, the cost of implementing necessary HL7XML interfaces should be included in the original contract(s) for new systems procured from now onwards. This important opportunity for introducing international coding, classification and terminology standards (e.g. LOINC, SNOMED) should also be availed of.

13) Bring PCRS into the proposed single national messaging service

It is unclear if/how the PCRS would be brought under the umbrella of the proposed national messaging service/system, and whether financial and clinical messages should both be communicated by a single service. The HeBE Messaging Group identified that this may introduce the need for encryption, digital signatures and other functionality which have not to date proved necessary for clinical messages. Such functionality is likely to be difficult and expensive to implement, and may constrain the current clinical messaging services, (Peyton, 2005a).

It was suggested by some interviewees that the PCRS may propose that Healthlink should be subsumed into their organisation, as they have invested significant resources to develop their infrastructures and capacity. However, it was suggested that service providers/users may not have full confidence in the PCRS, and would be very wary of such a move, and that the PCRS may have their own priority issues to deal with (e.g. possible changes to systems/processes for major schemes, staffing constraints).

It was suggested that the PCRS is primarily focussed on their own reimbursement business, and the next evolution of their systems/services to improve transparency, speed, efficiency and reduce paper. They do not consider messaging to be a heading in its own right, just a mechanism for interacting electronically, and a potential solution. As Healthlink and the PCRS operate messaging services independently of each other, it was suggested by some interviewees that they could continue to do until deemed appropriate for them to combine services.

14) Develop national GP portal

It was suggested that the development of a GP portal is likely to be the only portal project to proceed in the near future. A pressing requirement is the establishment of a national messaging portal (e.g. Healthlink) to facilitate exchange of messages. Communications between healthcare professionals could also be improved by providing additional facilities (e.g. secure e-mail, discussion/notice board) and establishing liaison groups.

5.9.4 Low Priority objectives/initiatives

15) Bring HPSC into the proposed single national messaging service

It is perceived that the proposed national message service will have little or no impact on the HPSC in the short term, but may provide opportunities in the longer term (e.g. national standards/coding, communications between primary care to public health depts). If all hospital and laboratory systems could communicate anonymised messages to the HPSC, these could be collated/mapped nationally in real time to alert of disease outbreaks/clusters, thus adding value.

16) Bring Chronic Disease Registers into the proposed single national messaging service

The national chronic disease registers need access to electronic laboratory results, and have other messaging needs. Taking a strategic view, they should be involved now in the national programme, so that they conform to national standards and do not proceed/operate independently.

17) Develop national health portal

It was suggested by some interviewees that the scope and requirements of such a project would need to be tightly specified, justified in terms of cost/benefit, and subject to rigorous project management including business sponsorship, to avoid following in the path of certain other health IT projects which failed. It was suggested that the original Health Portal project was terminated, as the complexity of what was proposed was seriously underestimated, and that this became increasingly evident as the project progressed. It is considered likely that an evolutionary approach will now be adopted, and that future portal projects will have a very defined and limited in scope, aiming to build one piece of the puzzle at a time.

5.10 Lessons learned and detailed conclusions

This section of the report identifies the main lessons identified and detailed conclusions, arising from the semi-structured interviews and high level literature review conducted:

5.10.1 Business case for health messaging

1. Health messaging currently has a central role in improving communications between healthcare providers in primary and secondary care, and significant qualitative benefits have been achieved and formally documented.
2. The strong business case for developing additional services in Ireland should be formally documented and communicated to all stakeholders, to improve programme sponsorship.
3. The development of additional messaging services requires an on-going investment of resources, which can deliver benefits in the short/medium term.
4. The cessation of printing has the potential to provide significant benefits to all stakeholders, but this is difficult to achieve on a widespread basis.
5. The future measurement and recording of quantifiable benefits should be considered.

5.10.2 National strategy

6. Good leadership and timely decision making are critical, and this could be significantly improved with business sponsorship at HSE Management Team level.
7. Effective governance for a national messaging programme is critically needed.
8. Identified organisational and political issues need to be overcome as a matter of priority.
9. The proposed national messaging programme needs to be owned and driven by the business, with a clear focus on the quality of service provided to the patient.
10. A senior level Programme Board representing all stakeholders, should define the vision, goals and priorities for messaging, and include these in national service/resource plans.
11. Buy-in from public and private healthcare providers is essential.
12. There needs to be political will to implement necessary organisational, cultural and business process change, and to enforce standards.
13. The development of health messaging standards, services and supporting infrastructures needs to be specifically prioritised within national Health IT strategies.
14. The national implementation of high volume, high value, treatment related communications should be prioritised, to yield the most significant benefits first (i.e. laboratory results, radiology reports and GP out-of-hours Co-op reports).
15. A review of the current position/status of existing messaging services/projects should be conducted to inform future plans.

16. The Health Reform process is likely to continue for at least a further 18 months, giving rise to further organisational change and uncertainty.
17. When the communication of health messages across Europe starts to become a reality, the transformation of messages from one standard format to another (e.g. HL7 to CEN) when entering/leaving Ireland is unlikely to be one of the most significant issues.

5.10.3 Programme/project governance

18. Consultation and engagement with stakeholders is a critical factor. Projects with low stakeholder involvement have typically encountered significant problems and delays.
19. Projects have typically been prompted by the business (e.g. GPs, Primary Care Units) and driven by the ICT Directorate.
20. The scope of the proposed national programme needs to be tightly defined.
21. Each project should seek to implement a single message type within a region/service.
22. Projects typically involve a large number of different organisations, individuals (100+) and disciplines, and can be difficult and time-consuming to co-ordinate.
23. Effective and consistent programme/project management is essential.
24. Projects should be co-ordinated nationally, but conducted locally.
25. Projects and services must be resourced appropriately (e.g. additional revenue funding for Healthlink, once appropriate governance structures in place).
26. Projects should be managed at a regional/service level by a senior ICT or Primary Care project manager.
27. Multi-disciplinary project teams should include competent, knowledgeable and experienced personnel, with the necessary mix of management, clinical, technical, health messaging and IT skill sets.
28. The regions/services will need to continue investing resources to develop and support services, even if messages are subsequently transported nationally without additional cost.
29. The availability of in-house HSE resources with suitable expertise is critical.
30. The dependency on external software vendors (e.g. PAS, Laboratory, GP), some of which do not have formal contractual relationships with the HSE, often delays projects.
31. The support pathway for GPs is complex, so roles and responsibilities must be clearly documented, communicated and adhered to.
32. It has been very difficult to conduct IT projects successfully during the Health Reform process, and this has impacted significantly on delivery, staff skill levels and morale.

5.10.4 Strategic development approach

33. A proven and cost effective approach was developed during the initial pilot projects, and this can be leveraged for future projects.
34. This proven approach is firmly based on the principles of informal but effective collaboration, co-operation and teamwork with all stakeholders. It is practical, evolutionary, and builds on success.
35. A national messaging group should be set up in the short term to address specific activities/issues, and include specialists and stakeholder representatives.
36. The HSE should consider how best to organise its existing messaging team(s), while governance for the national service/system is being addressed.
37. In many areas of the health services, integrated EPR systems do not exist or are outdated. This can be a barrier for the deployment of messaging services.
38. All GP software vendors must be seen to be treated equally so that the HSE is not seen to interfere in the competitive market that exists.
39. In principle, no HSE related software should be installed on the GP's desktop, as this greatly complicates on-going maintenance and support.
40. It is appropriate and necessary for healthcare IT suppliers to enhance their own systems to ensure compliance with national standards.
41. There should be incentives for using certified software (e.g. grants, fast-tracking of responses).
42. The combined use of incentives, contracts/agreements, marketing and penalties (to a lesser extent) to promote the widespread use of messaging services can be very effective.
43. It was suggested that from a GP's perspective, that the ultimate aim should be to converge existing Healthlink, PCRS and HSE regional services into a single national messaging service, accessed via one icon on the GP's desktop.

