Developing an Electronic Health Record for Ireland

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Declaration

I declare that the work described in this dissertation is, except where otherwise stated, entirely my own work, and has not been submitted as an exercise for a degree at this or any other university. I further declare that this research has been carried out in full compliance with the ethical research requirements of the School of Computer Science and Statistics.

Signed: _____

Phillip O'Grady

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Abstract

- The Electronic Health Record is a comprehensive, longitudinal and cross-institutional, semantically interoperable person-centred medical record in digital format.
- Semantic interoperability is the requirement that data stored in computer systems be meaningful, and that they retain that meaning when exchanged with and used by other computer systems.
- Electronic Health Records are widely regarded as contributing to the safety and effectiveness of healthcare, and to the efficiency and economy of healthcare delivery.
- Projects are on-going in many countries to develop Electronic Health Records, but not yet in Ireland.
- There is a confluence of developments in the Irish healthcare system that, with vision and purpose, might be harnessed to develop an Electronic Health Record. Among these are:
    - the proposal by the present Government to introduce managed competition model of Universal Health Insurance;
    - a health insurance companies initiative to develop a common e-claiming system;
    - the progress being made by the National HealthLinks Project in providing an electronic messaging system between the primary and secondary care sectors;
    - on-going work by the Health Information and Quality Authority in laying the groundwork for health identifiers for individuals, professionals and institutions, for a national demographic database, and for standards for the exchange of healthcare data.

- Those countries that report the greatest success in developing Electronic Health Records have adopted incremental, pragmatic and adaptable approaches.
- Strong, autonomous governance and leadership is required.
- The engagement of stakeholders, including both consumers and providers, is necessary throughout the development process.
- There is a growing consensus that healthcare consumers should have control of the Electronic Health Record, and the right to say when, where, and by whom, the record, or any part of it may be viewed.

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Abbreviations

AR-DRG	Australian Refined Diagnosis Related Group
CDA	Clinical Document Architecture
CIS	Client Identity Services (of the Department of Social Protection)
DoHC	Department of Health and Children
DRG	Diagnosis Related Group
DSP	Department of Social Protection
DTC	Diagnosis and Treatment Combination
eCHN	Electronic Child Health Network
EDIFACT	Electronic Data Interchange For Administration, Commerce and Transport
EHR	Electronic Health Record
EMR	Electronic Medical Record
GP	General Practitioner
HIQA	Health Information and Quality Authority
HISI	Health Informatics Society of Ireland
HL7v2.x	Health Level Seven Version 2.x
HL7v3	Health Level Seven Version 3
HMO	Health Management Organisation
HOI	Healthcare organisation identifier
HPI	Healthcare practitioner identifier
HSE	Health Service Executive
ICD-10	International Statistical Classification of Diseases and Related Health Problems 10th Revision
ICE	In Case of Emergency
ICT	Information and Communications Technology
ICGP	Irish College of General Practitioners
IHI	Individual health identifier
IOM	Institute of Medicine (U.S.A)
LSP	Landelijk Schakelpunt (Dutch National Switching Point)
LOINC	Logical Observation Identifiers Names and Codes
MFTP	Money Follows The Patient
NCI	The National Client Index (of the Health Service Executive)
NHS	U.K. National Health Service
NICTIZ	National IT Institute for Healthcare in the Netherlands
NIMIS	National Integrated Medical Imaging System
NPfIT	National Program for IT (U.K.)
PACS	Picture Archiving and Communication System
PCEHR	Personally Controlled Electronic Health Record
PCEHRS	Personally Controlled Electronic Health Record System (Australia)

PCRS	Primary Care Reimbursement Service
PHR	Personal Health Record
PPS	Personal Public Service number
SNOMED-CT	Systematised Nomenclature of Medicine Clinical Terms
TDS	Trusted Data Source
UHI	Universal Health Insurance
VHI	Voluntary Health Insurance

A note about terminology

The assumption underlying this dissertation is that an Electronic Health Record would be created for every consenting person entitled to utilise the healthcare system, regardless of whether, or to what extent, s(he) actually uses it. The person who is the subject of an Electronic Health Record is therefore described throughout this document as the healthcare consumer, or often just the consumer.

This document also envisages the establishment of an independent, non-profit authority charged with developing the Electronic Health Record, and thereafter, with administering it. For convenience, this authority will be referred to throughout as the Electronic Health Record Authority or EHRA.

Definitions

Semantic Interoperability	"the ability of two or more computer systems to exchange information and have the meaning of that information automatically interpreted by the receiving system accurately enough to produce useful results, as defined by the end users of both systems." (http://en.wikipedia.org/wiki/Semantic_interoperability).
Community Rating	The same flat rate health insurance premium applies to all subscribers.
Electronic Health Record	A comprehensive, longitudinal and cross-institutional, semantically interoperable person-centred medical record in digital format.

Electronic Medical Record	A locally created, maintained and stored person-centred medical record. Usually that of a hospital or other healthcare institution.
Health Portal	An application made available to healthcare consumers which allows access to their Electronic Health Record.
Healthcare Consumer	Any person mandated to be insured for healthcare.
Lifetime Cover	Health insurance policies cannot be terminated by the insurance company for reasons of age or health status.
Money Follows the patient	A system of funding where healthcare institutions are reimbursed for individual episodes of care actually delivered, rather than by block grant budgets.
Open Enrolment	Health insurance companies cannot refuse to cover a person for reasons of age or health status.
Personal Health Record	A personally maintained electronic health record which may be stand alone or linked to a provider record system.

1. Introduction

1.1 Background

The Fine Gael/Labour Coalition Government which assumed office in March 2011 has adopted, as the central plank of its health policy, the introduction of a system of universal health insurance (UHI) for Ireland. Though full details of the system have not yet been published, the picture that emerges from various policy documents and Department of Health (DoH) publications is of a system of managed competition between health insurance companies, with health facilities largely financed through a money-follows-the-patient (MFTP) reimbursement system. All healthcare consumers will be required to purchase a standard basic health insurance package from the health insurance company of their choice, with those on lower incomes subsidised in whole or in part from a central fund. The purpose of this research is to examine whether the proposed introduction of UHI offers the opportunity to initiate the development of an electronic health record (EHR) for Ireland.

Information and communications technology (ICT) is widely regarded as the key to providing safer, more efficient and more cost effective healthcare. However, the development of ICT infrastructures in the healthcare arena has proved problematic worldwide. Healthcare is a data intensive service, and many ICT systems have been developed to provide data capture and storage, as well as to provide clinical decision support. However these systems have typically been single purpose systems, developed in isolation, and without reference to national or supra-national standards (Kalra, 2006). The result has been the creation of constellations of health IT systems that perform the tasks for which they were

designed to a greater or lesser degree, but which lack the capability to communicate or interact with each other.

The ability of computer systems to communicate data such that the transmitting and receiving systems have a common and unambiguous understanding of the meaning of the messages exchanged is known as semantic interoperability (Mead, 2006). Various approaches have been adopted worldwide to attempt to develop semantic interoperability between healthcare ICT systems. Some countries have reported a degree of success in these endeavours, while others have run into difficulties. Denmark, for example, has developed a comprehensive health information exchange (Sundhed, 2011), whereas an attempt to do the same in England and Wales has recently been abandoned (Martin, 2011).

The problem of a multitude of ICT systems, each containing silos of information available only to those healthcare professionals in physical proximity to or with dedicated access to them is particularly acute in Ireland, both between and within healthcare institutions (HIQA, 2009). The possibility of obtaining a holistic or longitudinal view of an individual's interactions with the healthcare system as a whole, or often even with an individual healthcare facility, is remote.

