Health Information and Quality Authority

An tÚdarás Um Fhaisnéis agus Cáilíocht Sláinte

EPrescribing and Electronic Transfer of Prescriptions: an International Review

November 2012

Safer Better Care

About the Health Information and Quality Authority

The Health Information and Quality Authority (HIQA) is the independent Authority established to drive continuous improvement in Ireland's health and personal social care services, monitor the safety and quality of these services and promote person-centred care for the benefit of the public.

The Authority's mandate to date extends across the quality and safety of the public, private (within its social care function) and voluntary sectors. Reporting to the Minister for Health and the Minister for Children and Youth Affairs, the Health Information and Quality Authority has statutory responsibility for:

- **Setting Standards for Health and Social Services** – Developing person-centred standards, based on evidence and best international practice, for those health and social care services in Ireland that by law are required to be regulated by the Authority.

- **Social Services Inspectorate** – Registering and inspecting residential centres for dependent people and inspecting children detention schools, foster care services and child protection services.

- **Monitoring Healthcare Quality and Safety** – Monitoring the quality and safety of health and personal social care services and investigating as necessary serious concerns about the health and welfare of people who use these services.

- **Health Technology Assessment** – Ensuring the best outcome for people who use our health services and best use of resources by evaluating the clinical and cost effectiveness of drugs, equipment, diagnostic techniques and health promotion activities.

- **Health Information** – Advising on the efficient and secure collection and sharing of health information, evaluating information resources and publishing information about the delivery and performance of Ireland's health and social care services.

Overview of Health Information function

Health is information-intensive, generating huge volumes of data every day. It is estimated that up to 30% of the total health budget may be spent one way or another on handling information, collecting it, looking for it, storing it. It is therefore imperative that information is managed in the most effective way possible in order to ensure a high quality, safe service.

Safe, reliable, healthcare depends on access to, and the use of, information that is accurate, valid, reliable, timely, relevant, legible and complete. For example, when giving a patient a drug, a nurse needs to be sure that they are administering the appropriate dose of the correct drug to the right patient and that the patient is not allergic to it. Similarly, lack of up-to-date information can lead to the unnecessary duplication of tests – if critical diagnostic results are missing or overlooked, tests have be repeated unnecessarily and, at best, appropriate treatment is delayed or at worst not given.

In addition, health information has a key role to play in healthcare planning decisions – where to locate a new service, whether or not to introduce a new national screening programme and decisions on best value for money in health and social care provision.

Under section (8)(1)(k) of the Health Act 2007, the Authority has responsibility for setting standards for all aspects of health information and monitoring compliance with those standards. In addition, the Authority is charged with evaluating the quality of the information available on health and social care – (Section (8)(1)(i) – and making recommendations in relation to improving the quality of information and filling in gaps where information is needed but is not currently available [Section (8)(1)(j)].

Information and communications technology (ICT) has a critical role to play in ensuring that information to drive quality and safety in health and social care settings is available when and where it is required. For example, it can generate alerts in the event that a patient is prescribed medication to which they are allergic. It can support a much faster, more reliable and safer referral system between the GPs and hospitals.

Although there are a number of examples of good practice, the current ICT infrastructure in health and social care in the Republic of Ireland is highly fragmented with major gaps and silos of information. This results in service users being asked to provide the same information on multiple occasions.

Information can be lost, documentation is poor, and there is over-reliance on memory. Equally those responsible for planning our services experience great difficulty in bringing together information in order to make informed decisions. Variability in practice leads to variability in outcomes and cost of care. Furthermore,

we are all being encouraged to take more responsibility for our own health and wellbeing, yet it can be very difficult to find consistent, understandable and trustworthy information on which to base our decisions.

As a result of these deficiencies, there is a clear and pressing need to develop a coherent and integrated approach to health information, based on standards and international best practice. A robust health information environment will allow all stakeholders – patients and service users, health professionals, policy makers and the general public – to make choices or decisions based on the best available information. This is a fundamental requirement for a highly reliable healthcare system.

Through its health information function, the Authority is addressing these issues and working to ensure that high quality health and social care information is available to support the delivery, planning and monitoring of services.

One of the areas currently being addressed through this work programme is the need to develop messaging standards to support the electronic transfer of prescriptions (ETP) across organisational boundaries. This document reviews ePrescribing and ETP initiatives internationally to inform the adoption of appropriate standards in Ireland.

Table of Contents

Table of Figures

1. Introduction

'Prescription writing was not much in vogue when I first went into business. A doctor would say [orally] how many pills to make, each to contain so many grains of this or that: or so many ounces of syrup or mixture containing so many grains of such and such to a teaspoon. We would pencil it on a scrap of wrapping paper and go to work…. There was no refilling unless the doctor was present, and even he sometimes had to guess, as no copy was on file."[1]

The Institute of Medicine (IOM) in the United States of America (USA) published the report 'To err is human, Building a Safer Healthcare System' in 1999.[2] In this report it was estimated that medication errors alone, occurring either in or out of the hospital, account for over 7,000 deaths annually.

1.1 Aims and objectives

The purpose of this review is to document international experience with regard to ePrescribing and the electronic transfer of prescriptions (ETP) between prescribers and dispensers. An initial desktop review identified six countries for further analysis. The countries were chosen based on initiatives identified in the desktop review and the availability of relevant information. Information was compiled from the documentation available from the countries in question.

The countries that are reviewed in detail in this report are Australia, New Zealand, the Netherlands, England, Northern Ireland and Scotland. A short summary of the findings from the United States, Denmark and Sweden is also provided. A review of the ePrescribing element of the European eHealth Project (epSOS) is also included.

Initiatives exist across these countries that could potentially inform the development of standards for ePrescribing in Ireland. Additional factors contributing to the selection of these countries for this international review include the availability of information in the English language and geographic spread.

The findings for each country are presented under a number of headings, namely an overview of the model or architecture deployed, the level of implementation reached, the benefits realised and the governance arrangements.

1.2 Definition

Articles recommending moving from handwritten to electronically generated prescriptions may be traced back in the literature to the early 1980s.[3] By the early 2000s relatively sophisticated electronic prescribing systems were in existence that allowed healthcare practitioners to electronically generate patients' prescriptions and check for drug interactions using personal data assistants (PDAs). These PDAs could

be synchronised with desktop computers and the prescription printed or faxed to a pharmacy. In more recent years other jurisdictions have moved towards national initiatives to implement ePrescribing and ETP, and initiatives in Australia, New Zealand, the Netherlands, England, Northern Ireland, Scotland, the United States, Denmark and Canada are well under way.

The Centre of Medicare and Medicaid Services in the United States defines the ePrescribing process as:

> 'E-prescribing means the transmission, using electronic media, of prescription or prescription-related information between a prescriber, dispenser, pharmacy benefit manager, or health plan, either directly or through an intermediary, including an e-prescribing network. E-prescribing includes, but is not limited to, two-way transmissions between the point of care and the dispenser.'[4]

In Australia, according to Department of Health and Ageing's Pharmacy and Government Arrangements - Fifth Community Pharmacy Agreement:

> 'Electronic Prescription means an electronic prescription which is generated in accordance with a process by which a prescription is electronically generated by a prescriber, authenticated (electronically signed), securely transmitted (either directly or indirectly) for dispensing and supply, seamlessly integrated into the pharmacy dispensing software and, in the case of Pharmaceutical Benefits Scheme (PBS) prescriptions, is available to be electronically sent to Medicare Australia for claiming purposes. This definition does not preclude the use of paper-based processes to support ePrescribing activity.'[5]

For the purpose of this review, the following basic definitions apply:

- ePrescribing is generally the process of using a computer to generate a prescription
- electronic transfer of prescriptions (ETP) is the process of sending a prescription electronically from a prescriber to a dispenser
- eMedication management is the process of using information and communication technology (ICT) to support medication reconciliation.

1.3 Project Rationale

Under section (8)(1)(k) of the Health Act 2007, the Authority has responsibility for setting standards for all aspects of health information including, for example, information governance, common data definitions, and the exchange of electronic health information.

The Authority recognises that the implementation of the proposed standards will take time, possibly even years. However, as new systems are implemented it is expected that they will be required to adhere to the standards from the outset. For existing

ICT systems, a gradual approach is envisaged with the opportunity being taken when major upgrades to the systems are being undertaken to bring them into conformance with the standards.

The benefits of ePrescribing initiatives are well documented as an increasing number of countries adopt the use of ePrescribing in some form. These include a reduction in medication errors, prescription and transcription errors with a corresponding improvement in patient safety. The aim of this international review is to present the practices and processes adopted in other countries to develop national ETP solutions. Where available, the benefits gained in each country are documented. Information on the development of solutions in six countries that are at different stages of development and harmonisation is provided.

2. Australia

2.1 Introduction

The Commonwealth of Australia has a population of approximately 22.5 million. It is the sixth-largest country in the world, comprising six states and 10 territories with the population concentrated along the eastern and south-eastern coasts.[6] While overall coordination of the public healthcare delivery system is the responsibility of federal, state and territory health ministers, the health service in Australia is governed centrally by the Department of Health and Ageing. The Department has responsibility for providing leadership in policy making, public health, research and national health information management.[7]

The federal, state and territory health ministers are supported by the Australian Health Ministers' Advisory Council (AHMAC), a committee of the heads of the Australian Government, state and territory health authorities. AHMAC advises Australian health ministers on policy, resources and financial issues.

eHealth is a focus in Australia with the development of and implementation of standards lead by the National E-Health Transition Authority Limited (NEHTA). NEHTA was established in July 2005 as a collaborative enterprise by the Australian Commonwealth, State and Territory governments to identify and develop the necessary foundations for eHealth. NEHTA has five strategic principles:[8]

1. Deliver, operationalise and enhance essential foundations required to enable eHealth.
2. Coordinate the progression of priority eHealth initiatives.
3. Manage and deliver the key components of the Department of Health Australia Personally Controlled Electronic Health Record.
4. Accelerate national adoption of eHealth.
5. Lead the further progression of eHealth in Australia.

2.2 ePrescribing in Australia

In order to deliver against these principles NEHTA focused its efforts on electronic communications in practice by implementing and delivering early eHealth services for the most commonly exchanged health information, which include pathology reports, referrals, discharge summaries and medication management.[9]

NEHTA leads the eMedication Management Programme[10] and has delivered specifications which enable prescriptions to be securely transmitted direct from the GP's practice management system to the dispensing pharmacy.

Principle 2 of NEHTA's strategy (Coordinate the progression of priority eHealth initiatives) includes its eMedication Management Programme. This programme had significant dependencies with other areas of work identified under Principle 1

(Deliver, operationalise and enhance essential foundations required to enable eHealth).

These dependencies include:

- Priority 1.1 Architecture and Standards: NEHTA, in collaboration with Standards Australia has developed Electronic Transfer of Prescription Messaging and Document Standards.
- Priority 1.2 National Healthcare Identifier Service: Healthcare Identifier Service went live in December 2010.
- Priority 1.3 National Authentication Service for Health: The Department of Human Services has launched an interim authentication service in 2012.
- Priority 1.4 National Clinical Terminology and Information Service: SNOMED CT AU has been released (June 2010) the Australian Medicine Terminology (AMT) has been developed.
- Priority 1.5 Secure Messaging: Technical specification published by Standards Australia March 2010.
- Priority 1.6 Security and Access to Health Information: National eHealth conformance, compliance and accreditations programmes options paper released for public comment January 2010. Security and Access Framework initiated in 2011.

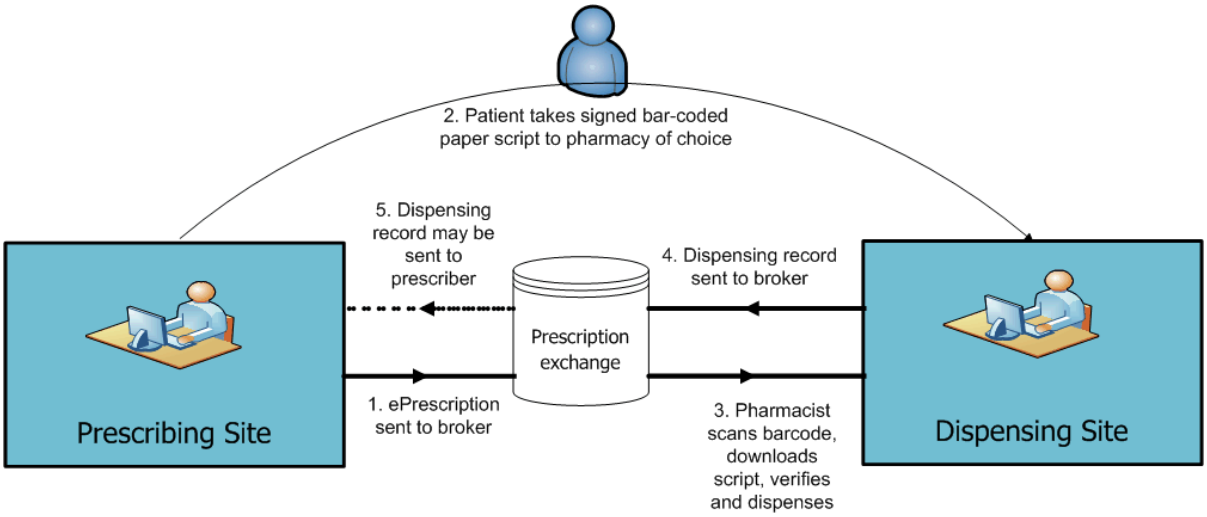
The Australian e-Medication Management programme solution is based on a barcoded paper prescription implemented in parallel with the transmission of an electronic copy of the prescription to a central prescription exchange server, with the goal of electronic only digitally signed prescriptions. This model was initially proposed in the *Consultancy in Electronic Prescribing and Medicines* in June 2008.[11]

The draft Electronic Transfer of Prescriptions (ETP) specifications were released in October 2009 and following a period of consultation final specifications were released in 2010.[10]

Three possible implementation levels have been identified. ETP is designed to support a paperless process where prescriptions cross organisational boundaries, as in primary care, hospital or residential care settings.