5.10.5 Conducting projects

44. Necessary organisational and business process change requires a will to change, and agreement to co-operate, and can take time.
45. The development and deployment of messaging services also takes time.
46. Laboratory, radiology and other staff have many priorities/commitments, and often cannot prioritise operational/project messaging activities, resulting in delays.
47. It is often difficult to get hospital consultants actively involved in projects, although this is helped by communication and engagement.

48. The installation of software upgrades/enhancements in pharmacies and GP practices has sometimes led to unforeseen failures, due to customised software being installed without appropriate systems/user testing.
49. Some GPs did not have a good experience of messaging, but they were the exception.
50. The routine reporting of relevant statistics by the PCRS to pharmacies and their software vendors has highlighted local software quality issues and promoted useful dialogue.

5.10.6 Standards

51. Adoption of standards is a pre-condition for health messaging.
52. The part-time HeBE Messaging Group and related Sub-Groups were well managed, productive and provided excellent value for money.
53. The pragmatic approach to developing messaging standards, which included the piloting of new standards/services to prove the concept, became 'tried and trusted' and resulted in practical standards that could be implemented effectively (see Section 5.3.3).
54. Health messaging services have a high degree of clinical acceptance and support, where high quality standards are adopted and maintained.
55. The national GPIT Group is currently certifying GP practice management systems to ensure that they provide appropriate messaging functionality and conform to agreed standards.
56. The availability and use of unique patient identifiers would help to reduce errors and clinical risk.
57. The duplication of patient records and requesting of tests for anonymised patients are on-going issues.
58. It has proved difficult to extract data files from laboratory systems, and identifying rules/mechanisms for populating such files was a greater challenge than their format.
59. Additional national coding standards/values are required (e.g. GP practice & patient identifiers).
60. Individual regional/hospital systems often use different codes for the same GP or practice, making it difficult to exchange messages and/or converge services.
61. The implementation of end-to-end 'request to report' communication processes would be of significant benefit to all stakeholders (e.g. laboratory tests).
62. HIQA and the NSAI should be requested to approve the HeBE messaging standards as immediately available national standards, without prejudice to further developments (e.g. EHR, EPR standards).

5.10.7 Technical approach

63. It is important to adopt practical but effective measures to maintain information security, as an appropriate balance must be struck between security and usability.
64. Most of the existing services are provided over ISDN/PSTN dial-up, and not broadband. GPs are becoming increasingly dissatisfied with this, and it is also a support overhead for those services.
65. It has been recognised that automated system-to-system communication using web services is the way forward.
66. Healthlink and the other regional messaging services communicate clinical messages, whereas the PCRS service communicates financial messages between parties. Currently, there is no overlap and it is not clear if there should be.
67. To date, there has been no direct encryption of health message files, or use of digital signatures.
68. In Ireland, electronic messages containing sensitive personal information should not be stored/retained by the national messaging service, providing a target for hackers/malware, (O'Mahony et al., 2005).
69. In principle, the transformation or re-mapping of extracted data should only change the structure and not the content of the relevant messages.

5.11 Overall conclusions

When judged on its own merits, without making comparisons with Denmark and other international centres of excellence, the development of health messaging services in Ireland to date has been very successful. Messaging projects have consistently delivered efficient, reliable, high quality and standards-based solutions within reasonable timescales and budgets. They have also continued to meet the defined business needs, led to improved patient care and safety, and provided excellent value for money.

There is little doubt that the availability and maturity of health messaging standards, services and supporting infrastructures will facilitate the development of additional health messaging services and other forms of electronic communication, well into the future.

Further high level observations and conclusions about Ireland, and key recommendations for the way forward, have been included in Chapters 6 and 7.

Chapter 6: Comparisons and Implications for the Irish Health Service

This chapter compares and contrasts healthcare and health messaging services in Denmark and Ireland, identifying important issues and focussing on lessons that could productively be applied to Ireland.

6.1 Basis for comparison – similarities

Denmark and Ireland have a considerable amount in common, enough to ensure that appropriate and valid comparisons can be made between them. They are both small, prosperous and mainly rural European countries, with educated and computer literate populations. The health services in both countries provide a similar range of services to citizens/patients, by means of public/private healthcare providers, and are in the midst of significant health reforms.

6.2.1 Proven track record

Both countries have a proven track record of successfully deploying health messaging services to meet identified needs, albeit on a different scale. Many of the lessons learned in Ireland, mirror those found in Denmark, confirming that Irish participants have developed the necessary messaging expertise and understanding of the critical success factors. This is significant, as it could be argued that there is a tendency to underestimate competence and expertise levels in the HSE. It is important to maintain and add to this core group of messaging experts, particularly in the regions, and to actively involve them in the proposed national programme.

6.2.2 “Tried and trusted” approach

The pragmatic approach adopted in both countries has been almost identical, and very effective. National messaging standards were developed as necessary, and focussed regional/local pilot projects were conducted to prove the concept and develop the necessary services/infrastructures. Each project implemented a single message type within an area/region, resulting in many small projects instead of a very large/complex project. This facilitated effective project/risk management. High-volume clinical communications were

prioritised to yield the most significant benefits first. This proven incremental approach, which builds on success, can be adopted by future programmes/projects.

6.2.3 Developed messaging standards

The standards development process in Denmark has been on-going since 1995, and 36+ EDIFACT standards (and related XML standards) have been developed. In Ireland, the HeBE Messaging Group was active between 2002 and 2005, and developed seven HL7XML standards. In spite of this difference in scope/scale, both countries have developed all of the messaging standards necessary to support their programmes. The existing standards in Ireland will facilitate a huge range of additional services, with some enhancement/refinement.

6.2.4 Established messaging services and infrastructure

Denmark has developed extensive health messaging services/infrastructures, used by 4,000+ healthcare organisations, and almost 44 million messages were exchanged in 2007. A more modest range of messaging services have been implemented in Ireland, used by approx. 1,466 healthcare organisations, and more than 4.9 million messages were exchanged in 2007. Despite this scale difference, Ireland's messaging services/infrastructures work very effectively, are suitable for future use, and can provide a strong foundation for future developments.

6.2 Gap analysis

There are also considerable gaps between Denmark and Ireland, which provide valuable lessons.

6.2.1 Business sponsorship

This research has confirmed that one of the most significant differences between Denmark and Ireland is the level of national business sponsorship for health messaging.

The MedCom programmes in Denmark have always had a high level of business sponsorship from senior Government/Health Ministers and managers nationally. The fundamental importance of electronic messaging services as a means of integrating health (and public/state) services was recognised at an early stage. Health IT strategies/plans and senior health service managers then prioritised and promoted the development of health messaging services/infrastructures.

In Ireland, business sponsorship of the local messaging initiatives and large regional projects/services has typically been good. The establishment of the HeBE Messaging Group in 2002, provided a national framework for the development of messaging standards, co-ordination of pilot projects to establish the existing services/infrastructures, and the development of proposals for a national approach and convergence of services. However, effective national business sponsorship was needed from 2004/2005 onwards, with the introduction of a new DoHC policy that all new ICT projects must be national, the establishment of the interim HSE, and uncertainty arising from the health reforms. This research has shown that, unfortunately, this national sponsorship did not materialise. As a result, the proposed national approach/convergence was not actioned, and the development of new messaging services ceased in some regions and lost momentum in others. The recent economic downturn has led to significant HSE staffing and financial constraints, exacerbating an already difficult business environment.

The identification of a senior business sponsor is critical to the continued successful development of health messaging services in Ireland, and needs to be urgently addressed.

6.2.2 Governance

In Denmark, an effective national Steering Group involving all public/private stakeholders was established in 1994, prior to the initiation of the MedCom I programme. This Steering Group sponsored sequential national programmes of 2-3 years duration, comprising large numbers of individual regional/local projects, and resourced them appropriately on a multi-annual basis. Formal co-operation agreements with all partners/projects, and widespread publication of usage/project statistics were critical to effective programme/risk management. Individual working groups addressed specific activities/issues, while co-ordination groups improved communications. Honest and non-judgemental evaluations ensured that lessons learned could be applied to future endeavours.