As will be discussed in this dissertation, the approaches to the problems outlined that seem to be having the greatest degree of success internationally, are those that adopt an incremental approach to the development of an EHR (Harrell, 2009), (Canada Health Infoway, 2009). Starting at a local level, and developing linkages between individual systems, establishing standards and gradually building networks

through adherence to these standards, is producing results. Some countries combine this approach with the establishment of a core system of initially limited functionality, to which local systems can connect as and when they become compliant with the established standards (Private Healthcare Australia, 2011).

Though healthcare ICT in Ireland is highly fragmented there are a number of large repositories of longitudinal and cross institutional healthcare data which could prove useful. Irish health insurance companies collect and store data related to their customers' interactions with the healthcare system, in particular the secondary and tertiary systems. They have company specific unique patient identifiers, unique identifier coders for healthcare professionals and institutions, and store demographic and coded diagnosis and procedure data related to each treatment episode for which they are billed. While each company has its own proprietary coding systems for healthcare professionals and hospitals, their diagnosis and procedure data are closely related, and even identical where internationally recognised coding systems are used. In addition the main insurance companies are currently cooperating on the development of a common e-claiming system which will further align their data collection practices. Of necessity, this e-claiming system will establish semantic interoperability between participating hospitals and insurance companies for a subset of hospital data.

At present about 48% of the population have health insurance. However, the introduction of a managed competition UHI system would mean that every healthcare consumer would be registered with one of the health insurers. The purpose of this dissertation is to examine whether the data

generated and collected by the insurance companies in such a scenario, perhaps in combination with data garnered from other sources, could provide the foundation for a national EHR.

1.2 The Research Question

The question under examination in this research is whether, under a universal insurance healthcare delivery system, data collected for the purposes of paying claims could be used to make up the backbone of an electronic health record, how this could be done, whether the data so collected would be sufficient for the creation of such a record, and whether other relevant data could either be collected or made available.

1.3 Overview of the Research

The research was conducted through a review of the literature on methods for the provision of population healthcare cover, on the apparent intentions of the Irish Government for reform in this area, on comparable systems elsewhere in the world, and on attempts, some more successful than others, to create electronic health records with longitudinal and cross institutional reach. In addition, the author has personal knowledge of the health insurers e-claims project, having played a peripheral role in the pilot project.

1.4 Research Methodology

The research methodology was entirely qualitative. Searches were conducted on PubMed, Google Scholar and Google for literature relating to electronic health information and healthcare systems. Search terms, individually or in combination, included electronic health record, EHR, PHR, PCEHR, personal health record, personally controlled, health record push pull, health record advantages, interoperability, standards, universal health insurance, UHI, Beveridge, Bismarck, Fine Gael health, Labour health, England, NPfIT, the Netherlands, Canada, Switzerland, South Korea, Health Infoway, Denmark, Sundhed, Australia, NEHTA, HealthVault, Dossia, Euro Health, Healthcare systems, etc. The Health Information and Quality Authority (HIQA) website's list of publications, and the list of past health informatics dissertations on the Trinity College, Dublin's Department of Computer Science and Statistics website were explored for pertinent material. Bibliographies and works cited in papers found were examined for other relevant publications, and these in turn led to others.

1.5 Overview of the Dissertation

This chapter provides a background to the research, a statement of the research question, and a description of the research methods and of the structure of the dissertation.

Chapter Two examines the literature pertaining to the Electronic Health Record and seeks to provide a definition of the term, an overview of its perceived advantages, and a review of its expected contents. Some pre-requisites for the creation of the EHR are discussed, and various EHR architectures are analysed.

Chapter Three provides an overview of the state of the art, looking at the various countries' efforts to introduce an EHR. The success or failure of efforts in England, the Netherlands, Canada, Denmark and Australia is examined. An emerging health record model not created or sponsored by governments, the personally controlled EHR, is also discussed.

Chapter Four addresses the question of Universal Health Insurance. The Government's stated intentions, both prior to and after coming into office, to introduce UHI, and their indications as to how it might be implemented, are discussed. Various models of health care systems are reviewed and classified into four broad categories. The UHI system in the Netherlands is examined in some detail, as the Government has indicated that this system might act as a model for the proposed system for Ireland. Based on the Government's stated intentions and the structure of UHI in the Netherlands, a projection of how UHI might be implemented in Ireland is presented. The similarities between the projected model and the current system of private health insurance in Ireland are outlined.

Chapter Five looks at the question whether an early introduction of the EHR in Ireland is feasible. The necessity for unique Individual and provider identifiers, and their corresponding demographic and identifier datasets, as an essential precursor to an HER, is indicated. The portions of the health insurers' e-claims dataset that could contribute to the EHR are presented. HealthLink, the existing secondary to primary care web-based messaging service is described, and the question whether data from this service could be incorporated into the EHR is discussed. Progress on the definition of standards for the exchange of health care data is noted, and the necessity for stakeholder engagement and governance and leadership is emphasised.

Chapter Six summarises the research and presents conclusions. The limitations of the research and possible future avenues for research are outlined.

2. Electronic Health Records - Literature Review

2.1 Introduction

This chapter is a review of the literature pertaining to the Electronic Health Record. Section 2.1 looks at the various terminologies used for electronic collections of health data, and defines what is meant by the term EHR in this dissertation. Section 2.2 lists some of the advantages claimed in the literature for EHRs, while Section 2.3 lists typical contents of the record. Section 2.4 discusses progress made in developing EHRs. Section 2.5 lists some pre-requisites for an EHR, while Section 2.6 analyses the architectures of EHR implementations.

2.2 Definition of an EHR

Several terms tend to be used, sometimes interchangeably, for computerised collections of medical data relating to an individual or an episode of care. Among the terms used are Electronic Health Record, Electronic Medical Record, Electronic Patient Record and Computerised Patient Record, and these can be used to describe data in a General Practitioner's (GPs) practice management system, a hospital department's electronic records system, an electronic diary for recording, for example, pain intensity or urinary voiding, or a longitudinal collection of an individual's medical history (Häyrinen, et al., 2008). In this document the term Electronic Health Record or EHR is used to denote a longitudinal and cross-institutional, person-centred record in digital format, and the term Electronic Medical Record is

used to denote a more limited collection of data in, for example, a hospital or practice management system.

Häyrinen, et al. (2008), citing the International Standards Organisation standard ISO/TR 20514, for Electronic Health Records, give the following, fuller definition:

“a repository of patient data in digital form, stored and exchanged securely, and accessible by multiple authorized users. It contains retrospective, concurrent, and prospective information and its primary purpose is to support continuing, efficient and quality integrated health”.

It is not explicit in this definition that the data are garnered from multiple sources, and over time, but these concepts form part of the definition of an EHR in this document.

2.3 The Advantages of an EHR

The advantages of an EHR are well rehearsed in the literature (Detmer, 2003), (Electronic Child HealthNetwork, 2010), (Chaudhry, et al., 2006), (Ball, et al., 2007) etc.. Among those most commonly cited are that it:

- enables rapid and timely access to a patient's health information at any time and in any suitably 'wired' location;
- makes information available simultaneously to all authorised personnel involved in the patient's care;
- creates patient-centred, not site dependant health records;

- aggregates healthcare information from multiple sites;
- reduces the incidence of missing, lost or illegible records;
- enables coordination of patient care across multiple locations;
- enables informed and timely diagnosis;
- reduces workload by eliminating unnecessary paperwork;
- reduces incidence of repeat diagnostic tests;
- makes test results available more rapidly;
- frees clinician to focus on the patient rather than the paperwork;
- enables follow-up care at locations closer to the patient's home;
- enables sharing of health data with the patient or their care giver;
- enables patient involvement in their healthcare;
- supports research and education.