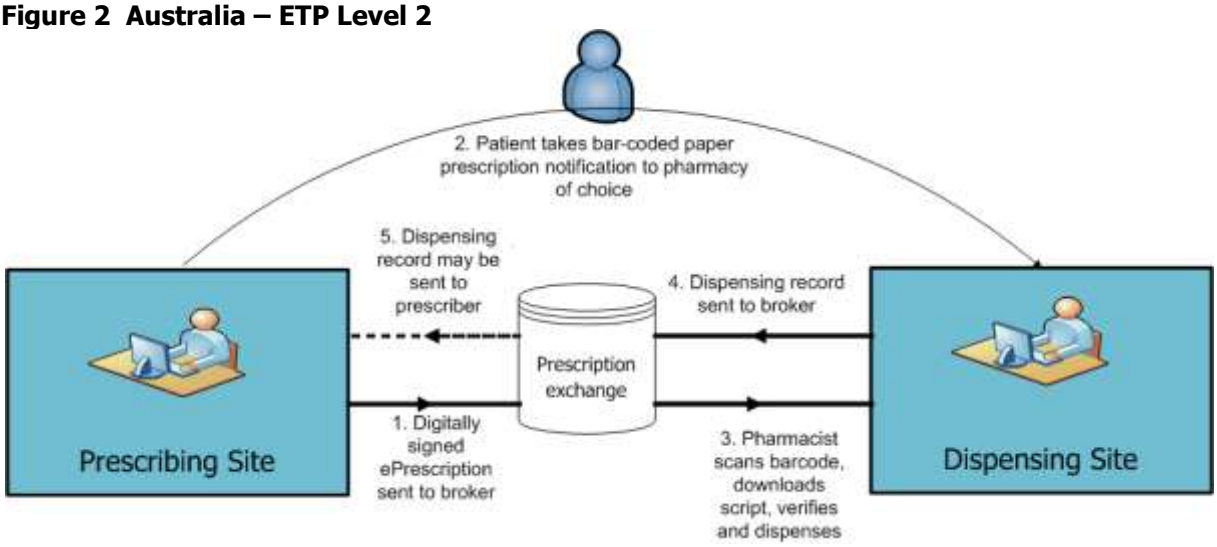
- **ETP Level 1:** Illustrated in Figure 1, this level describes the use of software incorporating the ETP specifications to transfer an electronic copy of a paper prescription. This level allows healthcare providers and vendors to gain experience with the ETP process while retaining paper prescriptions. To support this level it is necessary to generate an electronic message containing all of the information on the prescription and also to print a NEHTA specified Document Access Key (DAK) barcode for each item on a paper prescription. The paper prescription remains the authoritative and legal document and is physically signed by the prescribing practitioner.

Figure 1. Australia – ETP Level 1



- **ETP level 2:** This level, illustrated in Figure 2 adds an approved form of electronic prescriber's signature to make the electronic prescription authoritative and legal. The paper prescription is replaced with a printed prescription notification that contains information for the individual and a DAK, which the individual gives to the dispensing pharmacist and grants access to the prescription. The prescription notification is not considered a legal prescription. To support ETP level 2, an approved form of electronic signature is required. Adoption of level 2 in community settings requires a high adoption rate in community pharmacies as without this, the individual cannot use a prescription notification to receive prescribed medications. Level 2 adoption also supports paperless reimbursement of community pharmacists by the prescription reimbursement service (PBS).

Figure 2 Australia – ETP Level 2



- **ETP level 3:** This level adds the ability for prescribers to give individuals the choice to receive their prescription notification either on paper or electronically. At the time of writing, NEHTA intended to conduct a public consultation to ascertain whether there is public appetite for receiving prescription notifications electronically as adoption at this level would require national standardisation to ensure that both pharmacies and individuals have the ability to securely receive electronic prescription notifications.

The ETP specifications do not assign responsibility for maintaining longitudinal medication records within the prescription exchanges, rather the ETP solutions are intended to integrate with external systems, such as the Personally Controlled Electronic Health Record, which are better suited to such roles. This means that the ETP specification does not support the storage of individual prescription and medication records over time, but it does support linkage to electronic patient records which have the capability of maintaining longitudinal records. The ETP does not support searching for all prescriptions for an individual, and prescriptions are no longer accessible after they have been fully dispensed.

Currently two commercial ePrescribing solutions have been developed and implemented in Australia, eRx and MediSecure[12] and are competing for market share.[5] Approximately 250 million prescriptions are generated annually in Australia.[13] Under the Fifth Community Pharmacist Act (FCPA),[5] pharmacists are paid 15c for each electronic prescription dispensed, however, both vendors charge the pharmacist 15c for each digital prescription processed, hence a cost neutral model exists for pharmacists while the benefits in terms of efficiency and quality are gained. This creates a market valued at over 35 million Australian dollars.

eRX was the first solution to market and is 50% owned by the Pharmacy Guild of Australia. This was quickly followed by MediSecure, which has been endorsed by the Royal College of General Practitioners of Australia. Both systems are offered free to general practitioners (GPs) and community pharmacists by the respective vendors, with GPs generally choosing to use one of the systems and community pharmacists possibly having to use both, as each system uses its own architecture and servers and messages are not interchangeable between them.

While national ePrescribing standards have been developed by NEHTA, no mechanism exists for the two systems to share prescriptions between them. Both solutions were on the market before NEHTA had finalised its standards and both vendors have indicated that they will implement NEHTA standards, which should lead to improved interoperability. Each solution has its own architecture with prescriptions available to pharmacists in any part of Australia, thus not limiting a patient's choice of dispensing pharmacy. Both systems allow for repeat prescriptions, prescriptions to be generated by pharmacist (possibly because the script did not come from a participating GP) and for prescriptions to be filled in advance of the patient's arrival at the pharmacy.

2.3 Governance Arrangements

NEHTA has committed to continuing work with the Australian government to ensure patient safety and privacy are reliably and effectively maintained during and following implementation of ETP. In order to allow for electronic signatures to be used for ETP, changes to each jurisdiction's policy are required such that ePrescribing and dispensing are permissible in all states and territories.[14] At a Commonwealth level, policy change is required to allow for the authorisation of payment for dispensed medications utilising electronic signatures independent of a paper prescription.

NEHTA has developed an overarching privacy management framework for all eHealth projects to ensure that NEHTA initiatives are in compliance with information privacy protection laws. Due to the fact that privacy legislation across the various states and territories is not the same, NEHTA has identified a set of privacy principles based on the National Privacy Principles that are common to all jurisdictions. NEHTA has specified the ETP service in line with these principles.[14]

NEHTA has also introduced security controls to ensure that only appropriately authorised users are permitted to access the ETP service.[14] It is intended that all users who access the ETP service must be authenticated with National Authentication Service for Health (NASH) credentials.[15] The NASH is a key foundational governance component for eHealth in Australia which allows for the digital authentication of health providers to ensure the security of health information. At present, the Department of Human Services has implemented an interim NASH service as development of the full service has suffered delays. The NASH service will issue digital credentials and certificates to providers and organisations secured by smartcards as tokens for verification. The interim NASH service allows for the validation of the identity of each provider accessing an ETP service. All interactions with the ETP service are recorded in an audit log, further enhancing security and enabling monitoring of access.[14]

2.4 Benefits identified

The benefits have been identified as:

- better clinical decision making, leading to safer and higher quality care, through timely access to selected health information about an individual if the ETP solution is linked to an electronic patient record
- a reduction in transcription errors and legibility difficulties caused by handwritten prescriptions
- improved efficiency in the Australian healthcare sector through improvements to health information flows and a reduction in duplicate prescribing
- reduced reliance on the individual's knowledge of their medication/prescription
- better support for a mobile population as they cross jurisdictional boundaries

- adoption of ETP standards ensures improved consistency in (and therefore better consumer understanding and control of) the policies, processes and mechanisms that are put in place to ensure the privacy of electronic healthcare records
- more informed individuals who take an active role in the management of their own medications where the individual has access to prescription notifications
- improved support for future permissible secondary uses of data to deliver further public benefits, such as more targeted health initiatives, public health planning, research, education and disease detection when the ETP solution is linked to a longitudinal electronic patient record.[14;16]

3. New Zealand

3.1 Introduction

New Zealand has a population of approximately four million people who predominantly reside in urban areas. The Ministry of Health has overall responsibility for health and disability services and provides advice to the Minister of Health and, in turn, the government of New Zealand on policy issues. For administrative purposes, New Zealand is divided into 21 District Health Boards (DHBs) that either provide or fund health and disability services for the population in each of the DHBs.[17] Primary healthcare, including GP services, are contracted by DHBs to primary healthcare organisations (PHOs) who either directly provide the services or indirectly through member providers.

Recent changes to the Ministry of Health structure include the creation of a National Health Board (NHB) to improve coordination between the 21 DHBs and supervise expenditure of public health funding. The NHB, which is a ministerial committee working within the Ministry of Health aims to consolidate national planning and funding of all IT, workforce planning and investment. The table below presents an overview of the main entities and their functions.

Table 1, Ministry of Health entities

Name	Function
National Health Board (2009)	Centralised agency, established in 2009, responsible for the collection and dissemination of all health information.
National Health IT Board (2010)	A subcommittee of the NBH which provides strategic leadership and funding for information systems.
Health Information Standards Organisation (2010)	An advisory committee to the National Health IT Board (NHITB) supports and promotes the development, understanding and use of fit-for-purpose health information standards.

The National Health IT Board (NHITB) is a subcommittee of the National Health Board. It aims to provide leadership across the New Zealand health and disability sector for IT investments that offer patient safety and value for money, and build relationships while progressing critical foundation investments to support an improved health information model. It also aims to support future healthcare delivery models and set a direction for the appropriate and effective use of personal health information. The NHITB replaced the Health Information Strategy Advisory Committee (HISAC), the committee previously tasked with developing and progressing eHealth standards in New Zealand.

3.2 ePrescribing in New Zealand

ePrescribing has been on New Zealand's health IT agenda since at least 2005 when the Health Information Strategy for New Zealand (HIS-NZ) 2005[18] focused on a system view of the health sector. The HIS-NZ provided the key elements for a federated electronic health information model to support and improve health outcomes, at both individual and population level. The strategy proposed 12 action zones ranging from national network strategy, identifiers for individuals and organisations, national systems including laboratory systems, ePharmacy systems, chronic disease management systems and an action zone relating to national systems access. Some of the actions zones were seen as building blocks and provided benefit in their own right, while others were dependent on the existence of these building blocks. Action zone 4, ePharmacy, detailed a roadmap for the development of a national ePrescribing solution.

Significant initial work focused on developing the standards required, including the business processes which would be supported, medical terminologies required, messaging standards to support the solution, and information models for repositories. The Health Information Strategy Advisory Committee (HISAC), a forerunner to the NHITB, developed the Electronic Pharmaceutical Business Process Standard (HISO 10030.1)[19] and the Electronic Pharmaceutical Messaging Standard (HISO 10030.2).[19]

The NHITB has initiated key projects including Health Identity, Shared Care Planning for Long Term Conditions and Community ePrescribing. In order to achieve this, the Board focused on prioritised areas including an eMedicines programme, National Solutions, Regional (DHB) Information Platforms and Integrated Care Initiatives.

The eMedicines Programme[19] is developing electronic systems to support the safe, effective and appropriate use of medicines. The eMedicines Programme includes:

- New Zealand ePrescription Service (NZePS) – the New Zealand ePrescription Service will send GP and hospital discharge prescriptions to community pharmacists electronically. National trials of the NZePS are underway.

- Inpatient ePrescribing will see medications for hospital patients recorded and charted electronically

- Medicines Reconciliation – electronic systems for medicine reconciliation will allow clinicians to view a list of the most current medicines a patient has been prescribed for comparison to medications dispensed.

- NZ Universal List of Medicines – this is New Zealand's national list of current registered medications that has been prepared for universal use across the health and disability sector.

- NZ Medicines Formulary – the formulary will provide prescribers with online, standardised and up-to-date information about the use of medicines.

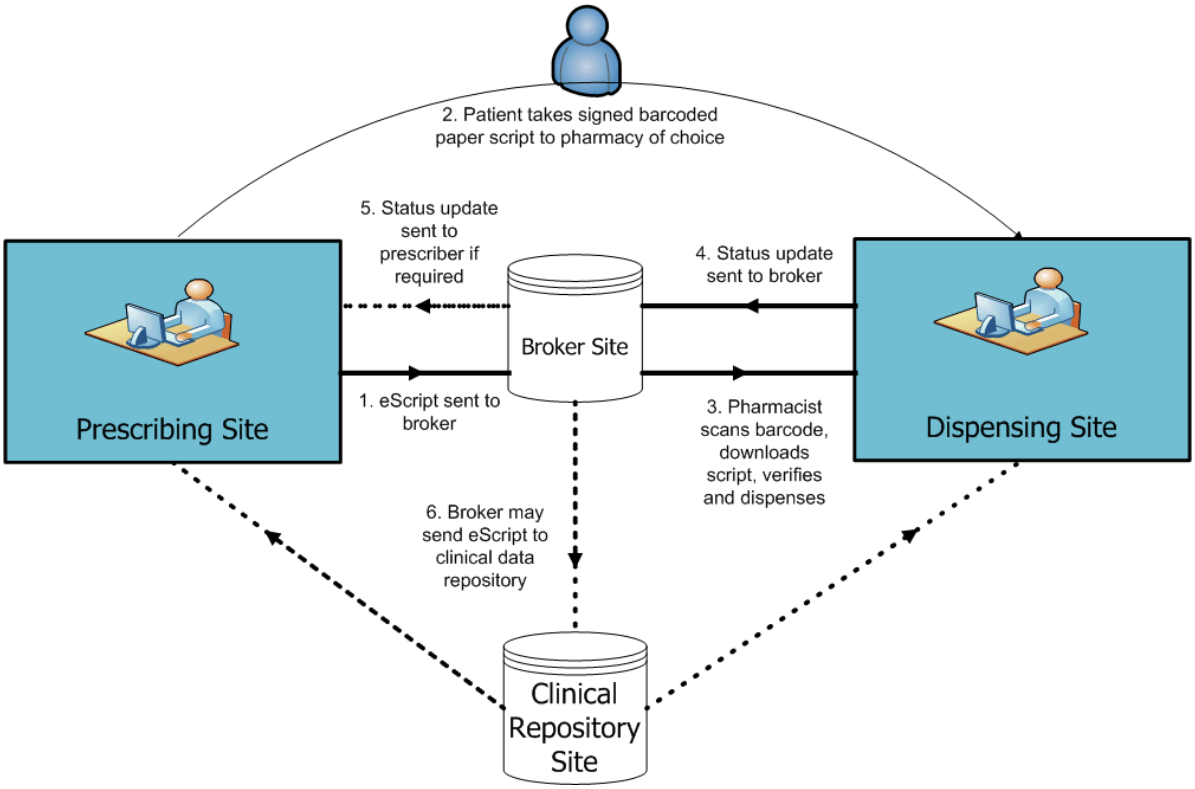
- Medication aspects of other projects including eReferrals, eDischarges, shared care planning, and clinical data repositories (CDRs).