In Ireland, most regional messaging projects/services were sponsored by a senior manager from the business/ICT, and formal/semi-formal Steering Groups representing key stakeholders provided the necessary governance. These structures typically worked well, creating high levels of local ownership/trust and bringing about a track record of successful delivery. However, this research has confirmed that no comparable governance structures were introduced at a national level.

A national messaging Programme Board representing key public/private stakeholders, should be established as a matter of priority, to provide governance for a proposed national messaging programme and existing messaging services (e.g. Healthlink).

6.2.3 MedCom organisation

In Denmark, MedCom was set up as an impartial prime-mover, negotiator and co-ordinator for their national messaging programmes. As they were not a messaging service/product provider, they were considered to be an ‘honest broker’ in resolving any difficulties that arose. They had a pivotal role, and their very significant contribution to health messaging/communications has been recognised internationally.

In Ireland, a similar project organisation based on MedCom should be established, to drive and co-ordinate a proposed national messaging programme. This ‘lead’ organisation should comprise senior specialists with practical messaging and programme/project management skills.

6.2.4 Ambitious approach

Denmark’s approach to the development of messaging services has been far more ambitious, than Ireland’s. For example they involved the majority of healthcare IT vendors as development partners from the outset, conducted 175 dissemination projects during MedCom II, and set out to deploy messaging services to all clinical services/departments within all hospitals nationally within a 3 year period. This partly explains why their current services are so extensive, when compared to Ireland’s.

6.2.5 Scope of development programmes/projects

The early development initiatives in both countries commenced in the late 80’s. However, Denmark was quicker to recognise the benefits of health messaging services, and initiated large regional projects and national programmes in 1992 and 1995 respectively. By contrast, the large regional projects in Ireland commenced in 2003, some 11 years later.

While the individual regional/local messaging projects conducted in both countries were comparable, the key difference was that significantly more such projects were conducted in Denmark, as part of their 2-3 year national programmes.

While Ireland communicated a greater number of electronic messages than Denmark in the first 5 years of development (see Figure 27), the scope and ambition of the Danish programme was much greater, bearing fruit in later years.

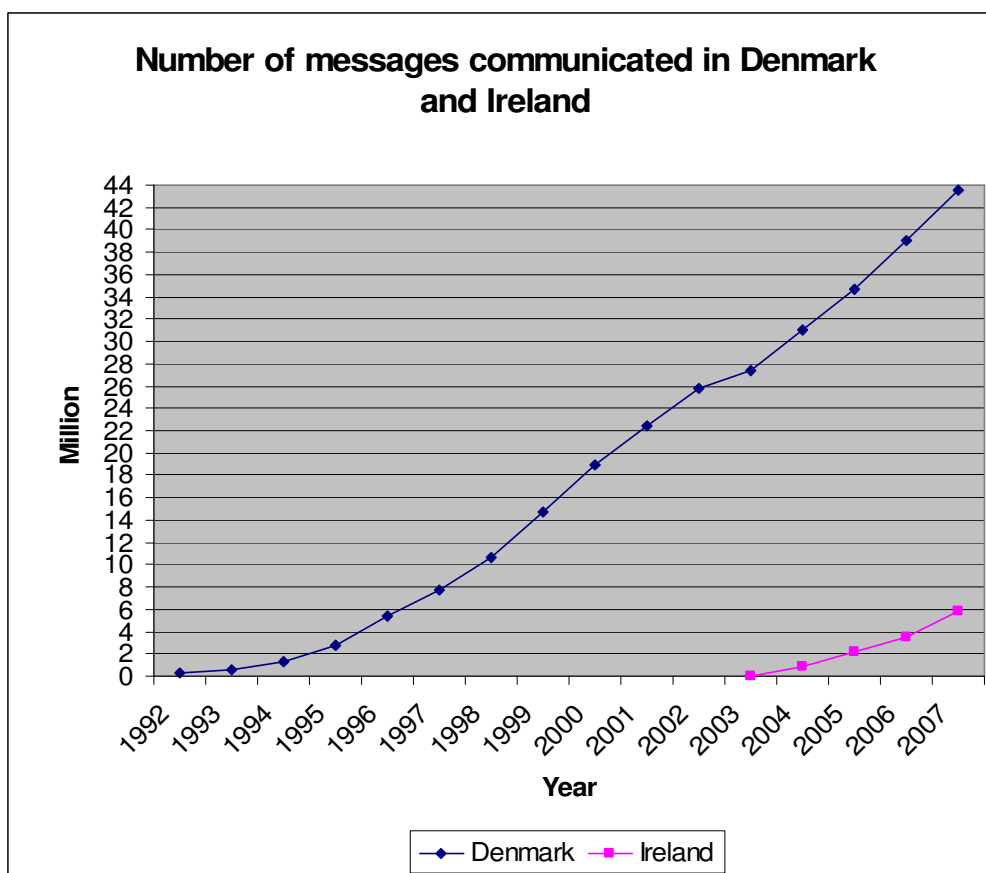


Figure 27: Number of messages communicated in Denmark and Ireland

6.2.6 Automated system-to-system communication

In Denmark, the automated system-to-system 2-way exchange of EDIFACT messages via e-mail on a separate VANS network, has been on-going since the early 1990s. Comparable services were developed in 2005, to exchange XML messages using web services on a separate and competing network.

In Ireland, the vast majority of HL7XML messages are downloaded from the service provider's application/extranet, via secure internet or dial-up connection. In 2005, a 2-way messaging solution using web services was developed and deployed, for a single message type in one region, and it is only more recently that additional web services solutions/services have been developed.

There is increasing recognition in Ireland, that it would be desirable to achieve the widespread 2-way exchange of messages by means of web services, and this objective is being actively progressed. The experiences in Denmark should inform this and related developments.

6.2.7 Level of investment

In the period from 1971 to 2006, Denmark has consistently spent more per capita on healthcare than Ireland, more than double the amount in 9 of those years (see Figure 28), (Gurría, 2008a). This on-going investment has enabled them to adequately resource ambitious programmes to develop modern and efficient healthcare IT systems, health messaging services and supporting infrastructures. In Ireland, there is a clear need for additional investment in healthcare ICT, and health messaging services in particular.

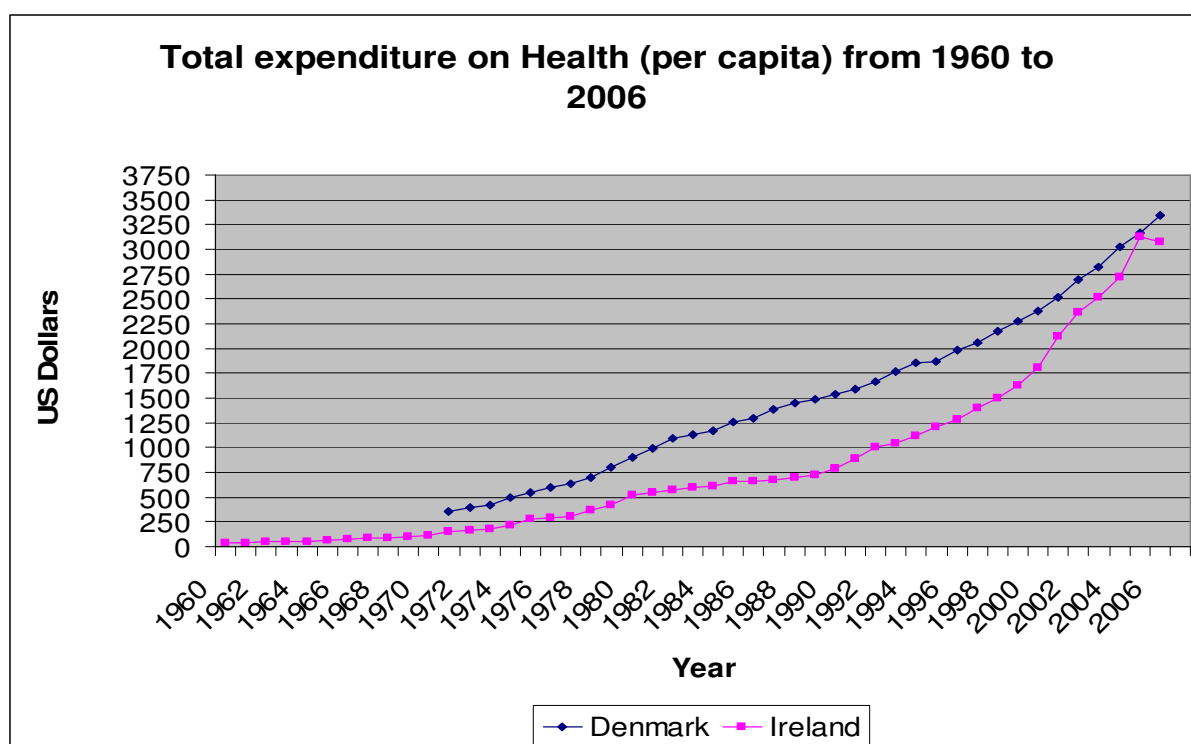


Figure 28: Comparison of total expenditure on health (per capita) from 1960 to 2006