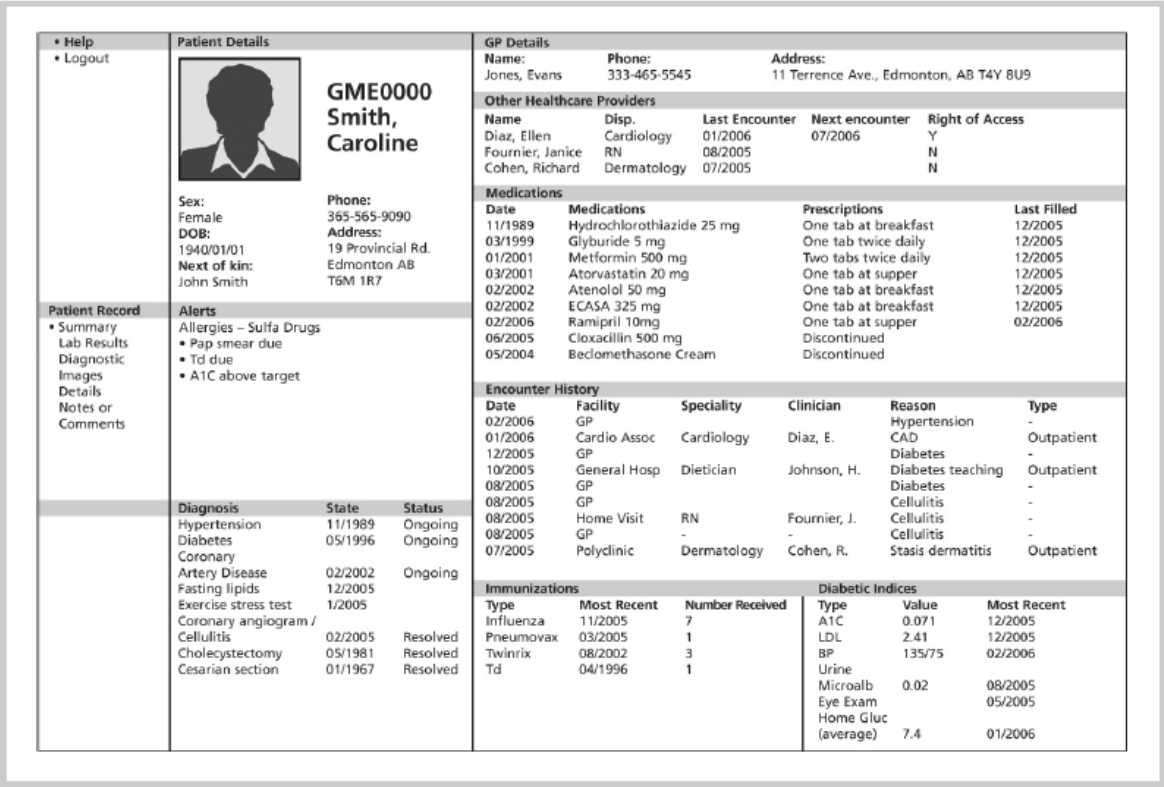
In short, the EHR is seen an enabler of greater patient safety, fuller patient involvement, more efficient healthcare delivery and more economic use of healthcare resources, and as providing valuable troves of data for research and development.

2.3 Contents of an EHR

EHRs can range in content from the extremely basic to comprehensive collections of most of a person's detailed medical data (though the latter are rare if in fact they exist at all). At the basic level a record might consist of no more than demographics, medications and allergies/adverse reactions. The Summary Care Record in England and Wales is an example of such a record (NHS, 2012), (though there has also been an attempt to develop a full EHR in England and Wales – this will be discussed further in

section 3.2). A more comprehensive EHR, containing diagnosis and treatment data from hospitals and GP Surgeries, laboratory results, medications and treatment feedback for persons with chronic diseases has been introduced in Denmark (sundhed.dk, 2011), though only summary data are available for the years prior to the system coming on-stream.

The Canadian Auditor General has defined the core elements of an EHR as comprising consumer and provider registries, a diagnostic imaging archival and communication system, and medication and laboratory information systems, and provides the illustration below of what an individual record might look like. (Office of the Auditor General of Canada, 2010)



• Help
• Logout

Patient Details

GME0000
Smith, Caroline

Sex: Female
DOB: 1940/01/01
Next of kin: John Smith
Phone: 365-565-9090
Address: 19 Provincial Rd. Edmonton AB T6M 1R7

Patient Record
• Summary
Lab Results
Diagnostic Images
Details
Notes or Comments

Alerts
Allergies – Sulfa Drugs
• Pap smear due
• Td due
• A1C above target

Diagnosis	State	Status
Hypertension	11/1989	Ongoing
Diabetes	05/1996	Ongoing
Coronary Artery Disease	02/2002	Ongoing
Fasting lipids	12/2005	
Exercise stress test	1/2005	
Coronary angiogram / Cellulitis	02/2005	Resolved
Cholecystectomy	05/1981	Resolved
Cesarian section	01/1967	Resolved

GP Details

Name:	Phone:	Address:
Jones, Evans	333-465-5545	11 Terrence Ave., Edmonton, AB T4Y 8U9

Other Healthcare Providers

Name	Disp.	Last Encounter	Next encounter	Right of Access
Diaz, Ellen	Cardiology	01/2006	07/2006	Y
Fournier, Janice	RN	08/2005		N
Cohen, Richard	Dermatology	07/2005		N

Medications

Date	Medications	Prescriptions	Last Filled
11/1989	Hydrochlorothiazide 25 mg	One tab at breakfast	12/2005
03/1999	Glyburide 5 mg	One tab twice daily	12/2005
01/2001	Metformin 500 mg	Two tabs twice daily	12/2005
03/2001	Atorvastatin 20 mg	One tab at supper	12/2005
02/2002	Atenolol 50 mg	One tab at breakfast	12/2005
02/2002	ECASA 325 mg	One tab at breakfast	12/2005
02/2006	Ramipril 10mg	One tab at supper	02/2006
06/2005	Cloxacillin 500 mg	Discontinued	
05/2004	Beclomethasone Cream	Discontinued	

Encounter History

Date	Facility	Speciality	Clinician	Reason	Type
02/2006	GP			Hypertension	-
01/2006	Cardio Assoc	Cardiology	Diaz, E.	CAD	Outpatient
12/2005	GP			Diabetes	-
10/2005	General Hosp	Dietician	Johnson, H.	Diabetes teaching	Outpatient
08/2005	GP			Diabetes	-
08/2005	GP			Cellulitis	-
08/2005	Home Visit	RN	Fournier, J.	Cellulitis	-
08/2005	GP	-	-	Cellulitis	-
07/2005	Polyclinic	Dermatology	Cohen, R.	Stasis dermatitis	Outpatient

Immunizations

Type	Most Recent	Number Received
Influenza	11/2005	7
Pneumovax	03/2005	1
Twinrix	08/2002	3
Td	04/1996	1

Diabetic Indices

Type	Value	Most Recent
A1C	0.071	12/2005
LDL	2.41	12/2005
BP	135/75	02/2006
Urine Microalb	0.02	08/2005
Eye Exam		05/2005
Home Gluc (average)	7.4	01/2006

Source: Adapted from a Canada Health Infoway Inc. illustration.
Note: The individual is fictional.

Fig 2.1 Example of an Electronic Health Record

A survey of Irish health professionals found that they would like to have access to details of the medical histories of both their patients and their patients' families, as well as the results of physical examinations and observations, clinical notes, prescribed medications, diagnostic test results, diagnoses and discharge summaries (O'Malley, et al., 2011).

In the future, records may contain not only data generated by health professionals, but readings from electronic medical equipment such as glucose or blood pressure monitors, life-style applications that record, for example, exercise schedules, and personally entered data such as organ donation wishes and living wills (Ball, et al., 2007). Indeed some personal health records (a variation on EHRs which will be discussed in future chapters) already have some of these capabilities (HealthVault, 2013), (Dossia.org, n.d.).