The community trial of the NZePS began in March 2011 in Auckland. Initially the service covered one GP practice management system vendor and one pharmacy practice management system vendor. Following the initial trial, NZePS has expanded to include all GP and pharmacy vendors and three to four more regions with national roll-out started in July 2012.

In the first phase vendors developed and tested the initial version of the software. The solution included a central electronic repository for prescriptions, known as the transaction broker, and a systems based on uniquely identifying each prescription via a barcode printed on a paper prescription. The system enabled a prescription to be generated with a unique number at the prescriber's site and an electronic message containing the prescription information to be transmitted from the prescriber's practice management system to a transaction broker. At the time of prescribing, an electronic message based on the HISO 10030.2[20] standard is sent to the transaction broker and a paper prescription is generated and signed by the prescriber. The patient is given the signed prescription which includes a barcode containing the unique number printed on the prescription. This is illustrated in Figure 3 below.

Patients present to their chosen pharmacy with the prescription. A pharmacist may process the request manually using the information provided on the prescription, or they may use the barcode provided to retrieve the electronic prescription from the central server. Pharmacy systems are able to incorporate the patient and medication information provided in the electronic messages.

Figure 3. New Zealand - ETP



The model shown in Figure 3 above was chosen as there is a legislative requirement that prescriptions are printed and signed in indelible ink by a prescriber. The barcode does not contain any personal or clinical information and is used to uniquely identify the prescription sent to the transaction broker. It also allows pharmacists unlock and download the prescription into their practice management systems. In order to avail of the services the pharmacist is required to register with the NZePS.

The transaction broker supports receipt of a prescription in a secure electronic format. It stores the prescription in a secure form until the prescription has time expired either for legal validity or for subsidy eligibility. The transaction broker may forward the prescription on to clinical data repositories (CDRs) or clinical repository site if available, but is not a CDR itself. Doctors or pharmacists cannot search the broker for a list of the patient's current medications nor does it store any information on a patient's medication history. The systems used in the trial are also participating in the trial use of the NZ Universal List of Medicine, another project being lead by the NHIB. Finally, prescribers may not influence the patient's choice of pharmacy for any gain.

3.3 Governance arrangements

The NHITB has overall responsibility for the national ePrescribing solution in New Zealand. Information governance arrangements are currently fragmented in New Zealand and the NHITB has established an expert advisory group (EAG) to address this issue. In order to strengthen leadership and accountability for new health initiatives such as the ePrescribing solution, the NHITB is developing a national governance model in consultation with the EAG. The EAG comprises the Primary Health Care IT Governance Group, the District Health Board CEO Information Group, National Programmes Group and the Ministry of Health Major IT Projects Group.[21] An information governance framework is currently being developed by the EAG following an extensive public consultation. The new framework will provide governing standards and guidance to all e-health initiatives at a national level.[21]

Until the information governance framework is available to provide detailed guidance on governance of e-health initiatives, legislation in the form of the Privacy Act and the Health Information Privacy Code form the basis for information governance rules in the New Zealand health and social care sector.[22;23]

3.4 Benefits identified

Patients, people in care and the health and disability sector will benefit from the NZePS through:

- safer care because the NZePS reduces manual data entry and therefore transcription errors resulting in reduced risk of a prescribed medicine not being correctly dispensed
- safer care because prescribed medicines descriptions are more accurate and there is improved legibility of prescription details
- fewer hospital admissions or unwanted effects because prescribers and dispensers can monitor patient adherence with prescribed medicines
- having prescriptions dispensed more quickly through more efficient processes.

Healthcare practitioners who prescribe medicines will benefit from the NZePS through:

- the ability to receive notification when a patient collects prescribed medicines enables adherence monitoring and patient follow up
- reduced interruptions from pharmacies querying prescriptions
- fewer prescriptions having to be returned to the prescriber for correction because they do not comply with legal or subsidy requirements.

Pharmacists who dispense medicines will benefit from the NZePS through:

- the usage of the common list of medicines (the NZULM), in both prescriber and pharmacy systems, means the pharmacy can more quickly and accurately select the intended medicine for the patient
- improved quality of prescription information and therefore a reduction in time spent contacting prescribers to clarify or correct prescriptions
- being able to download prescription details and not having to enter them manually can potentially make the process more efficient with less room for error.

Organisations that fund the health and disability sector will benefit from the NZePS through:

- the potential reductions in costs from improved patient adherence and reduced hospitalisation by being able to monitor collection of prescriptions by individuals
- efficiency gains would enable pharmacists to provide other patient orientated services.

In addition, where information is being sent to a Clinical Data Repository (CDR), organisations responsible for the delivery of healthcare outcomes through population based strategies can also benefit from the NZePS through:

- more complete data about prescribing and dispensing being sent to the CDRs
- the provision of new services such as Medicines Use Review, whereby an individual's adherence to collecting prescribed medications could potentially be delivered at lower costs due to improvements in information and process efficiencies brought about by collection notifications enabled by the NZePS
- the CDR being an additional, trusted information source to aid medicines reconciliation, once the ePrescription service has been subscribed to by the majority of GPs and pharmacists
- the supporting of optimised prescribing, e.g. improving the management of long-term health conditions
- being able to recall prescribing and dispensing history when seeing a different healthcare practitioner
- enabling the development of quality programmes, e.g. reducing wastage by prescribing appropriate quantities of medicines; addressing and reducing unexplained variability in prescribing patterns among providers; establishing evidence base for use of new and/or potentially expensive medicines.

4. The Netherlands

4.1 Introduction

The population of the Netherlands is approximately 16.5 million; it is one of the most densely populated countries in the world with the majority of its population residing in urban areas. The Netherlands is divided into 12 provinces and 646 municipalities. The decentralised governing bodies have a significant portion of the responsibility for running the healthcare services.[24]

In 2006, a major reform of the Dutch healthcare system came into effect, for many reasons, including the need to curb increasing healthcare expenditures. At the core of this new system is the health insurance act or Zorgverzekeringswet (ZVW).[25] The key characteristics of the health insurance reform was that health insurers offer basic health insurance package to citizens, who in turn, are obliged to take out health insurance. More than 90% of the population purchases supplementary health insurance coverage as well, such as for dental care, glasses, and physiotherapy. Low income citizens can qualify for a healthcare allowance towards the cost of their premiums.

There are two main parties involved in health information standards, depending on the area of healthcare or the type of information. Table 2 below provides an overview of these organisations and their functions.

Table 2, Involvement in health Information Standards

Name	Function
The Ministry of Health Welfare and Sport	The Ministry of Health Welfare and Sports' remit is to define policies that aim to ensure the wellbeing of the population in the Netherlands and aim to help the populace to lead healthy lives.
National ICT Institute for Health Care (NICTIZ)	NICTIZ provides advice and direction on the Elektronisch Patienten Dossier EPD (EHR) and IT agendas for the coming years, including priorities and milestones.

4.2 ePrescribing in the Netherlands

GPs in the Netherlands have traditionally been very proactive and have generally worked closely with professional organisations such as the Dutch College of General Practitioners (Nederlandse Huisartsen Genootschap or NHG) whose mission is to

provide scientific support for general practice, and the Dutch Association of General Practitioners (Landelijke Huisartsen Vereeniging or LHV) which supports and represents GPs at national and international level.

As early as the mid 1980s, GPs and IT professionals recognised the opportunities of IT in providing population-based services that would make processes more efficient. They joined together and formed the Coordination Workgroup on Informatisiation and Automation (Werkgroep Coordinatie Informatisering en Automatisering or WCIA).[26] This workgroup, in collaboration with vendors, agreed minimum requirements for functionality and quality in practice management systems.

Subsequently the Dutch government implemented a policy whereby GPs would be reimbursed the expense of computerisation of their practices provided they were using a WCIA certified and approved system, resulting in high penetration of practice management systems. ePrescribing was considered an essential module in a practice management system, traditionally producing a paper prescription. Over time, decision support systems and the ability to electronically transmit prescriptions using the EDIFACT messaging standard were incorporated into practice management systems.[27]

In the late 1990s a separate national ePrescribing application was developed, known as the Elektronisch Voorschriff Systeem (EVS),[26] to enable prescribing based on standard guidelines from the NHG. The EVS was originally distributed on CD but subsequently integrated in practice management systems. It advised on the most appropriate therapy based on multiple factors including the patient's diagnosis (ICPC coded), age, co-morbidity, family history.

In parallel, regional networks (OZIS) clusters were developed to facilitate electronic communications to and from general practitioners' practice management systems. The regional clusters facilitated the development of electronic transmission of prescriptions allowing prescriptions to be generated by GPs and sent to community pharmacists.[28]

Other initiatives which had facilitated ePrescribing in the Netherlands included:

- the early adoption of EDIFACT as the messaging standard for the regional network clusters and investment and funding for vendors to implement this messaging standards in their products
- the maintenance of a national drug reference catalogue, maintained by the Royal Dutch Association for the Advancement of Pharmacy
- the existence of a national healthcare identifier which uniquely identified all patients in the Netherlands.

In January 2002, the Dutch government established NICTIZ (http://www.nictiz.nl) to facilitate communication amongst the healthcare stakeholders. NICTIZ is a publicly sponsored organisation, bringing together different stakeholders in the Dutch healthcare system, and it provides a nationwide vision for building a national electronic health record (EHR) that can fully represent all relevant patient data for

every healthcare stakeholder at any time and at any place. Building on the regional networks NICTIZ have been implementing a national secure network and interoperability framework, known as AORTA. Standards selected for this include the Health Level 7 Version 3 standard and the Systemised Nomenclature of Medicine (SNOMED).

As a short-term goal, NICTIZ focused on exchanging medication records, which were considered to be of common interest amongst healthcare practitioners. The initial plan was to have patient medication records available in one region in 2004 and nationwide in 2006. This plan seemed to be realistic at the time and NICTIZ succeeded in taking good steps in defining standards and providing the necessary technical infrastructure for an inter-organisational communication. However, it later became clear that the plan was too ambitious to be realised within the timeframe. NICTIZ has since developed a national healthcare information hub, known as Landelijk Schakel Punt (LSP, literal translation National Switching Point) which makes information exchange between different care providers feasible. No patient information is stored in the hub, except that a record of what information on which patient is kept by which healthcare practitioner is stored as well as a log of who has accessed what information. In principle, GPs could read a professional summary of a patient's record by using their care unique identification card, while physicians and pharmacists could read the medication overview of patients. To date there has been a slow transition away from the regional networks to AORTA with only 20% of healthcare practitioners having signed up to use it by 2010 due to concerns about privacy and confidentiality. During 2011 the AORTA project was paused subject to resolution of privacy and confidentiality issues.

4.3 Governance arrangements

There are a number of key pieces of legislation in the Netherlands which govern ehealth initiatives, namely the Use of Citizen Service Number in Healthcare Act, the Personal Data Protection Act and the Electronic Health Record Act. These laws provide for the electronic transfer of personal information, including prescription information in a safe and secure manner.[29]

A governance model has been developed for national ehealth initiatives with the purpose of ehealth agenda setting, decision making and implementation monitoring. The IT and Innovation Platform is responsible for the coordination and agenda preparation for the national IT and electronic health record processes, and the IT and Innovation Steering Committee is responsible for the decision-making process and supervision of the national IT and electronic health record processes. The Steering Committee has also commissioned NICTIZ to coordinate the development of the programmes. Each approved programme is assigned an advisory committee with responsibility for ensuring the programme is managed and implemented in line with national legislation and standards.[29]

5. England

5.1 Introduction

The National Health Service (NHS) in the United Kingdom (UK) was established in 1948 to provide healthcare to the population. The NHS provides free healthcare to all residents of the UK except for a small charge for prescriptions, dental and optical services.[24] The NHS is financed by the taxpayer but is managed separately for England, Scotland, Wales and Northern Ireland.

There are 10 Strategic Health Authorities (SHA) in England and each SHA is responsible for enacting the directives and implementing fiscal policy as dictated by the Department of Health at a regional level. In turn each SHA area contains various NHS trusts which take responsibility for running or commissioning local NHS services. The SHA is responsible for strategic supervision of these services.

Health information has received much attention in the last few decades in England and has been covered in a number of publications, one of which is *Information for Health and Information Strategy for the Modern NHS from 1998 – 2005.* This strategy set out 'a radical programme to provide NHS staff with the most modern tools to improve the treatment and care of patients and to be able to narrow inequalities in health by identifying individuals, groups and neighbourhoods whose healthcare needs particular attention'.[30]

There was a change of government in the UK in 2010 which brought about even more emphasis on the importance of health information and its use in healthcare, in particular for the patient, and this is evidenced in a white paper entitled *Equity and Excellence: Liberating the NHS*.[31] This paper states the goal that 'that nationally comparable information is published in a way that patients, their families and clinical teams can use'.[31] It also outlines the vision and changes that will occur in the NHS that has at its core that 'patients will be at the heart of everything we do'.