6.2.8 Computerisation in Primary Care

A 2007 study, involving 6,789 GPs across the European Union (EU), illustrates the gaps between Denmark, Ireland and the EU average, in terms of the electronic exchange of patient data and ICT usage (see Tables 27 and 28), (Dobrev et al., 2008). This clearly demonstrates the significant room for improvement in Ireland.

Table 27: Electronic exchange of patient data between GPs and other health actors

	Lab results from laboratories	Admin data to reimburers	Medical data to care providers / professionals	Admin data to other care providers	Prescription to pharmacies	Medical data cross border
Denmark	96.2	47.9	73.6	74.0	97.3	1.9
EU 27	39.8	15.1	10.3	9.7	6.3	0.7
Ireland	40.4	15.1	1.9	4.4	0.5	0.5

Table 28: Benchmarking ICT use among GPs in Europe

	Denmark	EU 27	Ireland
Use of computers	98.9	87.4	73.4
Use of the Internet	98.9	68.8	64.7
Use of broadband	91.0	47.9	44.3
Electronic recording and storage of individual administrative patient data	96.9	79.5	63.7
Use of a computer during consultations	91.6	66.1	55.9

Chapter 7: Conclusions, recommendations and future work

This chapter summarises the conclusions and recommendations of this dissertation, and identifies areas where further research is needed.

This research successfully addresses the primary/secondary research questions and objectives as described in Sections 1.3 and 1.4, and identifies many important and useful lessons.

However, this dissertation report was more extensive than anticipated due to:

- The nature of this research assignment
- The detailed research questions/problem and objectives
- The assignment scope
- The quality of research material provided by the interviewees/literature, and need to do it justice
- The applicability of this research to “real life” developments

As this was the first Irish academic research into this specific area, there were no previous studies to inform this process.

The next challenge is in presenting the findings in a suitable format to the HSE National Director for ICT, other senior managers and colleagues, as an input to the review of messaging strategies/tactics.

7.1 Main Conclusions

Further to the detailed/overall conclusions outlined in Sections 4.10, 4.11, 5.10 and 5.11, the main conclusions of this research are as follows:

1. There is a compelling and undisputed business case for the development of health messaging services, and significant benefits have been achieved in Denmark and Ireland (e.g. improved patient safety/care, timeliness, quality, efficiency, resource utilisation).

2. Health messaging services have a central role in improving communications between public/private healthcare providers, and building/maintaining an integrated and cohesive health service. They also facilitate national/regional specialties, transition to new structures and the development of new efficient forms of electronic communications.
3. Health messaging is of particular importance to improving communications within the hospital sector. Communications within/between hospitals in Denmark were estimated to exceed hospital-to-primary-care communications by up to a factor of 10. The processing of such paper-based communications within hospitals was estimated to consume approx. 10% of available staff resource time. This is highly significant.
4. The Danish health services commenced their large regional messaging projects 11 years before Ireland, and adopted an ambitious but incremental approach. They have developed a very extensive range of health messaging services, now used by the majority of public/private healthcare providers (i.e. 4,000+). The many valuable lessons documented, validate Ireland's approach in many areas, and prompt necessary changes in others.
5. The Irish health service has successfully developed a more modest range of health messaging services, for communications between primary and secondary care, now used by a large number of healthcare providers (i.e. 1,466). When compared with Denmark, this research would suggest that more progress should have been possible in recent years, with appropriate national business sponsorship.
6. It has been established in both Denmark and Ireland, that health messaging projects should continue to be conducted regionally/locally to maximise ownership, but co-ordinated nationally with a view to widespread deployment.
7. The adoption and consistent use of international/national standards (e.g. messaging, classifications, coding, vocabularies) is particularly important, to facilitate the national interoperability of healthcare IT systems/services.
8. In Denmark, the establishment of MedCom as a separate project organisation and impartial prime-mover, negotiator and co-ordinator for their national messaging programmes, was significant and their contribution has been recognised internationally.

7.2 Main Recommendations

When developing this list of recommendations, the author has endeavoured to focus on short/medium term objectives that are considered important, practical and achievable:

1. The identification of a senior national business sponsor is critical to the continued success of the health messaging programme, and needs to be addressed urgently.
2. The business case for electronic health messaging should be formally documented and communicated to senior HSE managers and the Dept of Health and Children, to increase their commitment and ambition in relation to the development of such services in Ireland.
3. Considering the particular importance of health messaging for the hospital sector, and the fact that hospital systems, staff and work practices are most impacted by messaging projects, it may be appropriate to align the proposed national messaging programme with the National Hospital Office in the short/medium term, until the proposed Integrated Service Delivery directorate has been established.
4. A national messaging Programme Board representing the key public/private stakeholders (e.g. NHO, PCCC, DoHC, GPs, IPU, ICT, IT Vendors), should be established as soon as possible, to provide governance for a proposed national messaging programme and existing messaging services (e.g. Healthlink).
5. This national messaging Programme Board, chaired by the senior sponsor, should consider the high priority objectives identified in Section 5.9.2. and relevant lessons learned in both countries, when determining the best way forward.
6. A national health messaging programme should be initiated by the HSE, to provide a framework for co-ordinating multiple regional/local projects that will develop additional services in a controlled and incremental way, leveraging the existing messaging services, infrastructures, standards, development approach and expertise.
7. A new project unit, modelled on MedCom and reporting to the above Programme Board, should be established to lead and co-ordinate the development of messaging services in Ireland. This unit, initially comprising 2 senior messaging specialists (one acting as Programme Manager), should have a separate name/identity and should not be involved in

providing related services/products, so that it can act impartially.

8. In the medium term, the HSE should conduct research into current and proposed eHealth and health messaging developments, particularly in Europe, to identify developments that may have significant implications and/or benefits for Ireland.

7.3 Limitations of work

The literature review was limited to articles/reports published in English, where the full-text was available free of charge, and unpublished reports made available to the author. The absence of internationally recognised search terms for this subject area was a significant constraint, and greatly influenced the work involved in identifying relevant literature.

7.4 Future work

There would be value in conducting detailed research into specific aspects of Denmark's messaging programme, as necessary, to assess how they have approached or addressed specific problems/issues. It is also recommended that further research should be conducted, to assess how the following areas impact on the development of health messaging services/infrastructures in Ireland:

Table 29: Suggested topics for further research

<u>Ref</u>	<u>Topic Name</u>
a)	European strategies/policies (e.g. information society, eHealth, EPR, EHR)
b)	Irish Government ICT strategies/policies (e.g. information society, eHealth)
c)	European and Irish legislation (e.g. eCommerce, data protection, health acts)
d)	European and international standards (e.g. messaging, EPR, EHR, convergence)
e)	European and international messaging programmes/projects (e.g. advanced/innovative developments)

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Appendix 1: Proposed Questions for Interviewees

Status: Confidential briefing paper

Document Name: Proposed questions for interviewees v2.1.doc

Date: 21st April 2008

Author: Fergus Murray

Introduction

As part of an MSc in Health Informatics that I am undertaking at Trinity College Dublin, I am currently researching the approach taken to the development and implementation of health messaging services Denmark, and how the lessons learned can be applied to Ireland (see Briefing on MSc Research Proposal for Interviewees v2.doc). This involves researching the evolution and current status of messaging services in Ireland, so that appropriate comparisons and inferences can be made.