2.4 Progress

Despite the widely agreed advantages of an EHR, progress in developing cross institutional or national health records has been painfully slow (Economist Intelligence Unit, 2011). The UK government, after some nine years of development effort, and £12 billion in costs, announced in September 2012 that it was accelerating 'the dismantling of the National Programme for IT', its ambitious attempt to create a comprehensive IT infrastructure for the National Health Service. Though elements of the programme had been delivered, the difficulties in developing an integrated national EHR proved insurmountable, and the Government felt that they could not justify spending further taxpayers' money on it (DoH Media Centre, 2012). The ambition to develop an EHR has not however been abandoned. In May 2013 the

country's Department of Health announced the availability to hospitals of a £260 million fund to enable them digitise their patient record systems, and to introduce e-prescribing (Department of Health, 2013).

Development of an EHR in the Netherlands has also ground to a halt, this time because of law-makers' fears about privacy and security (Dutchhealthcare, 2011). In April 2011 the Dutch Senate ordered that work on the introduction of a central system which would allow authorised healthcare providers to access patient data stored in local databases be stopped until concerns had been met.

Denmark, however, reports success in its efforts to establish an internet portal, accessible by both consumers and healthcare professionals, that brings "the entire Danish health care sector together" (Sundhed, 2011).

Some of these countries' experiences will be examined further in Chapter 3.

2.5 Prerequisites for an EHR

Prerequisites for an EHR include a system of unique identifiers for both consumers and providers, a national demographic dataset, agreed common standards for health information messaging , engagement and buy-in from all of the stakeholders, and strong and committed leadership.

2.5.1 Unique Identifiers

There are at present no national unique identifiers for any of the players in the healthcare domain, a situation described as "the single most important deficiency in the health information infrastructure in

Ireland" (HIQA, 2009). An Individual Health Identifier (IHI) for every healthcare consumer is considered essential for patient safety, helping to prevent or reduce the incidence of, for example, medication and blood transfusion errors, incorrect procedures and treatments, and the discharge of new-borns to the wrong family. An IHI would also contribute to efficiency and cost-effectiveness, eliminating the need for data entry at each new healthcare encounter (and reducing the potential for error that multiple data entry occasions present), and reducing duplicate and unnecessary tests. In addition it would enable the linkage of healthcare data across institutions and organisations, contributing thereby to patient safety and facilitating research and planning (HIQA, 2009).

As a corollary to the IHI there is also a need for a healthcare practitioner identifier (HPI) and a healthcare organisation identifier (HOI), so that providers and organisations involved in episodes of care can be identified in a reliable and semantically interoperable fashion. These identifiers are also required to assist in service planning, and to facilitate the development of on-going national ICT systems such as the National Integrated Medical Imaging System (NIMIS) and future developments, not least an EHR (HIQA, 2011).

In December 2012 the Department of Health and Children announced that the forthcoming Health Information bill would provide the "necessary enabling legal framework" for the introduction of identifiers for consumers and providers (Department of Health, 2012). HIQA has recommended, among other things, that there should be a single, constantly available entity licenced to issue unique identifiers linked to demographic data (HIQA, 2009) .

2.5.2 A National Demographic Dataset

A national demographic dataset is described as one of the "three key components of the IHI", the others being the identifier itself and the entity issuing and maintaining the IHI (HIQA, 2013). Presently, healthcare institutions and providers maintain their own demographic datasets, and there are no commonly agreed rules for how such data are entered. This creates the possibility of misidentification, and of the generation of multiple records for the same individual both within and between healthcare institutions. A national dataset would carry with it the advantages of an 'enter once, use many times' record, and the adoption of rules to regulate how data (for example surnames beginning with "O'") are entered would reduce the incidence of duplicate entries. The benefits for the consumer would lie in the reduced danger of misidentification and error. GPs and hospitals would benefit from lower administrative burdens and the ability to exchange data between their respective information systems for services such as prescriptions, tests and appointments. More generally, healthcare planners would benefit from the availability of a comprehensive database of demographic data (HIQA, 2013).

The dual function of constructing a national demographic dataset and assigning IHIs to each healthcare consumer would therefore appear to be a task for a single entity. It would need to be always available and to be able to accept registrations from individuals, GPs, hospitals, test facilities, and perhaps even insurance companies, and also to be able to issue temporary numbers where the identity of a consumer could not be established. It seems natural that it would also act as the registrar and manager of identifiers for healthcare providers.

2.5.3 Interoperability

Interoperability, the ability of distributed IT systems to communicate meaningfully with each other, is a sine qua non for any electronic communication in the healthcare (or any other) domain. Interoperability can be defined on three levels, syntactic, human semantic, and computable semantic (Mead, 2006). In syntactic interoperability the receiving computer system will recognise that it has received a message from the sending system in a syntax that has been previously agreed, but it will have no ability to interpret the message. It would not be able to distinguish, for example, between the two statements 'the doctor administered morphine' and 'the tree bought cups '. In both the subject-verb-object syntax is adhered to, and if the communication system is set up to exchange messages in this syntax, both messages are valid, though only one makes sense.

Human semantic interoperability entails human intervention to interpret the exchanged message. Medical documents such as referral letters or discharge summaries are semantically interoperable on the human level as the clinician who reads the document should take the same meaning from it as the one who sent it intended.

The highest level of interoperability, computable semantic interoperability involves the transmitting and receiving computer systems agreeing not only on the syntax, but on the meaning of the exchanged data. In practice this means that the systems have common agreed coding systems for data, examples of which in healthcare include the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10), Logical Observation Identifiers Names and Codes (LOINC) and

Systematised Nomenclature of Medicine Clinical Terms (SNOMED-CT). In systems with computable semantic interoperability, the sending system needs only to transmit a code (for example the ICD-10 code J44.1) which the receiving system can then translate into meaningful terms (in this case 'Chronic obstructive pulmonary disease with (acute) exacerbation').

2.5.4 Messaging Standards

Interoperability requires standards for how messages must be structured, and the four most common such standards found in healthcare are the Electronic Data Interchange For Administration, Commerce and Transport (EDIFACT), Health Level Seven Versions 2 (HL7v2.x) and 3 (HL7v3), and Clinical Document Architecture (CDA). Of these, HL7v2.x is the most implemented worldwide, used, among other places, in the U.S., Australia and the Netherlands, and in Ireland in the Healthlinks Project, the secondary to primary care messaging service which will be discussed further in Chapter 5 (HIQA, 2012).

HL7v2.x is a continuously evolving standard with a large number of optional elements, the facility to insert user defined elements, and the capability to exchange messages between more and less well developed systems. However, the flexibility and optionality of HL7v2.x leads to a need for 'negotiated interoperability', i.e. prior agreement between all communicating nodes on the structure and interpretation of messages (Atalag, et al., 2010). The standard therefore lacks scalability since, as the messaging system grows in size and complexity, the number of unique interfaces increases by a factor of $(N^2-N)/2$ (Benson 2010). It also lacks an underlying information model to provide structure and clarity

to data models and thus reduce the potential for ambiguity (HIQA, 2012), and explicit vocabularies or coding systems to enable semantic interoperability (Atalag, et al., 2010).

EDIFACT is a widely used International Organization for Standardization (ISO) business messaging standard, and is not specific to the healthcare domain. Its structure is similar to that of HL7v2.x, and is subject to some of the same constraints, in particular the need for 'negotiated interoperability' (HIQA, 2012). Countries that have adopted EDIFACT standards for health messaging include Denmark (Protti, 2010) and the U.K. (for the electronic transfer of pathology results between laboratories and GP systems) (NHS - Connecting for Health, 2011).