NHS Connecting for Health, launched in 2005, was an NHS directorate with responsibility for delivering the National Programme for IT (NPfIT) with the major goal of achieving an EHR across health and social care in England. The NPfIT project, once described as the largest IT project ever undertaken outside of the military, has ceased prior to completion due to spiralling costs and a lack of value for money. However, the NHS Electronic Prescription Service remains as a successful and vital part of this programme.

In May 2012, the Department of Health published *The Power of Information: Putting all of us in control of the health and care information we need*. This document provides the formal government response to the NHS consultation document *Liberating the NHS: An information Revolution* and should be cross referenced with *Equity and Excellence: Liberating the NHS* mentioned above.[31;32] It is intended as a 10-year strategy with the aim of harnessing information and new technologies to achieve higher quality care and improve outcomes for patients and service users.

This strategy recommends continuing the roll out of the NHS Electronic Prescription Service and building upon this by implementing ePrescribing outside of GP practices such as within hospitals.[32]

5.2 ePrescribing in England.

EPrescribing is being implemented through a programme known as the Electronic Prescribing Service (EPS).[33] The EPS is a service comprising a number of key components, ranging from functionality in prescribing systems in primary and secondary care, dispensing systems in pharmacies and centrally managed functionally referred to as 'the spine'. Some of the functions are centrally managed by the NHS and others, especially in the pharmacy sector, are the responsibility of pharmacies to contract with the system suppliers.

EPrescribing has been managed as two specific releases – Electronic Transmission of Prescriptions Release 1 (R1) and Electronic Transmission of Prescriptions Release 2 (R2). Prescribers and dispensers are required to register to use the system and connect to services. Once registered, users are issued with smartcards which control their access to the system. The releases are summarised in the Table 3 below.

Table 3, Electronic Transmission of Prescriptions releases

Software	Phase
Electronic Transmission of Prescriptions Release 1 (R1)	1 – Initial implementers
	2 – Nationwide deployment
Electronic Transmission of Prescriptions Release 2 (R2).	3 – Transition
	4 – Full ETP

The approach is based on increasing the functionality in prescribing and dispensing systems incrementally, with the electronic transmission of barcoded prescription data between prescriber and dispenser initially. Paper prescriptions are still required in the R1 implementations. R1 brings minimal changes for patients and staff – the only noticeable difference being the addition of a barcode when prescriptions are printed.

R2 provides enhanced functionality for users and will deliver tangible benefits for patients, prescribers and dispensers. R2 allows:

- nomination of a dispenser – a new process that gives patients the option to choose, or 'nominate', a dispenser to which their prescriptions can be sent electronically, via the EPS
- electronic cancellation of prescriptions – prescribers (and other authorised staff working in the GP practice where the prescription was generated) will be able to cancel electronic prescriptions at any point up until they are dispensed
- electronic repeat dispensing – prescribers can electronically sign, and therefore authorise, a specific number of repeat prescriptions, alleviating the

need for patients to go back to their GP each time to collect another prescription.

- submission of electronic reimbursement endorsement – dispensers will be able to submit endorsement messages for electronic prescriptions (that have been dispensed against) electronically.

Prescribers may only use the functionality provided by R2 if the prescriber, through their Primary Care Trust (PCT), is specified in directions issued by the Minister for State. Initially 17 initial implementers were identified by the Secretary for State; this number now has grown to 83 as of December 2011.[34] Any electronic prescription issued in the PCT implementers list may be dispensed by any pharmacy, and pharmacies are not required to be identified in order to support R2.

As depicted in Figure 4, the selected architecture for EPS, both R1 and R2 involves locally and centrally managed services. The messaging is based on HL7 Version 3 and the HL7 Clinical Document Architecture standard.

Figure 4. England – EPS Architecture

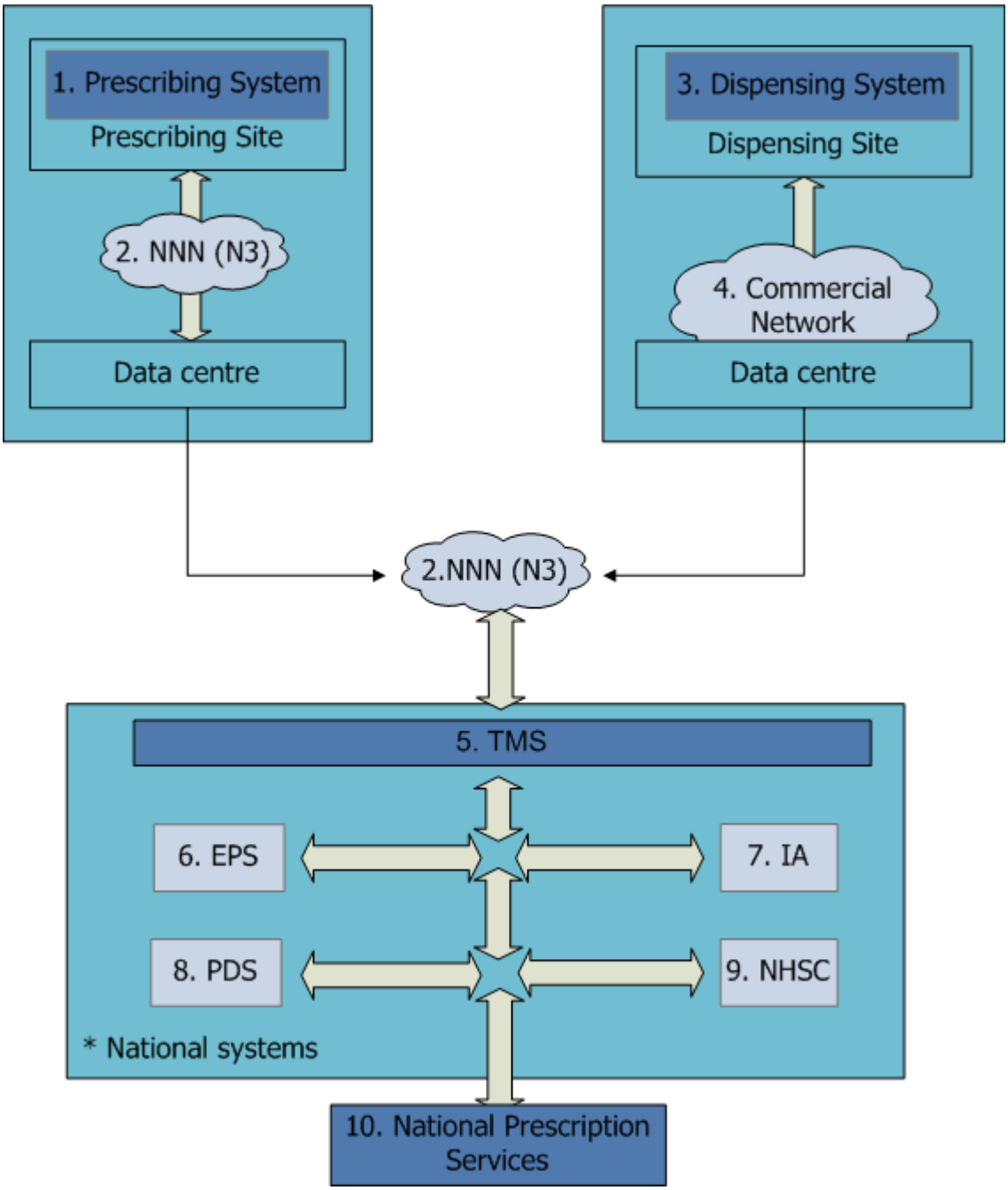


Table 4. Acronym descriptions

Acronym	Acronym description
NNN	New NHS Network
TMS	Transaction Messaging Service
EPS	Electronic Prescription Service
IA	Identity Agent
PDS	Personal Demographics Service
NHSC	National Health Service Choices

1. Prescribing systems include GP Practice management systems and community care practice management systems which are developed and supplied by system vendors after they have passed a rigorous certification process.

2. The N3, the New NHS Network, is the NHS national broadband network linking hospitals, medical centres and GPs in England and Scotland.

3. The dispensing systems reside in the pharmacy domain and are the systems used during the dispensing process in pharmacies and include barcode scanners and smartcard readers.

4. Pharmacies are obliged to contract with systems suppliers for network connectivity to N3. The most common way pharmacy management systems suppliers use to connect to N3 is to connect large multisite organisations or aggregate single pharmacies through a data centre and then onwards to the national network.

5. The Transaction Messaging Service (TMS) is a service supported centrally within the spine. It is the NHS mechanism for routing and delivering electronic messages to and from the intended components within the spine.

6. The Electronic Prescription Service (EPS) is a component of the spine. It is a transient message store which holds the electronic messages sent during both the prescribing and dispensing processes.

7. The Identity Agent (IA) is the service which checks users' credentials and informs the prescribing and dispensing systems of the access rights to functionality for individual users. The prescribing and dispensing system uses this information to allow users access to functionality within the respective IT systems.

8. The Personal Demographics Service (PDS) contains demographic information on users of the NHS, including name, address, associated demographics and nominations and holds a unique number, known as the NHS number, for each registered user of the NHS.

9. NHS choices (NHSC), the website which provides access to individuals, professionals and suppliers to information about NHS services, holds information on the level (EPT 1 or EPT Release 2) for dispensing sites.

10. The NHS Prescription Service is the service which reimburses pharmacies for prescriptions dispensed, where eligible.

Several reasons were identified for taking a gradual and phased approach to implementing ePrescribing in England. One obvious reason was the logistical challenges posed by an implementation of the size of the project in England. The

need to deploy at the local level and coordinate this activity with other national initiatives including the Identity Agent, the Personal Demographic Service and NHS Choices was also recognised.

It was also identified that there was a need to maintain patient choice and access to medications. For example problems would arise if patients were issued with electronic prescriptions and there were no local pharmacies which could supply the medication. Pharmacies were also concerned that if the choice of dispensing pharmacy was selected by the prescriber then patients would have less choice and pharmacies favoured by the prescriber would benefit commercially to the detriment of others.

Therefore during R1 and R2 the electronic service runs in parallel with the existing paper process. A patient is still able to take a paper prescription to a pharmacy of their choice and have their medication dispensed, irrespective of whether or not the pharmacy is operating the electronic service.

The incremental approach allows users to become familiar with the operation of key aspects of the service while not being dependant on the service.

5.3 Governance arrangements

Overall governance of the EPS programme is provided by the EPS Programme Board, which provides a forum for both policy makers in the form of England's Chief Pharmacist, representatives from the Medicines, Pharmacy and Industry Group in the Department of Health, as well as representatives from the agency responsible for delivery of the service, Connecting for Health (CfH).[35]

All NHS organisations, including healthcare providers involved in the EPS programme, are required to assess their compliance with information governance (IG) standards through the IG toolkit. The toolkit is a nationally agreed electronic self-assessment form. It was developed as part of the National Programme for Information Technology (NPfIT), which formed part of CfH. Trusts/NHS organisations publish an annual report on compliance with the IG toolkit. The toolkit provides a framework to bring together the requirements, standards and best practice that apply to the handling of health information.[36;37]

A number of acts contain provisions relating to health IG in England. Of these, the Data Protection Act 1998[38] and the Freedom of Information Act 2000[39;40] are most significant. The Department of Health, UK, has developed codes of practice for the NHS that are primarily based on the provisions contained in these pieces of legislation. These in turn have informed the development of policies and procedures at a provider level.[41] Providers with involvement in the EPS programme must also comply with the legislation and codes of practice to ensure that the use of information enabling the electronic transfer of prescriptions does not breach any of the IG provisions in legislation.

5.4 Benefits identified

The benefits of EPS have been identified as follows:

Benefits for patients

- The EPS will bring benefits for patients and their representatives – the extent of which will depend on individual circumstances including a more convenient service with a reduction in trips to the GP practice just to collect, or request a paper prescription – particularly for patients receiving repeat medication.
- The EPS also gives patients greater freedom of choice, making it simpler for them to use a dispensing contractor convenient to them.
- Potentially, it will also reduce pharmacy waiting times as dispensers will have the opportunity to prepare prescriptions in advance of the patient's arrival.

Benefits for prescribing staff

- There will be a reduction in workload generated by patients requesting and collecting individual prescriptions and the ability to make wider use of the repeat dispensing service.
- After reviewing electronic prescriptions on screen, prescribers can either sign electronic prescriptions individually or select multiple electronic prescriptions to sign. This will potentially result in a considerable reduction in workload and make the prescribing process more efficient.
- Prescribers will also have the ability to cancel electronic prescriptions at any point up until they are dispensed and to record the reason they were cancelled.
- Where currently a GP practice operates a prescription collection service, staff will no longer need to sort (or post) prescriptions, saving both time and resources.

Benefits for dispensing Staff

- The Electronic Prescription Service frees up dispensing staff from the work associated with re-keying prescription information.
- As nominated electronic repeat prescriptions can be received prior to the patient arriving, R2 allows dispensers to prepare medications in advance. It can also help them to manage stock control more effectively and order out-of-stock items in a timely manner.
- Dispensing staff currently offering prescription collection services will no longer be required to physically collect prescriptions from GP practices for patients who have nominated them.
- For electronic prescriptions, dispensers will be able to manage the submission of reimbursement endorsements electronically. This will reduce the volume of paper that needs to be sorted and posted at the end of each month.

6. Northern Ireland

6.1 Introduction

The NHS in Northern Ireland is referred to as Health and Social Care (HSC). Like the NHS in England, healthcare is free at the point of delivery but unlike the English NHS health and personal social services are integrated in Northern Ireland to include social care services such as home care services, family and children's services, day care services and social work services.

The Department of Health, Social Services and Public Safety (DHSSPS)[42] has overall responsibility for health and social care in Northern Ireland. Operational responsibility for health and social care is delivered through a number of bodies including the Health and Social Care Board (HSCB), the Patient and Client Council, the Public Health Agency, and the Business Services Organisation (BSO), and is regulated by the Regulation and Quality Improvement Authority (RQIA).