Having defined the research question(s) and proposed scope of this assignment, I then had to consider how best to capture the views and opinions of key individuals like yourself, that have been closely involved in the development of messaging services in Ireland. Following a review of the available options I opted to conduct one-to-one interviews with a representative group, as this would provide the richest source of qualitative data available. It is my intention to conduct these interviews either in-person or over the telephone, as appropriate.

The research materials gathered by this means will be supplemented by fact sheets completed for each existing messaging service, and a comprehensive literature review.

Proposed Interviewees

I am planning to conduct semi-structured interviews with the following key decision makers responsible for the development and provision of health messaging services in Ireland;-

- Mr. Willie Anderson, General Manager, HSE ICT Directorate, Kells, Co. Meath
- Dr. John Brazil, IT Manager, Health Protection Surveillance Centre
- Ms. Gemma Garvan, Acting Project Manager, National Healthlink Project

- Mr. Vincent Jordan, General Manager, HSE ICT Directorate, Galway
- Mr. Tom Laffan, I.T. Project Manager, HSE ICT Directorate, Cork
- Mr. Ivan McConkey, Management Services Officer, Primary Care Reimbursement Service, Dublin
- Mr. Richard McMahon, Director of Information Systems – National Lead – PCCC, HSE ICT Directorate, Limerick
- Mr. Michael Murphy, Systems Analyst / Application Support, HSE ICT Directorate, Limerick
- Dr. Brian O’Mahony, National ICT Project Manager - General Practice, Irish College of GPs, Lismore, Co. Waterford
- Dr. Eugene Thomas, HSE Primary Care Development Unit, North West
- Mr. Fran Thompson, Director of Information Systems – National Lead - Corporate, HSE ICT Directorate, Kells, Co. Meath

As you will be aware, the majority of these individuals were members of the Health Board Executive (HeBE) Messaging Group tasked with the development of national health messaging standards based on the international Health Level Seven (HL7) standard, and with co-ordinating the development and implementation of health messaging solutions. As the HeBE Messaging Group was disbanded in December 2005 following the establishment of the HSE, it is necessary for the purposes of this research to determine the current status of existing services/projects in Ireland. This will include a review of more recent progress and the identification of current issues. The proposed interviews will also provide an opportunity to obtain and assess the views of these key individuals on the most appropriate strategic and tactical way forward for health messaging in Ireland.

Interview Process

It is envisaged that each interview will last between 30 and 60 minutes depending on your role, and will be conducted either in person or over the telephone, as appropriate. The interviews will focus on summarising your own specific experience of health messaging in Ireland and clarifying what you consider to be the key priorities for the way forward.

When scheduling the interview, it would be helpful if you could select a time and place where you are unlikely to be disturbed. All interviews will be recorded to ensure that key points are not overlooked when I’m attempting to summarise the interview. This summary will be sent to you for review and feedback, to ensure that your observations and views have been

accurately expressed and noted. These interview recordings, notes and individual summaries will be treated as strictly confidential and will not be made available to anyone other than myself without your explicit consent.

Once the interview process has been completed, a summary of the key points arising from all of the interviews combined will be drafted and circulated to all interviewees for feedback. Every effort will be made to ensure that this combined summary only includes observations and views that have been anonymised, so that particular opinions cannot be traced back to specific individual(s). ***It is this combined summary of key issues that will be used as the basis for my research, and subsequently included as an appendix in my dissertation report.*** I will send you a draft of the relevant section(s) of my dissertation report for your comments and feedback, before it is submitted.

Any relevant strategic, business or technical documentation that relates to messaging (e.g. briefings, project initiation/evaluation reports) and fact sheets provided by you will be made available to senior HSE managers on request, but will not be circulated to anyone else without your explicit consent. A copy of the combined summary of key issues will also be provided on the same basis.

It is my intention throughout this assignment to adopt a researcher's perspective, and to review and collate all materials gathered as objectively and impartially as possible. My ultimate objective is to emphasise the positive and to highlight any issues that may need to be addressed in a constructive manner, so that this research can be considered as a positive and useful development. It would be my hope that other researchers will be encouraged to focus on health messaging, building on research that has already been completed, as this service area becomes increasingly important in the provision of healthcare in Ireland. I believe that this will happen in the not too distant future.

Proposed Questions

I am enclosing a list of 5 primary questions that I would like to ask you during our one-to-one interview. I'd welcome any comments that you may have regarding these questions, and would be happy to tailor the interview if there are amendments or additions that you would like to propose.

As you'll note, I have also included a number of sub-questions as examples to stimulate your thoughts. **Please feel free to ignore these sub-questions completely, and don't be constrained in any way by them!!** The most important thing is that the interview focuses on the main points and issues that are of particularly relevance and importance to you in your messaging role(s).

I have attempted to come up with primary questions that are comprehensive and open, while still being generic enough to be answered in a meaningful way by all interviewees in line with their role(s);-

1. Briefly describe your past and current role(s) in relation to the development of electronic messaging services in Ireland, in order to outline your perspective.
2. What led to the setting up of the messaging programme(s) that you were involved with, and how was this programme established?

For example;-

- a. What were the key drivers?*
- b. In what year did work commence?*
- c. Who were the main sponsor and stakeholders?*
- d. What governance arrangements were put in place, and who provided funding?*
- e. What strategy/approach was taken to the development of services?*
- f. What projects/services were included?*

3. Tell me about your experience of being involved in the development of messaging services?

For example;-

- a. How did the overall development strategy/approach work in practice?*
- b. What project(s) were you involved in?*
- c. Was your experience mainly positive or negative?*
- d. Were all projects successful?*
- e. What lessons were learned - what worked well and what could be improved on?*
- f. Were the projects and resulting benefits formally evaluated?*
- g. If so, what were the main conclusions and recommendations?*

- h. Were the developed services worth the cost and effort involved?*
 - i. What standards were chosen?*
 - j. What was your experience of trying to implement these standards?*
 - k. What were the main business, technical and organisational issues that arose?*
 - l. How were these issues addressed?*
4. What do you consider to be the key priorities for the future development of messaging services in Ireland?

For example;-

- a. Establishment of a national message service?*
 - b. Convergence of existing services into that national service?*
 - c. Cessation of printing (e.g. laboratory reports) to include/exclude implementation of acknowledgement messages?*
 - d. Rollout of existing message types to regions currently without services?*
 - e. Further development and rollout of Neurolink?*
 - f. Implementation of additional message types (e.g. laboratory requesting, discharge summaries, referrals)?*
 - g. Development and implementation of a national health portal?*
5. How could these key messaging priorities be achieved?

For example;-

- a. What strategy/tactics/approach would you suggest?*
- b. What governance and organisation structures should be put in place?*
- c. Could these priorities be achieved with the current resources? If not, what resources would be needed?*

Appendix 2: Fact Sheet template for existing Messaging Services

Name of Message Type (As known locally) / Question/Point	Example Responses (Laboratory)	A&E Attendance Notifications	Death Notifications	Discharge Notifications	Discharge Summary Reports	Laboratory Results	Radiology Reports	Other (please amend)	Comments
Please mark with an "X" each of the HL7XML messaging services currently provided in your area (add additional columns as required). Otherwise, please leave blank	X								
Please indicate the applicable HL7 message identifier	REF-I12								
Do you directly provide all messaging services, or are they provided via Healthlink. Enter "X" in the first column if provided directly. Otherwise, please leave blank	X								
For each of the messaging types under development or currently provided, please respond to each point/question as it applies to that specific message type:									
Please list the originators of these messages (e.g. those hospitals/services currently providing original message content from their regional/local IT systems)									
Originator 1	Waterford Regional Hospital								
Originator 2	St. Luke's Hospital, Kilkenny								