HL7v3 is an attempt by Health Level Seven International to address the perceived deficiencies in HL7v2.x and to create a standard that would enable computable semantic interoperability between loosely coupled large-scale health information systems. Unlike its predecessor, it is underpinned by an information model, the Reference Information Model (RIM), has an explicit methodology for developing messages, the HL7 Development Framework (HDF) and can incorporate established coding systems such as SNOMED (HIQA, 2012), (Atalag, et al., 2010). HL7v3 has been adopted, often in conjunction with HL7v2.x or other standards , for elements of healthcare messaging in the U.S., the U.K., the Netherlands and Australia. In the Netherlands, for example, the national messaging system conforms to HL7v3, but local systems are not obliged to (Atalag, et al., 2010).

The Clinical Document Architecture is a parallel standards development by HL7 International for the exchange of structured documents such as, for example, discharge summaries, that are persistent and human readable, but that also have machine-readable elements (HIQA, 2012). The latest version allows for different levels of structuring within the body section, so that implementers can incrementally increase structured and coded elements as the capabilities of their information systems increase (Atalag, et al., 2010). The CDA has been widely adopted, and documents can be transported within either HL7v2.x or HL7v3 messages (HIQA, 2012).

2.5.5 Stakeholder Engagement

One of the most important pre-requisites to the introduction of an EHR is the engagement and buy-in of all stakeholders. Failure to do so has led to the collapse of at least two large EHR projects. Development of an EHR in the Netherlands was at an advanced stage when parliamentarians called a halt because of privacy and security concerns (Dutchhealthcare, 2011). Given the choice to opt out of the system, 3% of Dutch consumers had chosen to do so. In addition, there was a high level of scepticism among healthcare professionals. A random sample of GPs and specialists found that 31% of them said they had opted out, while a further 25% had not yet decided (van Baardewijk, 2009). The abandonment of the project to create an EHR for England and Wales was ascribed in large part to its top-down nature, and failure to take account of local needs (Martin, 2011).

Denmark, in contrast, attributes much of its success to a favourable attitude towards government among its citizenry (Harrell, 2009) and consultation with and buy-in from health professionals

(Economist Intelligence Unit, 2011). Scotland, which successfully introduced an Emergency Care Record from 2004 onwards containing demographic information and details of allergies and medications, entered into a detailed process of consultation and engagement involving every healthcare consumer prior to and during roll-out (Fahy, 2012).

2.5.6 Leadership

In all of the countries where electronic health information projects have been most successful, committed leadership and strong project management have been identified as the most important of the critical success factors. Castro (2009), discussing the accomplishments of Denmark, Sweden and Finland, whom he describes as the global leaders in the field, states "Perhaps no factor is more important in explaining why some countries lead in health IT adoption than strong national-level leadership". In Denmark, MedCom, the non-profit, publicly funded, independent body set up to drive the development of health IT is credited with playing a pivotal role in that countries successful IT implementation (Fahy, 2012), (Murray, 2008). And Fahy (2012) identifies agencies in France, the Netherlands, Scotland, Germany, Australia and Finland which played strong leadership roles in progressing health IT projects.

2.6 EHR Architecture Types

Three basic EHR architectures have been identified in the literature (Gunter & Terry, 2005), the 'pull', 'push' and personally controlled models.

2.6.1 The 'Push' Model

In the 'push' model, data are sent to a central repository where they are matched with other data for the person concerned, building over time to a comprehensive, longitudinal record (Gunter & Terry, 2005). Duly authorised physicians and other healthcare providers can therefore access a complete record of the person's interaction with the health services in one location. These types of systems have also been called 'hub and spoke repository systems'. Countries that have adopted, attempted to adopt, or are in the process of adopting such systems include England, Norway and Canada (Canada Health Infoway, 2009).

2.6.2 The 'Pull Model

A second architecture type, the "pull" system (Gunter & Terry, 2005), or "point-to-point information exchange system" (Canada Health Infoway, 2009) retains only summary data in a centralised repository, but has links to more detailed data stored locally, and has the ability to request these data when required. New Zealand, Denmark and Australia have taken this approach.

"Pull" systems tend to be associated with countries where EMRs are in widespread use in primary care, whereas "push" systems are associated with lower primary care EMR penetration and centralised control of healthcare systems (Canada Health Infoway, 2009). In both "push" and "pull" systems the data are owned and controlled by providers, institutions and cross-institutional organisations and have been criticised for being designed more for the convenience of the healthcare professional rather than

the consumer (Ball, et al., 2007)

2.6.3 The Personal Health Record

Recent years have seen the emergence of a third model, the Personal Health Record (PHR). In this type of system the consumer may enter or amend data, control what is stored in the record, decide who can have access to it, and set different levels of access to different parts of the record. The PHR is seen as a method of empowering consumers and encouraging their active involvement in their own health maintenance and care (Gunter & Terry, 2005).

The PHR can be a free standing system, such as Microsoft Healthvault or a "tethered' system, linked to an EHR or EMR from which it can download data, or act as a portal, allowing the consumer to see their own health data. The PHR is designed to be able to amass data from disparate systems, but under the personal control of the healthcare consumer.

Table 2.1 below, adapted from a table in an early access version of an article to be published in Computer, gives a useful, if US-centred, summation of the state of the art in PHRs (Li, 2013). Record architectures are broken down into three types, tethered, web-based, and device based. Tethered systems are so called because they are tethered to a particular healthcare organisation's internal IT systems. While they provide a 'portal' whereby the healthcare consumer may access and view his or her data, and to communicate with providers, they typically do not allow the consumer to add or modify data. Other limitations may include a lack of interoperability and ability to transfer data to external

systems, and the inability to include data on healthcare contacts which occur at places outside the organisations remit.

Table 2.1: PHR Attributes

	PHR Type		
Attribute	**Tethered**	**Web-based**	**Device-based**
Interoperability	Not interoperable	Interoperable	Interoperable
Accessibility	Portal or client server	Internet portal	PC-based device driver
Data Sources	Electronic medical records	Electronic medical records and information added by consumers	Electronic medical records and information added by consumers
Completeness	Incomplete	Complete or partial	Complete or partial
Integrity	High	It depends	It depends
Major Risks	Transfer to other PHR systems may be problematical. Data entry by consumer may not be allowed.	Commercial or other secondary uses of PHRs by the service provider and its business partners	Physical loss, theft, damage, and security risks
Privacy Control	Managed by consumer's primary care site	Data controlled by consumer as well as the service provider	Data controlled by consumer alone
Security Governance	Secure extranet portal	Acceptable if encryption and strong authentication used	Acceptable if encryption and access control used
Example Installations or trials	Mayo Clinic and Kaiser Permanente	Dossia and Microsoft's HealthVault	CapMed's HealthKey and MediAlert's E-Health-KEY

Adapted from (Li, 2013)

Web-based systems allow consumers much greater control. They allow them to enter data, and to specify data that can be downloaded from other systems, such as healthcare organisations EMRs and wireless devices such as, for example, blood pressure or glucose monitors. They also allow consumer control of access to the data by healthcare providers. They are scalable, in that any organisation

capable of web-based transmission of data can potentially contribute to the record, and they can be accessed by any internet capable device. They are also portable; consumers 'bring the data with them' as they move between different healthcare systems, insurers and locations.

Device-based systems afford the consumer the greatest control, in that he or she has physical possession of the data on, for example a memory stick or smart card (though any records downloaded from other systems will, presumably, remain on the parent system). However they are prone to loss and damage, and are not automatically updated, whereas web-based or tethered systems would be.

The PHR is seen by some as having the potential to transform the doctor-patient relationship. Ball et al (2007) compare its likely effect to the invention of the stethoscope, which allowed the doctor to replace the subjective evidence of the patient with the objective evidence of technology. Continuous innovation in medical technology may have, in this view, led to the opposite problem, the exclusion of important subjective evidence. The advent of the PHR offers the opportunity "to create a more complete and balanced view of the patient" (Ball, et al., 2007).