As part of a recent restructuring programme the HSCB replaced four regional boards and is responsible for commissioning services, resource management and performance management and service improvement for the health and social care service throughout Northern Ireland. Health and social care services are directly provided through the five regional HSC trusts.[42] The regional HSC trusts became operational in 2007 and were created from a merger of 19 former trusts. The HSC trusts manage and administer hospitals, health centers, residential homes, day centers and other health and social care facilities and they provide a wide range of health and social care services to the community.

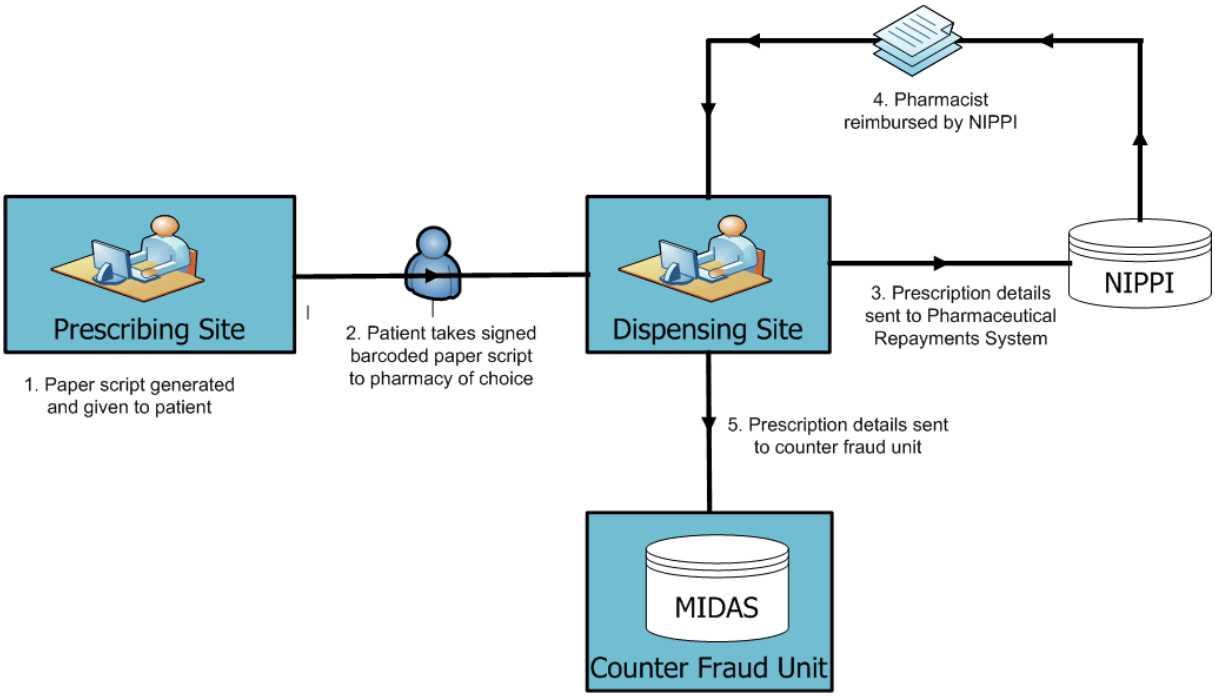
6.2 ePrescribing in Northern Ireland

As of 2008 Northern Ireland had implemented its Electronic Prescribing and Eligibility System (EPES). The project aimed to capture and record prescription information in electronic format at community pharmacy level and transfer this information to a central point in order to reduce prescription fraud. The origin of the project was the recognition that significant losses to the public purse and healthcare were occurring as a result of fraudulent claims by patients. Although 90% of all prescriptions in Northern Ireland were dispensed free of charge at the time, there was a requirement for those not eligible to pay £6.65 per item, generating an income of almost £43 million per annum. It was estimated that approximately £7 million was being lost annually by patients fraudulently claiming they were eligible for free medication.

Northern Ireland settled on an implementation which relied on the use of a two-dimensional (2D) barcode technology as illustrated in Figure 5. A 2D barcode is a graphical image that stores information both horizontally – as one-dimensional bar codes do – and vertically. As a result of that construction, 2D codes can store up to

7,089 characters, significantly greater storage than is possible with the 20-character capacity of a one-dimensional barcode.

Figure 5. Northern Ireland – EPES Architecture



To each prescription a 2D barcode was added which contained a unique identifier of the prescription, patient information, prescriber information and medication prescribed information. Essentially all of the information on a paper prescription was encoded into the barcode using XML technologies, so rather than investing in electronic transmission of prescription from prescribers to pharmacists the paper prescriptions were used to transmit the information.

Once the prescription is presented by the patient at a pharmacy all of the information contained in the 2D bar code can be read and automatically transferred into the pharmacy's IT system using commercially available 2D barcode readers. Pharmacists then use their clinical judgment to dispense or alter the prescription and prescription and dispensing information is fully recorded in the pharmacy, along with manual input of the patient's payment or claim eligibility for free medication.

A full record may then be sent by the pharmacy to the central EPES database where the information is used to reimburse the pharmacy and to check Social Security Agency records for any fraudulent claims by patients. The paper prescription is also sent to the Prescribing Pricing Division of the NHS Business Services Authority where a full scan is made and it is added to the record on the EPES database. Finally a patient's receipt can be generated by the pharmacist and given to the patient as a record of the transaction. Prior to the implementation of the system, in many instances of fraudulent activity patients initially accused community pharmacists of

"pocketing the money" or "failing to record my details" correctly. The introduction of the patient's receipt protected pharmacists against these accusations.

6.3 Governance arrangements

Governance in health and social care and of the EPES system is the responsibility of individual trusts under the Department of Health, Social Services and Public Safety. The Code of Practice on Protecting the Confidentiality of Service User Information (2012) ensures that the privacy and confidentiality of individuals is safeguarded and all health and social care providers must adhere to this code when accessing or processing identifiable personal information.[43]

The Northern Ireland Health and Social Care Standard on Information and Communications Technology requires that providers use a consistent, comprehensive and systematic approach to the management of electronic information and systems.[44] This ensures that in terms of information governance, the EPES system represents an improvement in safe communication between pharmacists and care providers by improving data quality and reducing fraud by strengthening identity practices.

6.4 ePrescribing in Wales (based on Northern Ireland model)

The Electronic Transfer of Prescription service for Wales, known as '2DRx', is based on the Northern Ireland architecture with some localisation of the information carried in the 2D barcode on the prescription. The Welsh implementation allows for different values to be carried in certain fields (prescription type); additional fields were added (the number of drugs on the prescription, the age of the patient); the algorithm used to generate the unique number to identify the prescription in Wales is different from Northern Ireland; and certain fields which were optional in the Northern Ireland implementation were mandated in the Welsh implementation (Middle name, Title, Patient's gender).

All GP practices in Wales now generate 2D barcoded prescriptions under the 2DRx project and Wales is in the process of enabling all its pharmacies to scan the prescriptions using a barcode scanner. A further stage of the project, which will enable pharmacies to submit electronic claim to the NHS Wales prescribing Services Unit, is to follow.

7. Scotland

7.1 Introduction

The National Health Service in Scotland (NHS Scotland) is responsible for the provision of public healthcare to the 5.2 million residents of Scotland. NHS Scotland comprises 14 area NHS boards and a number of special National Health Boards (NHBs). The area NHS boards are responsible for healthcare in their respective regions and the special NHBs for some services on a national basis including the Scottish National Blood Transfusion Service, the Scottish Ambulance Service and NHS Quality Improvement Scotland.[45]

7.2 ePrescribing in Scotland

Scotland has been investing in ePrescribing for almost 10 years. To make both prescribing and payment processing more efficient, the Scottish Government's ePharmacy Programme has been working to put in place the IT infrastructure to allow prescriptions to be sent electronically between GPs and Community Pharmacists since 2001. One of the aims of the programme is to improve patient care and also reduce GPs' workload by making better use of pharmacists' skills and expertise, especially for minor ailments and chronic conditions.

The electronic transfer of prescriptions (ETP) provides the IT technology to support two programmes, the electronic Acute Medication Service (eAMS) and the electronic Chronic Medication Services.[46]

ETP aims to enable electronic generation, transmission, dispensing and processing of prescriptions. The Scottish Government established a pilot project within the Ayrshire & Arran Primary Care Trust[47] to develop a system to establish the necessary functionality for the electronic transfer of prescriptions between 2001 and 2002. Suppliers of pharmacy and general practice systems were engaged and the relevant functionality was built into these systems.

The *Right Medicine* report[48] suggested that the project's objectives should be broadened to include the development of e-applications that would support the future delivery of community pharmaceutical services and improve communications across the healthcare team.

To reflect the extended remit, the initiative as a whole was re-badged as ePharmacy. The first component of ePharmacy infrastructure was the connection of all community pharmacists to the NHS net, the NHS email system. A connection programme began in October 2004 and upon completion in April 2005 it allowed access to the NHS net website and NHS email, for community pharmacists. Initially eAMS has been introduced across Scotland using both electronic prescriptions and paper prescriptions which facilitates testing the IT infrastructure fully.

The systems were rolled out nationally in 2008, with 1.9 million prescriptions sent electronically in July 2008. In late 2009 almost 80% of GP practices and community pharmacies systems had been enabled with an estimated 3.5 million prescriptions generated annually.

The eAMS prints a 2D barcode on prescriptions at a GP surgery and sends an eScript to Scotland's ePharmacy Message Store (ePMS), as depicted in Figure 6. When a patient presents at a pharmacy with their barcoded prescription, the pharmacist can scan the barcode to pull down the prescription and dispense the medicine. Dispensing a prescription triggers the creation of an electronic claim message to NHS National Services Scotland (NSS).

Figure 6. Scotland – ETP Architecture

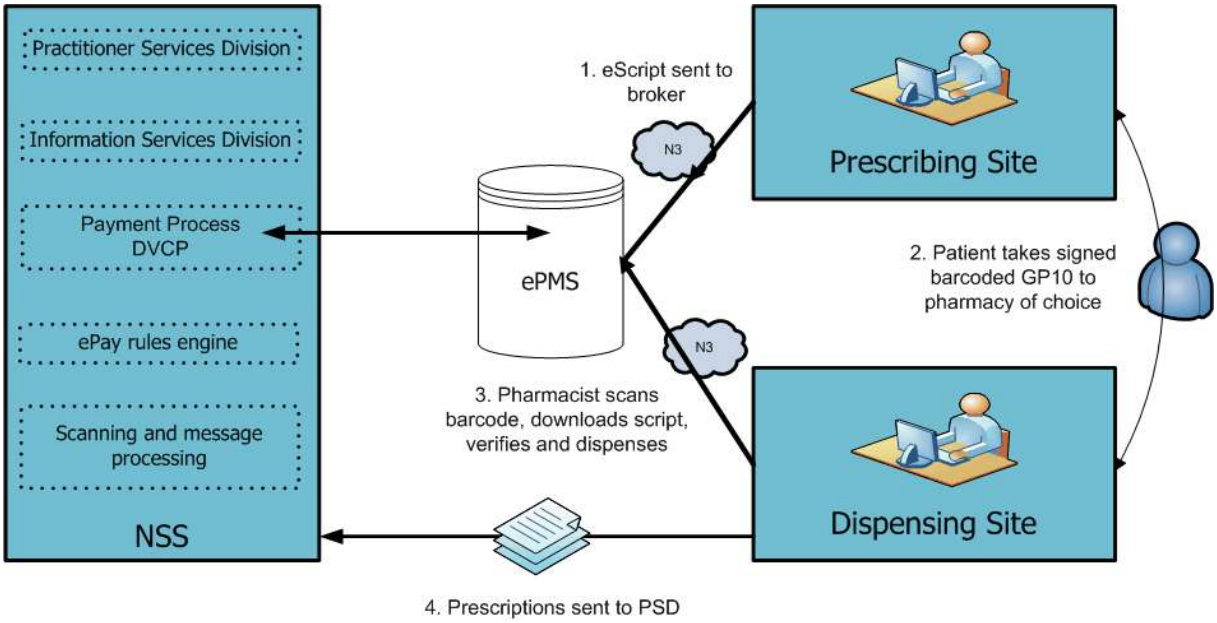


Table 5. ETP Architecture Acronym Descriptions

Acronym	Description
ePMS	ePharmacy Message Store
DVCP	Automated payment process
PSD	Practitioner Services Division
GP10	Prescription form filled out by GPs in Scotland
NSS	NHS National Services Scotland

7.3..Governance arrangements

The Scottish approach to health IG has been heavily influenced by the English model. An *NHS Scotland Information Security Policy Statement* [49] was published in 2006 by the Scottish Executive Health Department Directorate of Primary Care and Community Care. This policy statement updated the *NHS Scotland IT Security Policy* which had been established in 1993. The aim of the policy is to safeguard the confidentiality, integrity and availability of all forms of information within NHS Scotland. Similar to England, an IG toolkit is also available in Scotland to ensure all health and social care providers are aware of their information governance responsibilities.

In February 2007 NHS Scotland published a *Brief Guide to Information Governance*. The Guide defines IG as a framework for handling information in a confidential and secure manner in accordance with ethical and quality standards. This framework ensures that information is:[50]

- held securely and confidentially
- obtained fairly and lawfully
- recorded accurately and reliably
- used effectively and ethically
- shared appropriately and legally.

The ePrescribing initiative in Scotland represents an improvement to patient safety in terms of information governance by reducing the numbers of medication errors, transcription errors and incorrect identity errors.[51]

8. Summary of the United States, Denmark and Sweden

8.1 United States

The US system is primarily one of private insurance, with governmental insurance provided for certain citizens who do not have private insurance. Since the 1940s most insurance was paid for by employers who offer healthcare benefits as a form of compensation to attract employees. However, with excessive inflation of healthcare costs, many employers are being forced to reduce the healthcare related benefits. During 2010, the cost of healthcare insurance plans rose at a rate of three times the rate of national inflation in the US.[52] This has led to employees having to bear an increasing percentage of healthcare costs on their own. This has been a significant contributing factor to the rise in the number of people without health insurance in the US, currently estimated at 45 million or nearly 17% of the population. This has perpetuated a situation whereby those least able to pay actually pay more for their healthcare.