Name of Message Type (As known locally) / Question/Point	<i>Example Responses (Laboratory)</i>	A&E Attendance Notifications	Death Notifications	Discharge Notifications	Discharge Summary Reports	Laboratory Results	Radiology Reports	Other (please amend)	Comments
Originator X (please add as required)									
Please list the recipients of these messages (e.g. those services/hospitals receiving the relevant HL7XML messages)									
Recipient 1	<i>GP Practices</i>								
Recipient 2									
Recipient X (please add as required)									
Please indicate the year & month (YYYY/MM) when:-									
The original project to implement each service started	<i>2002/06</i>								
"Live" operations commenced for that service/type	<i>2003/05</i>								
Please indicate with an "X" if any of these projects;-									
Included a 'pilot' phase	<i>X</i>								
Were formally evaluated?	<i>X</i>								
How many GP practices and individual GPs do you currently provide with messages of each type?									
GP Practices	<i>92</i>								
Individual GPs	<i>189</i>								
If possible, please indicate the approx. number of "live" messages (excluding ACKs) that have been transmitted to GP Practices in your region/area in each of the following calendar years (for comparison with Denmark):-									
2007	<i>260,000</i>								
2006	<i>145,000</i>								

Name of Message Type (As known locally) / Question/Point	Example Responses (Laboratory)	A&E Attendance Notifications	Death Notifications	Discharge Notifications	Discharge Summary Reports	Laboratory Results	Radiology Reports	Other (please amend)	Comments
2005	64,000								
2004	32,000								
2003	8,000								
2002									
2001									
2000									
Please provide details of each source/feeder system that provides the original content/data;-									
Product name(s)	iLab								
Supplier(s)	iSoft								
Please provide details of any middleware used to transform data into structured HL7XML messages. If none, please leave blank									
Product name(s)	ICE Labcomm								
Supplier(s)	Anglia								
Please indicate with an "X" for each message type, where electronic messages exchanged;-									
Are fully compliant with the international HL7 and national HSE messaging standards									
Include known variations from these standards. If possible, include a brief summary of variations in the comments field	X								
Are provided in a format other than HL7XML (e.g. CSV, propriety interface). Please give relevant details									
Include international classifications or coding conventions (e.g. LOINC). If possible, include a brief summary									

Name of Message Type (As known locally) / Question/Point	<i>Example Responses (Laboratory)</i>	A&E Attendance Notifications	Death Notifications	Discharge Notifications	Discharge Summary Reports	Laboratory Results	Radiology Reports	Other (please amend)	Comments
Include national classifications or coding conventions (e.g. GP Identifier). If possible, include a brief summary	X								
Please provide details in the first column of how messages are stored, collected and secured. If you have more than one delivery infrastructure, please provide details by message type									
How are messages of each type stored prior to delivery?	<i>Database & XML</i>								
By what means do GPs connect to your service (or Healthlink) in order to collect their messages?	<i>RAS dial-up</i>								
Please outline the security mechanisms deployed for GP/practice user authentication, access and downloading of messages.	<i>RAS, Caller ID, Username, Password</i>								
Please indicate with an "X" the message types where HL7XML acknowledgement messages are returned by the recipient(s) to your service (or Healthlink)									
Please indicate with an "X" if the cessation of printing/faxing for this message type;-									
Is a medium/long term objective									
Is a short term objective	X								
Is being piloted									
Has been successfully achieved									
Has been evaluated									
Please identify with an "X" in the first column, each facility currently provided to GPs in your area. GPs									

Name of Message Type (As known locally) / Question/Point	<i>Example Responses (Laboratory)</i>	A&E Attendance Notifications	Death Notifications	Discharge Notifications	Discharge Summary Reports	Laboratory Results	Radiology Reports	Other (please amend)	Comments
can;-									
Review messages (e.g. results) for their patients on the web, using a secure site provided by your service (or Healthlink)									
Securely download electronic messages from your service (or Healthlink) onto their practice network/system	X								
Review downloaded messages within their practice, using software provided by your service (or Healthlink)									
Review, match and integrate downloaded messages into their practice system, using software provided by their vendor	X								
Please indicate with an "X" in the first column, all of the GP practice management systems currently used within your geographic area									
Complete GP									
GP Clinical	X								
GPMac	X								
HEALTHone	X								
Medicom	X								
Practice Partner									
Socrates	X								
Other (please insert names as required)									
Have you submitted a formal project proposal to provide additional messaging services during 2008? If so, please indicate with an "X" these new message types or provide project details in the comments field									

Name of Message Type (As known locally) / Question/Point	<i>Example Responses (Laboratory)</i>	A&E Attendance Notifications	Death Notifications	Discharge Notifications	Discharge Summary Reports	Laboratory Results	Radiology Reports	Other (please amend)	Comments
Please indicate the top 5 additional message types that you would like to implement in the future, in order of preference (i.e. enter 1-5).									
Fact Sheet Completed By:					Date:				

Appendix 3: Messaging Services in Ireland - Fact Sheet Summary

Name of Message Type / Question/Point	Healthlink	Mid-West	North East	North West	PCRS	South	South East	West
Please enter "X" if services provided directly (i.e. not via Healthlink)			X	X	X	X	X	
Please mark with an "X" each of the HL7XML messaging services currently provided in your area								
A&E attendance notifications	X							
Co-op out-of-hours reports	X	X	X				X	
Death notifications	X							
Discharge notifications	X							
Discharge summary reports	X							
Laboratory orders	X							
Laboratory results	X	X	X	X		X	X	X
Neurology referrals	X							
Out-patient clinic appointment notifications	X							
Pharmacy claim reimbursement					X			
Radiology reports	X	X		X		X		X
Waiting list	X							

Name of Message Type / Question/Point	Healthlink	Mid-West	North East	North West	PCRS	South	South East	West
notifications								
For each of the messaging types under development or currently provided, please respond to each point/question as it applies to that specific message type:								
Please list the originators of these messages (e.g. those hospitals/services currently providing original message content from their regional/local IT systems)								
Originator 1	19 hospital extracts are delivered via Healthlink.	Mid-Western Regional Hospital	Lab Our Lady of Lourdes Drogheda	Letterkeny General Hospital	Pharmacies via their Dispensing Software	Cork University Hospital	Waterford Regional Hospital sends results	University Hospital Galway
Originator 2		Ennis General Hospital	GP out of Hours Co-op Ardee	Sligo General Hospital	PCRS is an originator for exception messages	Kerry General Hospital	St. Luke's General Hospital, Kilkenny	Mayo General Hospital
Originator 3		Nenagh General Hospital	Rad Our Lady of Lourdes Drogheda			Bantry General Hospital	Wexford General Hospital	Roscommon County Hospital

Name of Message Type / Question/Point	Healthlink	Mid-West	North East	North West	PCRS	South	South East	West
Originator 4		ShannonDoc CoOp	Lab Cavan Hospital				South Tipperary General Hospital, Clonmel	Portiuncula Hospital
Originator 5							Carlow Emergency Doctors on Call Ltd (CareDoc) sends reports	
Originator 6							GP Practices send acknowledgements	
Please list the recipients of these messages (e.g. those services/hospitals receiving the relevant HL7XML messages)								
Recipient 1	GP Practices	GP Practices	GP Practices	GP Practices	Pharmacies via their dispensing systems	GP Practices for all	GP Practices receive results/reports	GP Practices
Recipient 2	Health Agencies such as health centres or day care facilities receive lab and radiology reports	A Geriatric consultant and a Psychiatrist receive laboratory results		St. Joseph's Hospital, Garden Hill, Sligo	PCRS		Carlow Emergency Doctors on Call Ltd (CareDoc) receives acknowledgements	
Recipient 3	Laboratory Staff receive Lab Order Messages							

Name of Message Type / Question/Point	Healthlink	Mid-West	North East	North West	PCRS	South	South East	West
Please indicate with an "X" if any projects;-								
Included a 'pilot' phase	X	X	X	X	X	X	X	X
Were formally evaluated?	All pilots are evaluated prior to go live.			X	A formal evaluation of a sort but not in form of a report.	X	X	X
How many GP practices and individual GPs do you currently provide with messages of each type?								
GP Practices	608	101	33	51	450 Pharmacies	150	73	104
Individual GPs	1239	152	68	92		395	184	218
Please provide details of each source/feeder system that provides the original content/data;-								