The Markle Foundation, an American philanthropic organisation that focuses on the development of ICT in ways that benefit mankind, has looked in detail at the issue of consumer consent to the storing, transmission and sharing of healthcare data. It has outlined seven patient and consumer principles for the management of data in PHRs (see table 2.2 below). These principles state that consumers must have meaningful access to their data, and must be in a position to control with whom, if anybody, the data may be shared. They also lay emphasis on audit trails, on the 'integrity, security, privacy, and confidentiality" of the data and on independent oversight of data exchange systems.

Table 2.2: Consumer Principles

1. Individuals should be able to access their health and medical data conveniently and affordably.
2. Individuals should be able to authorize when and with whom their health data are shared. Individuals should be able to refuse to make their health data available for sharing by opting out of nationwide information exchange.
3. Individuals should be able to designate someone else, such as a loved one, to have access to and exercise control over how their records are shared.
4. Individuals should receive easily understood information about all the ways that their health data may be used or shared.
5. Individuals should be able to review which entities have had access to their personal health data.
6. Electronic health data exchanges must protect the integrity, security, privacy, and confidentiality of an individual's information.
7. Independent bodies, accountable to the public, should oversee local and nationwide electronic health data exchanges. No single stakeholder group should dominate these oversight bodies, and consumer representatives selected by their peers should participate as full voting members.

Source: (The Markle Foundation, 2005)

2.6.4 Hybrid Systems

As EHR systems develop, elements of the three approaches can be discerned in many of the systems under construction. Recent years have seen greater emphasis on patient participation and involvement in their own healthcare, and the importance of including them as stakeholders when designing EHRs is increasingly acknowledged. Thus systems that adopt a largely "push" approach are increasingly including patient portals where patients can look up and download details from their records, and in some cases enter data of their own. "Pull" systems are beginning to see the need to centrally store some data, and to allow greater consumer involvement (Canada Health Infoway, 2009). And PHRs with the ability to download data from providers EMRs are perceived to have advantages over

free-standing systems, (Bates & Wells, 2012). These advantages include the ability to download medication lists, to conveniently obtain repeat prescriptions, to make appointments and receive reminders, and to exchange e-mails. Data downloaded from providers' EMRs are also likely to be regarded as more reliable by healthcare professionals (Steele, et al., 2012).

No matter whether a 'push' or 'pull' EHR model is adopted, the personal element is increasingly seen as essential to the advancement of healthcare. Häyrinen, et al. (2008) cite it as the first element common to efforts to develop national EHRs in anumber of countries, including England, Canada and Australia. In the highly influential report "Crossing the Quality Chasm: A new Health System for the 21st Century" (Institute of Medicine, 2001) the second and third of "Ten Rules for Redesign" of healthcare are "the patient is the source of control" and "knowledge is shared and information flows freely". Tang and Lansky (2005) take these rules among others to imply that without consumer involvement the aims of the IOM will not be met (Tang & Lansky, 2005). Ball, et al. (2007) advocate the integration of PHRs, defined as data managed by the consumer, and EHRs, where the data is managed by the provider, in order to facilitate a holistic approach to disease.

3. State of the Art

3.1 Introduction

Strategies for the development of national EHRs are examined in this chapter. Two broad courses of action are identified in Section 3.2, an all-at-once or 'big-bang' approach where an attempt is made to introduce a comprehensive EHR, and an incremental approach, where standards and frameworks are established centrally, and healthcare actors are invited to link up as and when they become ready. A number of individual country experiences are examined in the light of these strategies, and the extent of their successes or failures are outlined. Section 3.3 introduces the concepts of health portals and personal health records (PHR), and Section 3.4 discusses the personally controlled electronic health record (PCEHR). Some examples of PHRs are also described.

3.2 Approach to the Development of National EHRs

A review of the literature suggests that there are two broad approaches to the development of nationwide EHRs. The first might be described as an all-at-once or 'big-bang' approach where the Government attempts to introduce a comprehensive EHR, and mandates all healthcare actors to participate. The UK's National Programme for IT (NPfIT), is an example of this approach (Coiera, 2007). The second is where the Government acts as a standard setter and enabler, providing advice and encouragement, and in some cases funding, to actors in the healthcare domain to develop systems compatible with national standards. The providers are free to devise approaches suitable for their individual needs, and to incrementally establish links with other healthcare actors at first locally, then

nationally. The Canadian approach is a prime example of the latter (Canada Health Infoway, 2009).

3.2.1 England

The National Programme for IT was set up by the UK Government in 2002 to deliver a comprehensive IT infrastructure for healthcare. The programme, which has been described as the largest civilian IT project in the world (Randell, 2007), had four main deliverables: a dedicated national broadband for healthcare, an infrastructure which would store data and act as a link between healthcare actors, an e-mail service, and an EHR. By the time the 'accelerated' dismantling of the project was announced in September 2012, the first three components had been delivered. A dedicated high speed broadband network, known as N3 was in place, the health infrastructure known as the Spine stored National Health Service (NHS) numbers, Summary Care Records , PACS, and health and research information, and NHSmail was operational (Walker-Osborn, 2011). (The Summary Care Record contains demographic data, and prescribed medications and allergies or adverse drug reactions lists, primarily for use when attending out-of-hours or emergency medical services.) However, the comprehensive EHR part of the programme was seen to have failed to achieve targets for delivery dates, functionality, adoption and pay-off and was criticised by a parliamentary committee and the National Audit Office for wasting taxpayers' money (Martin, 2011). Critics ascribe the failure to the top-down approach, and the failure to get the engagement and support of end-users (Maughan, n.d.).

3.2.2 The Netherlands

The Dutch approach also has a large top down element and has been criticised for failing to get end-user and patient support (Dutchhealthcare, 2011). Described as a 'pull' system or a “Google for care”, the framework as designed stores no actual data. Instead it acts as a gateway to health data stored on health providers’ and institutions’ EMRs, the idea being that authorised users would be able to gain access to an individual's health records no matter where they are stored. In order to achieve this, the Government set down legal requirements for EMRs, and obliged by law that these EMRs link to the National Switching Point (LSP in Dutch). However, the system has been subject to delays and cost over-runs, as well as criticisms around technical specifications, security and confidentiality, and in 2011 the upper house of the Dutch parliament imposed a ban on further development until improvements have been made. Prior to the ban approximately 3% of the population had availed of the legal right to opt out of the system, and it also failed to attract the support of care providers (van Baardewijk, 2009).