In addition to private healthcare, the US system has several public funded components:

- Medicare (a federal programme that covers individuals aged 65 and over, as well as some disabled individuals)
- Medicaid (a programme designed for the low-income and disabled)
- the Children's Health Insurance Program (designed in 1997 to cover children whose families make too much money to qualify for Medicaid but make too little to purchase private health insurance)
- the Veterans Health Administration (is a federally administered programme for military veterans).

Following on from the IOM 'To err is human, Building a Safer Healthcare System' the Medicare Prescription Drug, Improvement, and Modernization Act (MMA) 2003[53] required Medicare to support ePrescribing, with a planned implementation date of April 2009. Implementation was slow, with approximately 0.4% of office-based prescribers using ePrescribing in 2004. Subsequent to this, standards to support the MMA were agreed in 2005 and piloted in 2006. Also in, 2006 the IOM published a pivotal report 'Preventing Medication Errors'.[54] This report laid out a blueprint for improvements to medication safety. The report made clear that providers had many opportunities to improve. Technologies, such as computerised physician order entry or ePrescribing and computerised adverse drug event monitoring, would undoubtedly play a key role. The report also emphasises how essential a cultural change, combined with well-designed technologies, would be necessary to achieve the next level of safety called for in the IOM report.

In 2007 the Center for Improving Medication Management (CIMM)[55] was established. The CIMM serves as a centre for excellence. It is a collaborative forum

that establishes project-specific priorities to demonstrate the value of pharmacy interoperability with both patients and physicians for the purpose of improving the medication management process. The aspects of the medication management focused on are

- best practice as it relates to processing prescriptions electronically
- improving patient compliance with physician medication orders by utilising electronic communications between the patient, pharmacist, and physician.

The center educates clinicians and their staff on the best approaches to implementing ePrescribing technologies and integrating them with the day-to-day workflow. Following this, ePrescribing was legalised in all 50 US states. Momentum increased with the National ePrescribing Safety Initiative which provided free software for prescribers.

Two further Acts incentivised the use of both ePrescribing and the electronic health record (EHR). The Medicare Improvement for Patients and Providers Act 2008 (MIPPA)[56] offered a 2% bonus payment in 2010 for qualified ePrescribers that prepared and sent prescriptions to pharmacies electronically using a certified ePrescribing system. Such systems could be standalone systems or embedded in EHR software. Reimbursement was offered through to 2013, with a maximum of 2% available in 2009 and 2010, falling to 1.5% in 2011, 1% on 2012 and 0.5% in 2013. MIPPA also created a penalty for prescribers who do not use ePrescribing by 2012, specifically those prescribers will suffer a penalty on the Medicare reimbursement rates starting at 1%. The requirement for compliance is relatively low, with prescribers required to send only 10 prescriptions in the first six months of 2011 to avoid MIPPA penalties in 2012 and 25 prescriptions in 2012 to avoid penalties in 2013.

A second incentive, the Health Information Technology for Economic and Clinical Health Act (HITECH), a key component of the American Recovery and Reinvestment Act (ARRA), provided $19 billion towards the adoption and meaningful use of health information technologies.[57]

The HITECH Act provided a substantial financial incentive to encourage physicians and hospitals to adopt health IT by 2014. The incentives focus on providing direct payment for the adoption, implementation and maintenance of electronic health records (EHRs) to eligible professionals who establish meaningful use of an EHR. Eligible professionals, who become 'meaningful' EHR users quickly, by 2010 or 2011, would receive the maximum payment of $44,000. Those who choose to adopt an EHR a couple of years later will receive $24,000. Eligible professionals in designated shortage areas will receive a 10% increase in their bonus payment.

ePrescribing is considered a key component of meaningful use components, including a mandatory requirement that EHR systems must be capable of electronic prescriptions routing to pharmacy, and that a minimum of 40% of eligible prescriptions must be sent electronically during a reporting period.

In 2011 570 million prescriptions,[58] or 36% of the total number of prescriptions issued in the US, were sent electronically from prescriber to dispenser and almost 58% of office-based doctors used ePrescribing software. This was an increase of over 800% from 68 million prescriptions in 2008 figures. ePrescribing in the US has possibly surpassed its tipping point with significant increases in uptake each year since 2008.

8.2 Denmark

Denmark is a constitutional monarchy and a parliamentary democracy. It has a population of approximately 5.5 million people and is divided into five regions and 98 municipalities for administrative purposes. The Ministry of Interior and Health is in charge of the administrative functions in relation to the organisation and financing of the healthcare system, including psychiatry, healthcare insurance and pharmacies. Operational responsibility for healthcare is devolved to the five regions and operational responsibility for social care is devolved to the municipalities.[59]

Denmark has a long history of ICT adoption in healthcare; by the late 1990s almost 100% of general practitioners used electronic patient records (EPRs). In a study undertaken by Empirica in 2007, Denmark was ranked first in use of ICT in general practice in Europe.[60] Key initiatives include:

- Medcom (www.medcom.dk) is an ICT organisation dating back to the early 1990s that arose out of collaboration between IT specialists and healthcare professionals. Initially funded as a one-off healthcare project it was made permanent with formal funding (approximately €3 million annually) in 1999
- a national eHealth portal (Sundheld.dk) – provides an interface between patients, healthcare practitioners and institutions
- SDSD-Digital Health – a cross-governmental organisation set up to coordinate the national Health IT strategy 2008-2012 development programme.

ePrescribing activity has existed in Denmark since the early 1990s driven by general practitioners' demands and the work undertaken by Medcom. Medcom works closely with many stakeholders to gain consensus on the use of standards and has led on both pilot projects and large scale implementations. It has been a key factor in the success of ePrescribing in the Denmark by creating the required standards, gaining agreement to use the standards and funding implementation of the standards.

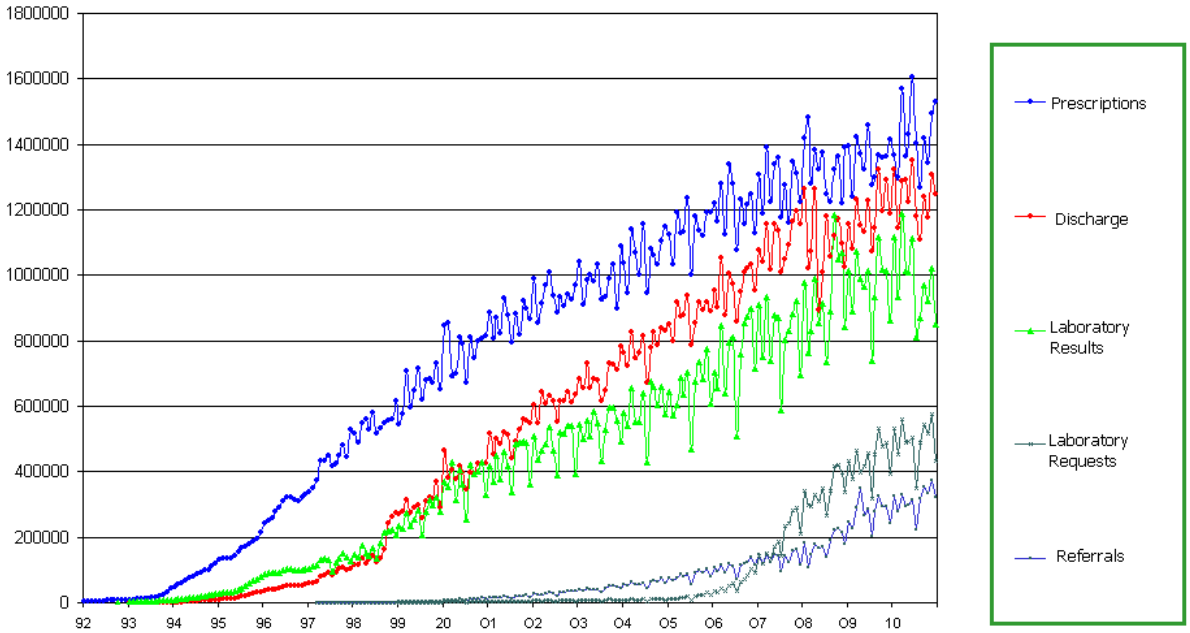
The Danish Health Data Network (DHDN), also known as Sundhedsdatanettet, was developed by Medcom to facilitate the secure exchange of data between healthcare providers and organisations.

Medcom next gained consensus that the EDIFACT messaging standard would be adopted, and it developed the messages and specification required to support projects including ePrescribing. Medcom has undertaken certification of healthcare

products in the Denmark, with 60 suppliers and over 100 products achieving certification.

As depicted in Figure 7, message volumes have been increasing year on year with over 160,000 prescription messages sent during 2010. It is estimated that almost 88% of the total number of possible prescriptions are generated and messaged electronically in Denmark, with one region (North Jutland) achieving 100%[61]. Messages are predominantly sent as EDIFACT messages, but there is a gradual migration to XML-based messages. Of note, HL7 v2 was assessed in the early 2000s as a possible messaging standard by Medcom but was rejected mainly on the grounds of poor vendor support for the standard at that time.

Figure 7. Denmark – ePrescription messaging volume(61)



Other initiatives which facilitated ePrescribing in Denmark include:

- the existence of an unique health identifier for patients in Denmark since 1966
- the Danish Medicines Agency which regulates the used of medicines in Denmark produces a single national file of all medicines every two weeks and this is distributed to software suppliers. The file contains information about drugs including name, content, substitutions, price, mapping to ATC codes and codes for dosage. There is almost 100% adoption of this file by vendors of GP and pharmacy systems thus facilitating interoperability and ePrescribing.
- A national portal launched in 2003 designed to provide patients with services including viewing of their hospital records, booking of appointments, ordering medications and renewing prescriptions
- proactive approach by MEDCOM to train software suppliers in the specifications developed by MEDCOM.

8.3 Sweden

Sweden has a population of 9.3 million and covers an area of 450,000 square kilometres. It is administratively divided into 21 county councils and 290 municipalities. The Swedish healthcare system is organised into National, Regional and local entities with county councils (regional level) having primary responsibility for the planning and organisation of healthcare. There are approximately 1,000 primary care centres, 900 pharmacies and 80 hospitals.

Sweden also has a long history of implementing ICT in healthcare with the first electronic prescription sent from a GP to a pharmacy as far back as 1983. Initially initiatives were based in regions, but in 2000 national efforts commenced with the establishment of Carelink – a Swedish national organisation that works to support IT development and increase cooperation between member healthcare organisations. Carelink's initial efforts focused on the development of a secure infrastructure and network dedicated to healthcare known a Sjunet. In 2005, a National High Level Group for eHealth was formed to work towards a national eHealth Strategy which was approved by the government and published in 2006.

As stated, the first electronic prescription was transmitted in Sweden in 1983. Following further pilot projects a national taskforce was formed in 1999 to implement ePrescribing throughout Sweden. A structured implementation strategy was developed and led to remarkable growth in ePrescription volumes.[62] Between 2002 and 2007 the number of ePrescriptions grew from 3 million to 25 million prescriptions annually, approximately 75% of the total number of prescriptions issued.

Implementation up until 2004 required that the ePrescription was sent directly to a pharmacy, but with the development in 2004 of a national ePrescription mailbox, patients could attend any pharmacy and have their prescription dispensed. Sweden's ePrescription architecture is based on two different messaging formats – EDIFACT and XML. The EDIFACT standard was used initially but, as in the Netherlands, there is a gradual move to replace EDIFACT messages with XML-based messaging. With the implementation of the national ePrescription mailbox, additional services were made available to patients including allowing patients access to their prescribing history, support for repeat prescriptions, and allowing patients have their prescriptions filled by online providers and delivered to their home.

More than two million ePrescriptions are transmitted each month in Sweden. A little more than 95% of the customers/patients who have tried the ePrescription would readily use it again. The smoothness of the process, the security, and the saving of time are the things most appreciated. Both physicians and pharmacists estimate that they 'win' 30 minutes a day by using the ePrescription.

9. The European eHealth Project

9.1 Introduction to epSOS

The European Patient Smart Open Services (epSOS) project is the main European eHealth interoperability project co-funded by the European Commission and the partners involved in the project. It represents the largest EU investment into the health sector and focuses on improving medical treatment of citizens while abroad by providing health professionals with the necessary patient data in a secure electronic format. In particular, epSOS attempts to offer seamless healthcare to European citizens by building and evaluating a service infrastructure.(63)

The key objective of the epSOS project is to develop a practical e-health framework and an ICT infrastructure that will enable secure access to patient health information, particularly with respect to basic patient summaries and ePrescriptions between different European healthcare systems. The epSOS project began in July 2008 with an investment of €36.5 million and is due for completion at the end of 2013.(63)

9.2 ePrescribing

The ePrescribing part of the epSOS project consists of two components, electronic prescribing and electronic dispensing:(64)

- ePrescribing is defined as the electronic prescribing of medicine with the use of software by a legally authorised health professional and the electronic transmission of said prescription data to a pharmacy where the medicine can then be dispensed.
- eDispensing is defined as the electronic retrieval of a prescription and the dispensing of the medicine to the patient as indicated in the corresponding ePrescription. Once the medicine has been dispensed, the dispenser is to report the dispensation information using the ePrescription software(64)

In order to facilitate the use of ePrescribing across European borders and due to the fact that different countries were at various stages and levels of ePrescription implementation, it was necessary to define functional minimum requirements between the systems of each country involved in piloting the epSOS software. Use-cases were devised so that a common minimum dataset could be derived, forming the minimum required amount of information for transfer of an ePrescription across European borders. It was necessary that the ePrescribing solution in each country could fulfill the requirements of the use-cases in order to participate.(65)

9.3 Use-cases

In order to identify use-cases relevant to the large scale pilot (LSP) of the epSOS ePrescribing, it was necessary to first document all possible use-cases.[65] Five possible use-cases were identified and these are shown in Table 4 where A, B and C refer to different countries:

Table 6. epSOS ePrescribing Use Cases

Use Case	Home *(Country)*	Prescribing *(Country)*	Dispensing *(Country)*	Comment
0	A	A	A	Regular situation. No special epSOS action upfront.
1	A	A	B	'Medication already prescribed in Country A' use case.
2	A	B	B	'Medication newly prescribed in Country B' use case.
3	A	B	A	'Medication prescribed in country B and dispensed in home country' use case
4	A	B	C	Two foreign countries involved.