Name of Message Type / Question/Point	Healthlink	Mid-West	North East	North West	PCRS	South	South East	West
Product name(s)	WINPATH KEOGH RIS ADASTRA APEXLIS TOREXPAS TELEPATHLIS IMSRIS	1. iLab 2. RIS 3. Adastra	1. WinPath LIS 2. Keogh RIS 3. Adastra Out of Hours System 4. Netaquire LIS	1. MiSys 2. Keogh Software	Unknown	1. iLab 2. RIS	1. iLab 2. Adastra	1. iLab - Mayo Galway, Roscommon 2. Clinisys - Portiuncula 3. PACS/RIS
Supplier(s)	iSoft, Custom Software, Medical Suppliers Company, Keogh, IMS, Adastra	1. iSoft 2. IMS 3. Adastra	1. Medical 1. Supply 2. Keogh Software 3. Adastra Software 4. Custom Software	1. MiSys 2. Keogh Software	Pharmacy vendors McLernons / Helix Health / Ocucio	1. iSOFT 2. Keogh Software	1. iSoft 2. Adastra Software	1. iSoft 2. Medical Supplies Co. 3. Agfa
Please provide details of any middleware used to transform data into structured HL7XML messages. If none, please leave blank								
Product name(s)	Healthlink Bridge Middleware used in all sites	Custom-built	Extranet bespoke development	HSE North West e-Results Delivery System	Incoming messages are loaded to Oracle using SUN JCAPS bespoke development.	ICE Labcomm	ICE Labcomm	Custom-built
Supplier(s)	Healthlink	Contractor	System Dynamics	HP	As Above	Anglia	Anglia HSL	Rivendale

Name of Message Type / Question/Point	Healthlink	Mid-West	North East	North West	PCRS	South	South East	West
Please indicate with an "X" for each message type, where electronic messages exchanged;-								
Are fully compliant with the international HL7 and national HSE messaging standards	X	X		X	X	X	X	X
Include known variations from these standards. If possible, include a brief summary of variations in the comments field			X	X	X		X	
Are provided in a format other than HL7XML (e.g. CSV, propriety interface). Please give relevant details					X			
Include international classifications or coding conventions (e.g. LOINC). If possible, include a brief summary					n/a			?

Name of Message Type / Question/Point	Healthlink	Mid-West	North East	North West	PCRS	South	South East	West
Include national classifications or coding conventions (e.g. GP Identifier). If possible, include a brief summary			X	X (North West region GP Identifier)			X	?
Please provide details in the first column of how messages are stored, collected and secured. If you have more than one delivery infrastructure, please provide details by message type								
How are messages of each type stored prior to delivery?	Database	Database & Healthlink service	Database & XML	Database & XML	Database	Database & XML	Database & XML	Database & Healthlink service
By what means do GPs connect to your service (or Healthlink) in order to collect their messages?	Internet access, broadband / isdn/dial-up	SSL Internet connection	ISDN	RAS dial-up	RAS Dial up	Depends on what internet connectivity is available within practice Dial-up, ADSL	GPs connect via dial-up to HSE network, and login to GP extranet to collect lab results, using web services to collect Coop reports & transmit related ACKs. CareDoc connects over HSE WAN and uses web services to transmit Coop reports & collect ACKs.	SSL over internet

Name of Message Type / Question/Point	Healthlink	Mid-West	North East	North West	PCRS	South	South East	West
Please outline the security mechanisms deployed for GP/practice user authentication, access and downloading of messages.	Username, Password PIN and Security Certificate	Caller Id, Password, PIN and Security Certificate	RAS, Caller ID, Username, Password	RAS, Caller ID, Username, Password	PKI Certificate	Practice receives notification via e-mail that results are available. Link is embedded in mail which when selected, links to secure mail server (Tovaris) and then prompts user password supplied by HSE. An SSL session is then established and results downloaded. The link expires after 4 weeks.	RAS (Caller ID, Username, Password). Website (Username and password). Web services (shared certificate, username, password)	Digital certificates, username, pin password
Please indicate with an "X" the message types where HL7XML acknowledgement messages are returned by the recipient(s) to your service (or Healthlink)	Lab order NACK messages only				X		X (for Coop reports)	
Please indicate with an "X" if the cessation of printing/faxing for this message type;-								

Name of Message Type / Question/Point	Healthlink	Mid-West	North East	North West	PCRS	South	South East	West
Is a medium/long term objective	Cessation of paper is a hospital by hospital decision. Healthlink only operates as a standard working hours 9-5 support service. Healthlink has full auditing capabilities.	For Lab and Rad (some practices shred the paper on a monthly basis)	X	X	X	X	X(for Lab results)	
Is a short term objective	X	X (for Coop reports)						
Is being piloted	West are piloting cessation of lab result messages. Other hospitals have expressed interest in ceassing sending paper reports for cost savings							X (for Lab results)
Has been successfully achieved							X (for Coop reports)	
Has been evaluated						X (for Laboratory)		
Please identify with an "X" in the first column, each facility currently provided to GPs in your area. GPs can;-								

Name of Message Type / Question/Point	Healthlink	Mid-West	North East	North West	PCRS	South	South East	West
Review messages (e.g. results) for their patients on the web, using a secure site provided by your service (or Healthlink)	X	X	X	X	n/a			X
Securely download electronic messages from your service (or Healthlink) onto their practice network/system	X	X	X	X	Exception Messages Provided to Pharmacists	x	X	X
Review downloaded messages within their practice, using software provided by your service (or Healthlink)	X	X			n/a			X
Review, match and integrate downloaded messages into their practice system, using software provided by their vendor	X	X	X	X	Exception Messages Provided to Pharmacists	x	X	X

Name of Message Type / Question/Point	Healthlink	Mid-West	North East	North West	PCRS	South	South East	West
Please indicate with an "X" in the first column, all of the GP practice management systems currently used within your geographic area								
Complete GP								
GP Clinical	X	X	X	X		X	X	X
GPMac	X	X	X	X		X	X	X
HEALTHone	X	X	X	X		X	X	X
Medicom	X	X	X	X		X	X	X
Practice Partner								
Socrates	X	X	X	X		X	X	X
MedPlus		X						
Clinical Objects		X						
Medix (Runs on MAC)		X						
Please indicate with an "X" in the first column, all of the Pharmacy systems currently used within your geographic area								
Helix Health					X			
McLernons					X			
Ocuco					X			
Have you submitted a formal project proposal to provide additional messaging services during 2008?	X				n/a			

Name of Message Type / Question/Point	Healthlink	Mid-West	North East	North West	PCRS	South	South East	West
If so, please indicate with an "X" these new message types or provide project details in the comments field								
Please indicate the top 5 additional message types that you would like to implement in the future, in order of preference (i.e. enter 1-5).	Expansion of structured referral messages to other disciplines & areas	1) Lab Ordering 2) Referrals 3) Death Notification 4) A+E Notifications 5) Waiting Lists	1) Lab results 2) Radiology reports 3) Discharge summary reports 4) Discharge notifications 5) A&E attendance notifications	1) Discharge summary reports 2) GP Coop attendances 3) A&E attendance notifications 4) Death notifications 5) Discharge notifications		1) Southdoc out of hours reports 2) Lab ordering 3) Acknowledgements 4) Discharge summaries	1) Acknowledgements 2) Radiology reports 3) Laboratory requesting 4) Referral and discharge letters	1) Discharge summary reports 2) Waiting list information

Appendix 4: MedCom's EDI and XML standards - November 2007

MedCom's existing EDI and XML based communication standards are listed below (Hulbaek et al., 2007);-