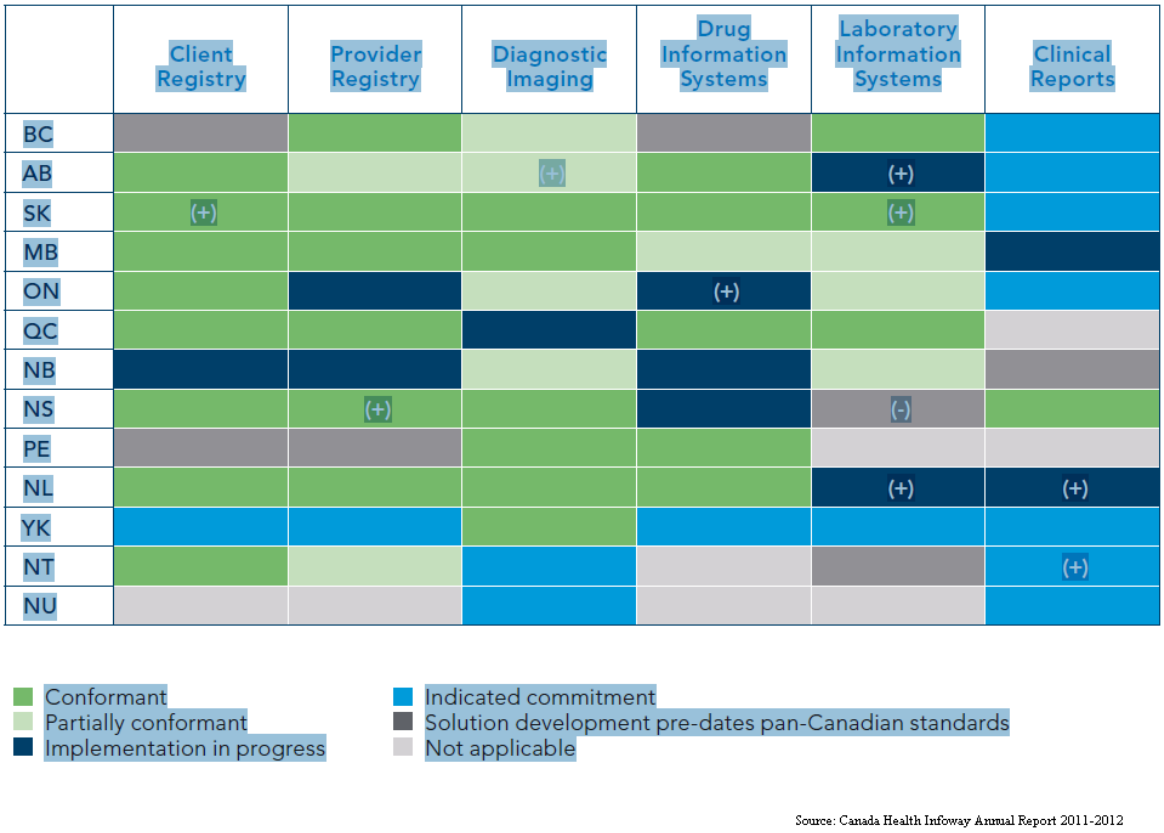
3.2.3 Canada

Canada Health Infoway was set up in 2000 to assist and accelerate EHR development in Canadian provinces and territories. Its role was to develop common standards and to encourage and assist providers to conform to these standards. To this end it produced a document called the EHR Blueprint, which it describes as a "road map guiding the sustainable development of the interoperable Electronic Health Record (EHR) for all Canadians" (Alvarez, 2006). Healthcare providers and institutions which conform to the EHR Blueprint standards for interoperability and security are eligible to receive advice and assistance, and in some cases, financial investment from Canada Health Infoway.

By 2010 six of the most populous of Canada's thirteen provinces and territories had at least one of the core elements of an EHR, defined as consumer and provider registries, a diagnostic imaging archival and communication system, and medication and laboratory information systems, in place, and in some the task was almost complete (Office of the Auditor General of Canada, 2010)

The focus of Infoway's efforts has been on patient and provider identification and demographics, diagnostic images, drugs, laboratory test results and clinical reports. Table 3.1 below, taken from Infoway's Annual report for 2011-2012, shows progress to date.

Table 3.1: Canadian Progress in EHR Development



Source: Canada Health Infoway Annual Report 2011-2012

States and territories are listed in the first column, and the extent of their progress under various headings are colour coded in the remainder. As can be seen, substantial progress has been made in the area of client and provider registries, which have been established in most of the administrative regions. Filmless diagnostic imaging is at 93% while 33% of pharmacies and 50% of hospital emergency departments have interoperable drug information systems. Laboratory information systems are less well developed, while there is much work to be done in the digitisation of clinical reports such as doctors notes, referral letters and discharge summaries.

The Canadian approach could be described as a 'building block' system, digitising at a granular level in an agreed way, and incrementally building connections to other actors at an increasing geographical

remove. An example of this can be seen in Ontario's Electronic Child Health Network (eCHN). The non-profit eCHN went live in 2000, linking four sites in Toronto and one approximately 130 kilometres away. A number of physicians were also connected to the network. By 2010 these numbers had grown to 109 sites in all corners of the province and over 1,000 doctors' offices. The number of individual health records amounted to 1.8 million (Electronic Child HealthNetwork, 2010).

The eCHN collects electronic data from all of these sources and consolidates them into an individual EHR, which is then available to any health professional who is involved in the patient's 'circle of care'. The types of data included in the EHR include clinicians' notes and letters, laboratory results, diagnostic images, and admission, discharge and transfer records (Electronic Child Health Network, 2010). The eCHN lays strong emphasis on designing systems to suit the users, rather than requiring users to change to fit the systems. It focuses on integrating data from existing systems in hospitals, clinics and GP's surgeries rather than requiring them to purchase new equipment. It also consults medical professionals about their needs and tries to fulfil them (Szende, 2011).

One possible criticism of the eCHN is that it appears to be entirely provider focussed. There is no mention on the web-site of parent access to, or control of, the data. The consent model appears to be based on opting out. Parents "may" be asked to consent to the uploading of data by participating providers though there does not appear to be an obligation for the providers to do so, and they can "revoke" consent for their childrens' data to be uploaded, or for data from the network to be made available to a particular facility (eCHN, 2010).

3.2.4 Denmark

Denmark, after an initial attempt to introduce an overarching system failed, also adopted an incremental approach to developing an EHR. In a 'Time' article in 2009, an employee of Sundhed.dk, the Danish web portal was quoted as saying "What we found is that EHR adoption must be done by evolution rather than revolution. You have to work with the systems already in place." (Harrell, 2009). Databases already put in place by regional authorities were linked together rather than having to conform to a top-down imposed blueprint. According to the 'Time' article, all hospitals and pharmacies, and 98% of primary care practitioners were connected to the centralised database. The system is seen as a resounding success in a field more marked by failure to a greater or lesser extent. In the Euro Health Consumer Index 2009, the country received a perfect score of 100 marks in the category of e-health (Björnberg & Uhlir, 2008). A report from the Information Technology and Innovation Foundation acclaimed the Danish System, along with those of Finland and Sweden as being ahead of most countries in the development of health IT (Castro, 2009). Among the factors identified as contributing to those successes were strong national leadership to promote, and government mandates to regulate, healthcare IT adoption, structural factors such as larger primary care practices and fewer actors and institutions with stakes in the outcome, high population rates of technology uptake and knowledge, the use of e-health, common health IT frameworks , population size and homogeneity, attention to privacy and security, and the establishment of robust standards from the outset.

3.2.5 Australia

Australia's Personally Controlled eHealth Record System (PCEHRS) went live in July 2012. From that date citizens and healthcare organisations were able to register to participate. Like in Canada, healthcare organisations are invited to opt-in to the PCEHRS subject to both the organisation and the relevant individuals within the organisation having recognised provider identifiers, and to their having compatible electronic patient record systems (eHealth.Gov.AU, 2012a), (eHealth.Gov.Au, 2012b). As the name suggests, the Australian model lays strong emphasis on patient control of the system. The consumer decides whether he or she wants a record, which healthcare workers have access to it and what parts of it he or she will allow to be seen by any particular healthcare worker (eHealth.Gov.AU, 2012a).

Two methods of access are available: a read-only internet portal, and read/write connection through a compatible clinical patient record system. Table 3.2, below, shows the sources and content of the information used to populate the PCEHR. Data are collected from provider systems and from the country's UHI system, Medicare. There is also a facility for the consumer to enter health notes and personal health information, such as medications, allergies and contact details.