The use-case scenario in the scope of the current epSOS LSP is use-case 1, a patient from country A has a prescription issued in country A and the prescription is dispensed in country B, as it is the most common interoperability scenario between ePrescription services.

9.4 Country Requirements to Participate

In order to participate in the epSOS LSP, a country must be able to satisfy requirements that allow use-case 1 to occur. The pre-conditions for this use-case to take place are:

- The patient has already been electronically prescribed a valid prescription by a prescriber authorised to prescribe in country A.
- In country B, a mechanism to validate the identity of the patient and to handle patient consent against country A has to be available at the pharmacy and the dispenser is a person legally authorised to dispense medicinal products.
- In order to obtain the required information in country B, the Prescription Provider in country A must make accessible at least the 'available' prescriptions to be sent or requested by another country. This implies that country A is able to calculate the 'available' prescriptions (it has the necessary information or parameters to select the prescriptions that can be dispensed at that moment).

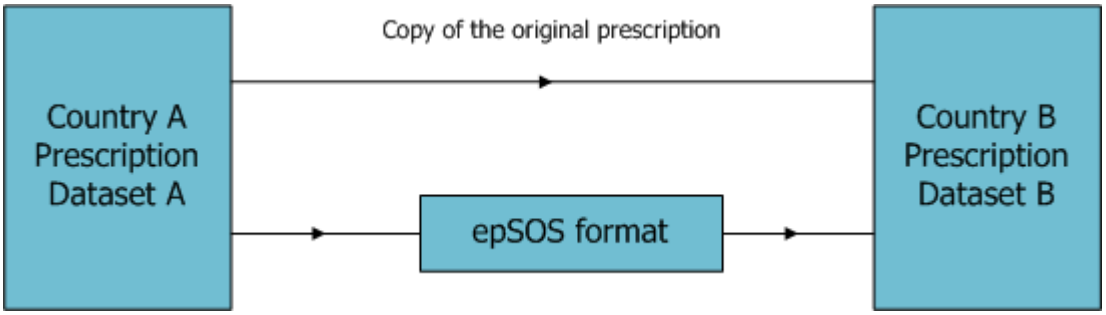
- country A must provide, maintain and support a logical country node (NCP) supporting communication of the information identified in this section with country B and vice versa and that there must be a chain of trust between system actors in this process.[65]

9.5 Common epSOS Dataset

In order to ensure that the prescription and dispensing information sent across borders fulfilled all mandatory requirements of participating countries, a common dataset had to be defined. Questionnaires were distributed to participant countries to ascertain their requirements. Following analysis of these requirements, a common minimum and maximum dataset was arrived at which includes patient identification data, prescriber identity data, ePrescription data, dispenser identity data and dispensed medicine data.[65]

The minimum dataset containing this information from one country can then be put into a format defined by epSOS Semantic Services and transferred to the other country as illustrated below in Figure 9.[65]

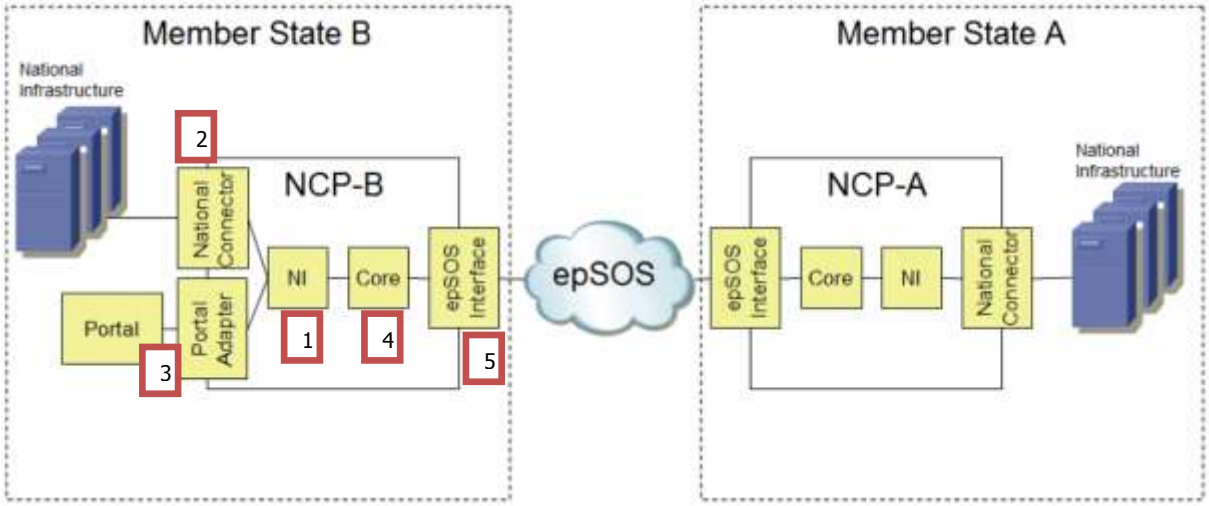
Figure 8. epSOS Interoperability Process



9.7 epSOS Architecture

The epSOS architecture is based on IHE (Integrating the Healthcare Enterprise) profiles and is based on the service oriented paradigm. Figure 9 describes the basic building blocks required for interoperability across country borders.[66]

Figure 9. epSOS Architecture(66)



1. National Interface and 2. National Connector

The National Interface connects the epSOS Common Components and the National Connector. The National Connector is not part of the epSOS Common Components. National Connector Interfaces exposed to the national infrastructure are country-specific. The National Connector is responsible for accessing the national infrastructure and fulfilling the national requirements.

3. Portal and Portal Adapter

The Portal is a Graphical User Interface used by the health professional when providing epSOS Services, including ePrescribing to patients. Two different Portals are part of the Common Components and each country can decide which one they would like to use. If a country develops a portal solution of its own, then they are obliged to use the Portal Adapter, which is a web service.

4. Core Elements

The 'Core Elements' are the Common Components which were defined within the epSOS project and belong to the business layer in the NCP architecture. They consist of the Workflow Manager, the Security Manager, the Transformation Manager, the Terminology Service Access Manager, the Audit Trail Writer, the Audit Repository and the Routing Manager.

5. epSOS Interface

The epSOS interface is also a part of the Common Components defined in epSOS and belongs to the epSOS communication layer in the national contact point architecture. It consists of the Inbound Protocol Terminator (when acting as the patient's home country) and the Outbound Protocol Terminator (when acting as the patient's visiting country).[66]

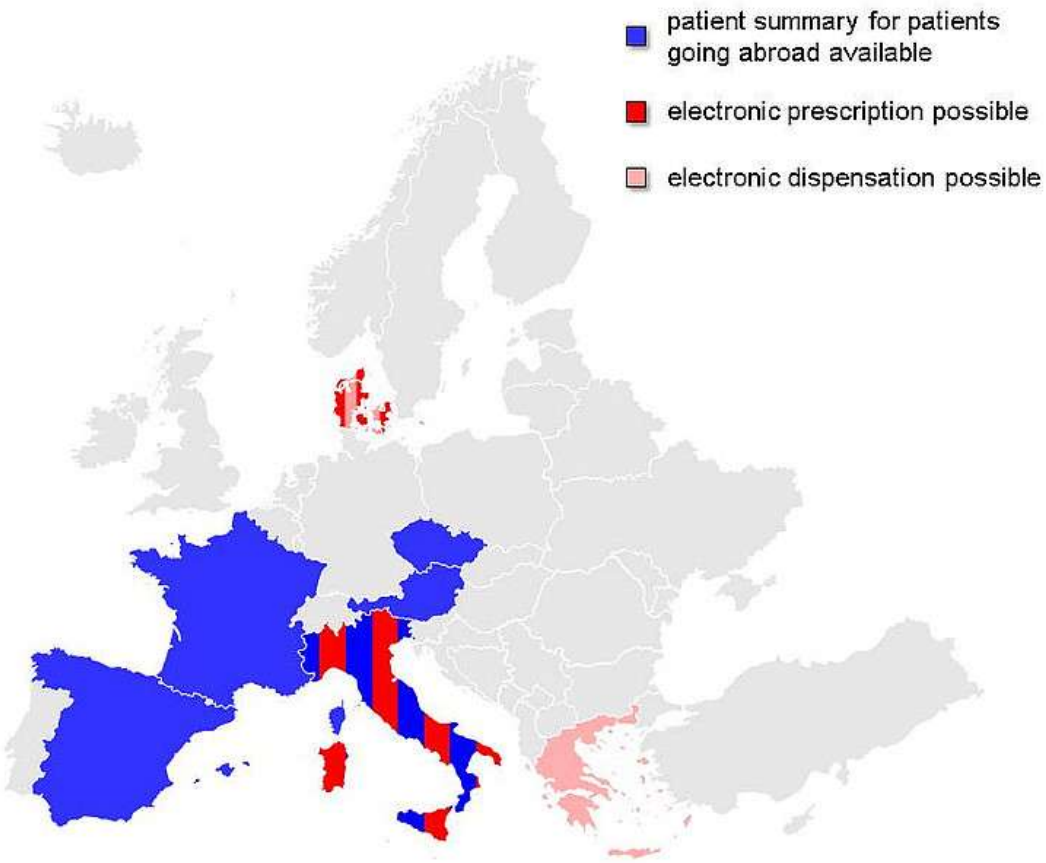
9.8 Semantics

Within the epSOS project, the use of different local classification systems and also languages had to be taken into account. epSOS' semantic services utilise HL7 Clinical Document Architecture (CDA) 2.0 with the additional constraints of the HL7 continuity of care document (CCD) and IHE Patient Care Co-ordination (IHE PCC).[67] This was chosen due to the prevalence of CDA use throughout the countries participating.[68]

9.9 epSOS Progress

The map below in Figure 10 shows the countries of Europe that are currently testing the epSOS ePrescribing software.

Figure 10. epSOS ePrescribing participants(63)



The piloting phase of the epSOS project began on 13 April 2012 and is expected to run for one year. This involves the testing by participating countries of the technical, semantic and legal solutions developed by epSOS over the past three years. This means that any eligible patient in a European member country who consents to participate will evaluate the pilot cross border patient summary, ePrescription and

eDispensing initiatives. It is hoped that this pilot will demonstrate that the epSOS project enables a measurable improvement to medical treatment across European country borders[63].

10. Conclusion

Each of the six jurisdictions has commenced implementation or already implemented ePrescribing solutions, with similarities and differences between them.

Each focused mainly on prescribing and dispensing of medication in the community rather than from hospital setting to the community pharmacies. This is explained as a consequence of both GPs and pharmacists having similar processes with their peers and hence being able to support computerisation of the process. By contrast, hospital medication management processes are typically more complex, making standardisation and computerisation more complicated.

Each has also undertaken the processes in a phased and incremental approach, with paper systems either included as part of the solution or paper systems supported in parallel with the electronic solution. Barcoding of prescriptions has been included in each of the solutions but the purpose of the barcoding differs. In Northern Ireland and Wales 2D barcoding technologies were used to facilitate the transfer of all of the information on the prescription. In the other jurisdictions 1D barcoding technology was utilised to transmit an identifier which uniquely identified either the prescription or an item on the prescription.

With the exception of Northern Ireland, each solution involved the transmission of an electronic message from a GP's practice management system to a message or transaction broker, where the message was stored. Each solution also allowed pharmacists to retrieve and verify a prescription prior to dispensing.

This international review provides information and evidence to aid the development of an ETP solution for Ireland. Based on this international review, it is apparent that there are a number of fundamental building blocks that must be in place prior to developing an ETP solution. These include:

- the introduction of an individual health identifier (IHI) and an identifier for health and social care professionals and organisations
- the development of an interoperability framework and supporting infrastructure to facilitate the safe and secure electronic transfer of prescriptions between prescribers and dispensers
- the development of a data model to support the implementation of a national drugs reference catalogue
- the development of messaging standards to support ETP across organisational boundaries.

The information gathered in this international review was used to inform the work programme of the eHealth Standards Advisory Group and to prioritise the development of standards to support the electronic transfer of prescriptions across organisational boundaries in Ireland.

11. References

Reference List

(1) Glen Sonnedecker, David Cowen, Gregory Higby. *American Pharmacists Recall Life Behind the Counter 1824-1933.* American Institute of the History of Pharmacy, 2002.; 2002.

(2) Institute of Medicine. *To err is human, Building a Safer Healthcare System*. 2009. Available online from: http://iom.edu/Reports/1999/To-Err-is-Human-Building-A-Safer-Health-System.aspx. Accessed on: 5 March 2012.

(3) Nilsson S OLDJÅB. A computer in the physician's consultancy. *Medinfo 1983: 1185-1186.* 1983;

(4) Department of Health and HumanServices. *Medicare Program; ePrescribing and the Prescription Drug Program; Final Rule*. 2005. Available online from: http://edocket.access.gpo.gov/2005/pdf/05-22026.pdf. Accessed on: 1 March 2012.

(5) Australian Government Department of Human Services. *Fifth Community Pharmacy Agreement*. 2010. Available online from: http://www.medicareaustralia.gov.au/provider/pbs/fifth-agreement/index.jsp. Accessed on: 24 February 2012.

(6) Australia Government. *Australia.gov.au*. 2012. Available online from: http://australia.gov.au/. Accessed on: 3 March 2012.