Lettertype DK	Version	BRVTYPE	Lettertype UK	XML Version	XML BRVTYPE
Udskrivningsepikrise	D0133L	DIS01	DischargeLetter	XD0133L	XDIS01
Ambulantepikrise	D0233L	DIS02	OutPatientDischargeLetter	XD0233L	XDIS02
Skadestueepikrise	D0333L	DIS03	CasualtyWardLetter	XD0333L	XDIS03
Billediagnostisk epikrise	D0533L	DIS05	RadiologyReport	XD0533L	XDIS05
Lægevagtsepikrise	D0633L	DIS06	*DoctorsCallCenterLetter	XD0633L	XDIS06
Speciallægeepikrise	D0733L	DIS07	*PrivateSpecialistLetter	XD0733L	XDIS07
Bookingsvar	D1333L	DIS13	BookingConfirmation	XD1333L	XDIS13
Fysioterapiepikrise	D0833L	DIS08	*PhysiotherapyLetter	XD0833L	XDIS08
*Korrespondancebrev	D9134L	DIS91	*ClinicalEmail	XD9134L	XDIS91
Sygehushenvisning	H0130R	REF01	HospitalReferral	XH0130R	XREF01
Billediagnostisk henvisning	H0230R	REF02	XrayRequest	XH0230R	XREF02
Speciallægehenviisning	H0630R	REF06	*PrivateSpecialistReferral	XH0630R	XREF06
*Laboratoriesvar	R0130K	RPT01	*LaboratoryReport	XR0130K	XRPT01
Patologisvar	R0430P	RPT04	HistopathologyReport	XR0430P	XRPT04
Cervixcytologisvar	R0330P	RPT03	CervixcytologyReport	XR0330P	XRPT03
*Mikrobiologisvar	R0230M	RPT02	*MicrobiologyReport	XR0230M	XRPT02
			*MicrobiologyWebReport	XR0530M	XRPT05
*Laboratorierekvisition	Q0131K	REQ01	*LaboratoryRequest	XQ0131K	XREQ01
Mikrobiologirekvisition	Q0230M	REQ02	MicrobiologyRequest	XQ0230M	XREQ02
Patologirekvisition	Q0330P	REQ03	PathologyRequest	XW0330P	XREQ03
*KKA analyserepertoire	A0137Z	DAO01	*LaboratoryAnalysisFile	XA0137Z	XDAO01
Lægeafregning	U0131U	RUC01			
Speciallægeafregning	U0231U	RUC02			
Tandlægeafregning	U0331U	RUC03			
Fysioterapifregning	U0431U	RUC04			
Apoteksafregning	U0531U	RUC05			
Kiropraktorafregning	U0631U	RUC06			
Laboratorieafregning	U0731U	RUC07			
Lægevagtsafregning	U0831U	RUC08			
Danmarksafregning	U0931U	RUC09			
Psykologafregning	U1031U	RUC10			
Fodterapeutafregning	U1131U	RUC11			
Indlæggelsesadvis	D2030C	DIS20	NotificationOfAdmission	XD2030C	XDIS20
Indlæggelsesvar	D1431C	DIS14	AnswerOfAdmission	XD1431C	XDIS14
Udskrivningsadvis	D1730C	DIS17	NotificationOfDischarge	XD1730C	XDIS17
Indlæggelsesrapport	D1630C	DIS16			
Udskrivningsrapport	D1830C	DIS18			
Varsling af færdigbehandling	D1930C	DIS19	WarningOfDischarge	XD1930C	XDIS19
Hjemmeplejestatus	D9530C	DIS95			
Fødselsanmeldelse	D3233L	DIS32			
Triggermeddelelse	I0130D	PID01			
Personstamdatameddelelse	I0230D	PID02			
Patientstamdatameddelelse	I0330D	PID03			
Cavemeddelelse	I0430D	PID04			
Vedvarende helbredsforhold	I0530D	PID05			
Recept	LMS016	PRE01	Prescription	XLMS016	XPRE01
Web-receptfornyelse	R5030W	PRE50			
System-receptfornyelse	R6030W	PRE60			
System-receptfornyelse	R6031W	PRE60	PrescriptionRequest	XLMS016	XPRE60
Negativ VANS-kvittering	C0130Q	CTL01	NegativeVansReceipt	XC0130Q	XCTL01
Negativ kvittering	C0230Q	CTL02	NegativeReceipt	XC0230Q	XCTL02
Positiv kvittering	C0330Q	CTL03	PositiveReceipt	XC0330Q	XCTL03
Fysioterapihenvisning	H0730R	REF07	*PhysiotherapyReferral	XH0730R	XREF07
Fodterapihenvisning	H0830R	REF08	*FootTherapistReferral	XH0730R	XREF08
Binær dokumenttransport	B0130X	BIN01	BinaryLetter	XB0130X	XBIN01
Psykologhenvisning	H1030R	REF10	*PsychologistReferral	XH1030P	XREF10
Psykologepikrise	D1033L	DIS10	*PsychologistLetter	XD1033L	XDIS10

Appendix 5: Pharmacy Integration Product Roadmap

Row #	Integration Generation	High Level Description	Feature List
001	Zero Generation	Manual Paper Submission	<ul style="list-style-type: none"> • Manual Paper Submission • Submission Reimbursable in All Cases • Submission Mechanism of Last Resort for Electronic Pharmacies • Payment Cycle 4-6 Weeks Approx • Rejects Manual Process Paid at 8-10 Weeks
002	First Generation – 1997 (Version 1.0)	Basic Electronic Submission	<ul style="list-style-type: none"> • Basic Electronic Submission • Submission Reimbursable Where File is Loadable • Payment Cycle 2 Weeks • Rejects Manual Process Paid at 6, 10, 14 Weeks
003	Second Generation – 2004 (Version 2.0)	Full Cycle Electronic Submission	<ul style="list-style-type: none"> • Full Cycle Electronic Submission • Response File 15 minutes – 24 hours. • Full Payment Cycle 2 Weeks • Support for Zero Unloadable Files • Support for Zero Claim Rejects • Support for Zero Difference in Items • Electronic Submission and Early Pay LTI Claims • Electronic Submission and Early Pay HiTech Claims • Electronic Submission and Early Pay HAA Claims • Integrated Electronic Correction Claims • Integrated Electronic Claim Warnings • Integrated Electronic Difference In Items • Direct Pharmacy to HSE Claim Submission • SMS Submission Reminders • SMS Communication in Event of Submission Failure

Row #	Integration Generation	High Level Description	Feature List
004	Third Generation Target Release Date – H2 2008	Network Enabled	<ul style="list-style-type: none"> • Access Component Less Operation As Option for Vendor • Broadband, PSTN, ISDN Compatible • Real Time Integrated Eligibility Confirmation • Additional Drug Product Support • Additional Validations To Be Defined • Support for Multiple Claim Files Per Month (Single Monthly Payment) • Support for Super Fast Claim Submission • Support for Super Fast Exception Retrieval • Support for Automated Submission and Retrieval of Claim and Exception Files • Supporting Pharmacy Application Suite with access to self service menu of options to include, <ul style="list-style-type: none"> ○ Current and Archived Listings ○ Downloadable Fees Schedule ○ Backup Claim Submission ○ Claims Submission Batch Review ○ Browser Based Eligibility Confirmation ○ Contacts Maintenance ○ File Processing Transparency • Supporting Pharmacy Vendor Application Suite with access to self service menu of options to include, <ul style="list-style-type: none"> ○ File Processing Transparency ○ Archived Quality Reports

Row #	Integration Generation	High Level Description	Feature List
005	Next Significant Release Target Release Date – To Be Announced (Version x.x)	Electronic Prescription Enabled	<ul style="list-style-type: none"> • Automated Electronic Prescription Loading • Support for Prescription Receipt Before Client • Prescription Cancelling Up to Dispensing Point • Full Patient Identification • Generic HSE Card • Compatible with Facilities Available to GPs and GP System Vendors
006	Next Significant Release (Version x.x)	Smart National Family Balance Enabled	<ul style="list-style-type: none"> • Smart National Family Balance Enabled • Support for Reimbursement for Above Threshold Items Irrespective of Origin of Dispensings

Notes:

(1) This roadmap presents earlier versions of integration with the benefit of 2008 technology and hindsight. As each came along it was a significant improvement on what went before at the time...

(2) Content of product version is fixed when it is formally released by HSE PCRS and at least one vendor.

(3) Content of future product versions negotiable until formally released.