(7) Health Information and Quality Authority. *Guidance on Privacy Impact Assessment in Health and Social Care.* 2011. Available online from: www.hiqa.ie. Accessed on: 8 February 2012.

(8) National E-Health Transition Authority Limited. *NEHTA Strategic Plan (2011–2012)*. 2011. Available online from: http://www.nehta.gov.au/about-us/strategy. Accessed on: 5 July 2012.

(9) National E Health Transition Authority. *e-Communications in Practice*. 2012. Available online from: http://www.nehta.gov.au/e-communications-in-practice. Accessed on: 20 June 2012.

(10) National E-Health Transition Authority Limited. *e-Medication Management*. 2010. Available online from: http://www.nehta.gov.au/e-communications-in-practice/emedication-management. Accessed on: 15 January 2012.

(11) KMPG. *Consultancy in Electronic Prescribing and Medicines*. 2008. Available online from: http://www.health.gov.au/internet/main/publishing.nsf/Content/80B878329CD

34C6ACA25715700229B28/$File/DOHA08-ePrescribing%20report-Final290708.pdf. Accessed on: 12 January 2012.

(12) *Medisecure*. 2012. Available online from: http://www.medisecure.com.au/index.html. Accessed on: 13 March 2012.

(13) Australian Government Department of Health and Aging. *Australian Statistics on Medicines 2009*. 2011. Available online from: http://www.health.gov.au/internet/main/publishing.nsf/Content/913697554D938FFDCA257967007A83EA/$File/ASM%202009.pdf. Accessed on: 11 June 2012.

(14) National E Health Transition Authority. *Concept of Operations: Electronic Transfer of Prescription Release 1.1*. 2010. Available online from: http://www.nehta.gov.au/e-communications-in-practice/emedication-management. Accessed on: 23 February 2012.

(15) National E Health Transition Authority. *National Authentication Service for Health*. 2012. Available online from: http://www.nehta.gov.au/connecting-australia/nash. Accessed on: 11 June 2012.

(16) National E-Health Transition Authority Limited. *e-Medication Management*. 2010. Available online from: http://www.nehta.gov.au/e-communications-in-practice/emedication-management. Accessed on: 15 January 2012.

(17) Ministry of Health New Zealand. *District health boards*. 2012. Available online from: http://www.health.govt.nz/new-zealand-health-system/key-health-sector-organisations-and-people/district-health-boards. Accessed on: 19 January 2012.

(18) Ministry of Health New Zealand, Ministry. *The Health Information Strategy for New Zealand (HIS-NZ) 2005*. 2005. Available online from: http://www.moh.govt.nz. Accessed on: 23 January 2012.

(19) IT Health Boards New Zealand. *EPharmaceutical*. 2008. Available online from: http://www.ithealthboard.health.nz/Epharmaceutical. Accessed on: 23 January 2012.

(20) Health Information Standards Organisation. *Electronic Pharmaceutical Messaging Standard*. 2008. Available online from: http://www.ithealthboard.health.nz/sites/all/files/10030.2%2BEPharmaceutical%2BMessaging%2BStandard%2Bv1.pdf. Accessed on: 10 April 2012.

(21) Information Strategy Group NHB. *Information Governance in the NZ Health Sector, A Discussion Document*. 2011. Available online from: http://www.ithealthboard.health.nz/sites/all/files/Information%20Governance%20in%20the%20NZ%20health%20Sector%20-%20A%20Discussion%20Document.pdf. Accessed on: 13 August 2012.

(22) The Privacy Act, New Zealand. 1993. Available online from: http://www.legislation.govt.nz/act/public/1993/0028/latest/DLM296639.html. Accessed on: 13 August 2012.

(23) Health Information Privacy Code 1994 (Revised 2008), New Zealand. 1994. Available online from: http://privacy.org.nz/health-information-privacy-code/. Accessed on: 14 June 2012.

(24) Health Information and Quality Authority. *International Review of Health Information Sources*. 2011. Available online from: www.hiqa.ie. Accessed on: 8 February 2012.

(25) *Health Insurance Act, The Netherlands*. 2012. Available online from: http://www.nza.nl/regelgeving/wetgeving/zorgverzekeringswet/. Accessed on: 23 January 2012.

(26) Lidia Villalba Van Dijk, Han De Vries, Douglas S.Bell. *Electronic Prescribing in the United Kingdom and in the Netherlands*. Agency for Healthcare Research and Quality; 2011. Available online from: http://healthit.ahrq.gov/portal/server.pt/gateway/PTARGS_0_11699_954562_0_0_18/ElectronicPrescribingUKNetherlands.pdf. Accessed on: 13 August 2012.

(27) HL7 International. *Aorta: Use of HL7 V3*. 2012. Available online from: http://wiki.hl7.org/index.php?title=AORTA#Use_of_HL7_v3. Accessed on: 5 November 2012.

(28) Nationaal ICT Instituut in de Zorg. *E-Health Monitor 2010 Volumes: Elektronische communicatie van patiëntgegevens in Nederland, overzicht en volume*. 2010. Available online from: www.nictiz.nl. Accessed on: 8 February 2012.

(29) National IT Institute for healthcare in the Netherlands. *eHealth in the Netherlands: Policies, Developments and Status of Cross Enterprise Information Exchange in Dutch Healthcare*. 2008. Available online from: https://community.oecd.org/docs/DOC-34560. Accessed on: 13 August 2012.

(30) Department of Health NE. *Information for health: an information strategy for the modern NHS 1998-2005*. 1998. Available online from: http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4007832. Accessed on: 23 February 2012.

(31) Department of Health (England). *Equity and Excellence: Liberating the NHS*. 2010. Available online from: http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/@dh/@en/@ps/documents/digitalasset/dh_117794.pdf. Accessed on: 13 June 2012.

(32) Department of Health (England). *The Power of Information: Putting all of us in control of the health and care information we need*. 2012. Available online

from: http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_134181. Accessed on: 13 August 2012.

(33) NHS Connecting for Health. *Electronic Perscription Service*. 2012. Available online from: http://www.connectingforhealth.nhs.uk/systemsandservices/eps. Accessed on: 13 June 2012.

(34) NHS Connecting for Health. *PCTs with Secretary of State direction*. 2012. Available online from: http://www.connectingforhealth.nhs.uk/systemsandservices/eps/nhs/deploy/rollout/direction. Accessed on: 13 June 2012.

(35) Hibberd, R, Barber N, Cornford T, Lichtner V. *The Evaluation of the Electronic Prescription Service in Primary Care*. 2012. Available online from: http://www.ucl.ac.uk/pharmacy/documents/staff_docs/EPS. Accessed on: 13 August 2012.

(36) NHS Connecting for Health. *NHS CFH Information Governance Programme Board*. 2009. Available online from: http://www.connectingforhealth.nhs.uk/systemsandservices/infogov/board. Accessed on: 23 June 2012.

(37) NHS - Connecting for Health. *Information Governance Toolkit* [Online]. Available from: https://www.igt.connectingforhealth.nhs.uk/. Accessed on: 23 February 2012.

(38) The Data Protection Act, UK. 1998. Available online from: http://www.opsi.gov.uk/acts/acts1998/ukpga_19980029_en_1. Accessed on: 13 June 2012.

(39) The Data Protection Act, UK. 1998. Available online from: http://www.opsi.gov.uk/acts/acts1998/ukpga_19980029_en_1. Accessed on: 13 June 2012.

(40) The Freedom of Information Act (UK). 2000. Available online from: http://www.opsi.gov.uk/Acts/acts2000/ukpga_20000036_en_1. Accessed on: 13 June 2012.

(41) NHS - Connecting for Health. *NHS Codes of Practice and Legal Obligations*. 2009. Available online from: http://www.connectingforhealth.nhs.uk/systemsandservices/infogov/codes. Accessed on: 23 February 2012.

(42) DHAAPSNI. *The Department of Health, Social Services and Public Safety Northern Ireland* [Online]. Available from: www.dhsspsni.gov.uk/. Accessed on: 23 February 2012.

(43) Deparment of Health SSaPS. *Code of Practice on Protecting the Confidentiality of Service User Information*. 2012. Available online from:

http://www.dhsspsni.gov.uk/confidentiality-code-of-practice0109.pdf. Accessed on: 13 August 2012.

(44) Department of Health SSaPS. *Controls Assurance Standard, Information and Communications Technology*. 2009. Available online from: http://www.dhsspsni.gov.uk/index/hss/governance/governance-archive.htm. Accessed on: 20 April 2012.

(45) The Scottish Government.[Online]. Available from: http://www.scotland.gov.uk/Topics/Health/NHS-Scotland. Accessed on: 23 February 2012.

(46) The Scottish Government. *ePharmacy Toolkit for Community Pharmacists*. 2008. Available online from: http://www.scotland.gov.uk/Resource/Doc/209438/0055428.pdf. Accessed on: 23 February 2012.

(47) Community Pharmacy Scotland. *NHS Care Services*. 2012. Available online from: http://www.communitypharmacyscotland.org.uk/nhs_care_services/infrastructure/epharmacy.asp. Accessed on: 23 February 2012.

(48) Scottish Executive. *The Right Medicine: A Strategy for Pharmaceutical Care in Scotland*. 2002. Available online from: http://www.scotland.gov.uk/Resource/Doc/158742/0043086.pdf. Accessed on: 23 February 2012.

(49) The Scottish Executive Health Department. *The NHS Scotland Information Security Policy* [Online]. Available from: http://www.sehd.scot.nhs.uk/mels/HDL2006_41.pdf. Accessed on: 18 August 2009.

(50) Information Services Division, NHS Scotland. *A Brief Guide to Information Governance* [Online]. Available from: http://www.shb.scot.nhs.uk/initiatives/informationgovernance/documents/V2Info-governance-guide-070122.pdf. Accessed on: 18 August 2009.

(51) e-Health Insider. *Patient safety Through ePrescribing*. 2008. Available online from: http://www.e-health-insider.com/img/Document_Library0282/E-prescribingRoundTableFinal_Report.pdf. Accessed on: 18 April 2012.

(52) Mercer Consultants. *Health Benefit Cost Growth Accelerates to 6.9% in 2010*. 2010. Available online from: http://www.mercer.com/press-releases/1400235. Accessed on: 23 February 2012.

(53) Centres for Medicare and Medicaid Office of Legislation. *Summary of H.R. 1, Medicare Prescription Drug Improvement and Modernization Act, 2003.* Public Law: 108-173; 2004. Available online from:

https://www.cms.gov/MMAUpdate/downloads/PL108-173summary.pdf. Accessed on: 23 February 2012.

(54) Institute of Medicine. *Preventing Medication Errors*. 2006. Available online from: http://iom.edu/Reports/2006/Preventing-Medication-Errors-Quality-Chasm-Series.aspx. Accessed on: 23 February 2012.

(55) *The Center for Improving Medication Management*. 2012. Available online from: http://www.thecimm.org/. Accessed on: 13 March 2012.

(56) U.S.Congress. *Medicare Improvements for Patients and Providers Act of 2008*. 2008. Available online from: http://www.govtrack.us/congress/bill.xpd?tab=summary&bill=h110-6331. Accessed on: 13 March 2012.

(57) U.S.Congress. *American Recovery and Reinvestment Act (ARRA)*. 2009. Available online from: http://www.govtrack.us/congress/bill.xpd?bill=h111-1. Accessed on: 13 March 2012.

(58) Surescript. *The National progress report on e-prescribing and interoperable healthcare*. 2012. Available online from: http://www.surescripts.com/about-e-prescribing/progress-reports/national-progress-reports.aspx. Accessed on: 13 March 2012.

(59) *Ministry of Interior and Health (Denmark) [Online]*. 2012. Available online from: http://www.sum.dk/. Accessed on: 13 March 2012.

(60) empirica. *Benchmarking ICT use amongst general practitioners in Europe*. 2008. Available online from: http://ec.europa.eu/information_society/eeurope/i2010/docs/benchmarking/gp_survey_final_report.pdf. Accessed on: 23 February 2012.

(61) Medcom DDS. *Medcom - Status i antal og %*. 2011. Available online from: http://www.medcom.dk/wm110000. Accessed on: 18 December 2012.

(62) Stockholm lans Landsting. *EPrescriptions in Sweden*. 2012. Available online from: http://www.webbhotell.sll.se/etjansterlakemedel/E-recept/In-English/. Accessed on: 23 February 2012.

(63) European Patients Smart Open Services. *epSOS; About Us*. 2012. Available online from: http://www.epsos.eu/home.html. Accessed on: 15 August 2012.

(64) European Patients Smart Open Services. *ePrescription*. 2012. Available online from: http://www.epsos.eu/epsos-services/eprescription.html?no_cache=1&sword_list%5B0%5D=eprescribing. Accessed on: 15 August 2012.

(65) European Patients Smart Open Services. *Final definition of functional service requirements - ePrescription*. 2010. Available online from: http://www.epsos.eu/uploads/tx_epsosfileshare/D3.1.2_Final_Definition_of_F

unctional_Service_Requirements_ePrescription_01.pdf. Accessed on: 15 August 2012.

(66) European Patients Smart Open Services. *epSOS Technical Aspects*. 2012. Available online from: http://www.epsos.eu/uploads/tx_epsosfileshare/epSOS_Technical_Aspects_Factsheet_01.pdf. Accessed on: 15 August 2012.

(67) European Patients Smart Open Services. *Semantic Issues*. 2012. Available online from: http://www.epsos.eu/technical-background/semantic-issues.html. Accessed on: 15 August 2012.

(68) European Patients Smart Open Services. *Semantic Services Definition*. 2010. Available online from: http://www.epsos.eu/fileadmin/content/pdf/deliverables/D3.5.2_epSOS_Semantic-Services-Definition.pdf. Accessed on: 15 August 2012.

Published by the Health Information and Quality Authority.

For further information please contact:

Health Information and Quality Authority
Dublin Regional Office
George's Court
George's Lane
Smithfield
Dublin 7

Phone: +353 (0) 1 814 7400
URL: www.hiqa.ie