Table 3.2 Types and Sources of Data in Australia's PCEHR

Data Source	Data Item	Content
Healthcare Professional	Shared Health Summary	Medical history, medications, allergies, adverse reactions, immunisations.
	Event Summary	Consultation details, diagnoses, treatments, prescriptions.
	Discharge Summary	Diagnoses, treatments, medications.
	Diagnostic Test Results	Diagnostic test results.
	Referrals	Referral details.
	Specialist Letters	Copy of specialist letters.
Medicare	Medicare Benefits	Provider name, date of service, service details.
	Pharmaceutical Benefits	Medication details.
	Childhood Immunisation Register	Details of childhood immunisations, natural immunities, contraindications to immunisations.
	Organ Donor Register	Patients organ/tissue donation decisions.
Patient	Personal Health Summary	Patient entered health, medications, allergies and contact details. Visible to Healthcare professionals.
	Personal Health Notes	Not visible to healthcare professionals

Compiled from information presented at http://publiclearning.ehealth.gov.au/modules/consumersIntro/index.html

3.3 Health Portals and Personal Health Records

The personal health record, whether that be a personally held and maintained electronic record such as Microsoft Healthvault, or a portal into a record held by a healthcare provider or cross-institutional repository, is increasingly seen both to be a prerequisite to, and a way forward for the digitising of healthcare data and the exploitation of those data for the benefit of the consumer (Ball, et al., 2007), (Li, 2013).

The bottom-up approach to the development of an EHR in Canada means that there has been no overarching structure or prescriptive common approach to the development of an EHR. This may be why there has been little evidence of the kind of consumer involvement that is seen in other advanced

EHR projects. The 2006 version of the Electronic Health Record Solution (EHRS) Blueprint made little reference to the healthcare consumer as a stakeholder in the enterprise; its focus was largely on the technical aspects and on the providers. Looking at some of the components of what it is planned will become a nationwide EHR, the province of Alberta, for example has a website, MyHealth, which it calls a personal health portal (Government of Alberta, 2013). However, even though it is a secure site, it neither provides access to personal health data or the ability to record and store such data. Instead it gives healthcare information and advice and allows users to check symptoms or get information on medications, tests and treatments, and waiting times at medical facilities.

In the most recent update of the EHRS blueprint however, considerably more emphasis is laid on the consumer as a stakeholder and a participant in their own care. There is now explicit reference to the creation of patient portals with personal health information. One of the examples of the future of healthcare in Canada describes a man accessing a personal health portal and recording blood pressure data and the progress of his fitness regime (Canada Health Infoway, 2009).

3.4 Personally Controlled Electronic Health Records

The difficulties experienced in the United States in developing person-centred records sourcing data from disparate providers and institutions sometimes at great geographical divides, has led to the emergence of a variant on the PHR, the Personally Controlled Electronic Health Record (Tang, et al., 2006). This is a portable record, owned and controlled by the consumer, which has the functionality to download data from provider, health institution and insurance company systems. It is not tethered to any one system. Instead it stores data either on the web, in the 'cloud', or on physical devices such as

USB sticks tablets or laptops. Consumers who move from one healthcare institution, insurance company or even state are able to bring their healthcare data with them, and have full control over third party access to them.

In America a number of Fortune 5000 companies came together to establish a PCEHR for their employees as a method of managing rising healthcare costs. These companies hoped to encourage their employees to manage their health statuses by providing them with information about their healthcare, and by incentivising them to keep records of health maintenance and improvement activities and to engage in workplace wellness programs. By these means they hope to reduce healthcare costs through reducing demand and improving productivity (Dossia.org, 2010). The system is open source, web-based, personally controlled and portable and can gather data from hospital and doctor systems, pharmacies and labs, health insurance companies and web enabled medical devices (Dossia.org, n.d.).

4. Universal Health Insurance

4.1 Introduction

In this chapter the most common approaches to the provision of population wide healthcare are identified, and the likely shape of Universal Health Insurance in Ireland is outlined. Section 4.2 reviews the various policy statements issued by Government parties both before and after they took office, and attempts to glean from them some idea of how UHI might be implemented. Section 4.3 analyses the various health system models to be found around the world. Section 4.4 looks in particular at the Dutch system, a probable model for Ireland. Based on the work of the previous sections, Section 4.5 then sketches an outline of what the Irish scheme might resemble, and Section 4.6 compares that putative scheme to the current private health insurance system in Ireland.

4.2 UHI as Government Policy

In its 2011 Programme for Government (Fine Gael and the Labour Party, 2011), the incoming coalition administration announced its intention to reform the existing 'two-tiered' health service, and to introduce a system of Universal Health Insurance (UHI) based on the European precept of social solidarity. The existing system, with its complex mix of social insurance, private health insurance, free care for persons and families below fixed income levels, and out-of-pocket payments or co-payments for the rest of the population (Harvey, 2007), has long been criticised as inequitable, delivering, for those in a position to pay for it, better access to health services and better care in hospital (Wren, 2003, pp.

139-175), (Tussing & Wren, 2006, pp. 139-141), (Burke, 2009, pp. 7-24). The new UHI scheme would not only "end the unfair, unequal and inefficient two-tier health system", it would also reduce the cost of care delivery (Fine Gael and the Labour Party, 2011).

The document went on to sketch the outlines of the new system. All adults would be mandated to purchase a basic health insurance package from one of a number of competing insurance companies. Children would go free, while the government would pay for or subsidise premiums for those on low incomes. The basic insurance package would be subject to community rating and risk equalisation: insurance companies would not be entitled to take age or health status into account when setting the premium, and claims costs would be spread among all insurers proportionately. Neither hospitals nor insurers would be allowed to sell packages which offered faster access to services covered under the basic insurance package. The management of public hospitals would be devolved to independent, not-for-profit trusts, which would be reimbursed for the care delivered largely on a fee-per-service basis. Insurance companies would be allowed to negotiate with individual hospitals, thus, it was anticipated, driving efficiency and innovation.

A Hospital Insurance Fund, into which any exchequer funding for hospitals would be channelled, would be set up. This body would manage the Risk Equalisation fund, pay for or subsidise insurance premiums for those on low incomes, reimburse hospitals for services not covered by health insurance, and ensure that hospitals considered essential on location or other grounds would not be forced to close.

As an essential pre-requisite to these reforms, universal entitlement to free primary care would be

introduced. GPs would be paid primarily on a capitation basis, though they would be incentivised to manage persons with chronic illnesses in order to keep them, in so far as possible, out of the hospital system. More GPs and practice nurses would be trained and recruited to strengthen the primary care system. GPs would continue to act as a gateway to secondary care providers.

The Programme for Government made no specific reference to the Dutch universal health insurance system, though, as will be outlined below, the plans as announced bear considerable resemblance to that scheme. In 2011 Fine Gael re-launched a health policy document 'Fair Care' (Fine Gael, 2011) which they had initially issued in 2009, the provisions of which bear considerable resemblance to those put forward in the Labour Party's 2001 health policy document 'Our Good Health' (The Labour Party, 2001). The 2011 policy document explicitly references the Dutch system, and the plans announced in the Programme for Government would appear to be largely based on this document.

4.3 Health Systems Models

Various classifications of health systems, based in the main on how they are financed, are available in the literature. Wren (2003) discerns three broad types; those funded through general taxation, those funded through compulsory insurance schemes, and those that are privately funded.

The British National Health Service (NHS) is perhaps the best known example of the first type, and indeed the United Kingdom was the first country to introduce such a system. Based on recommendations for social reform put forward in a report in 1942 by the economist Sir William Beveridge, the NHS has a single payer, the state, is funded from general taxation, and the majority of

providers are publicly funded. Other countries with 'Beveridge model' systems include Italy, Spain and Sweden (Lameire, et al., 1999). Health expenditure is consistently lower in countries with Beveridge model systems, but outcomes are slightly worse, and consumer satisfaction considerably worse than in countries with compulsory insurance based schemes (van der Zee & Kroneman, 2007).

Funding systems based on compulsory insurance are commonly named after Count Otto von Bismarck who introduced Sickness Insurance to the German Empire in 1883 (Read, 2009). In these 'Bismarck model' systems, workers are mandated to purchase health insurance to fund healthcare for themselves and their families. Employers may also be required to contribute. Insurance is provided by a multiplicity of companies or organisations. In some countries insurers and providers can aspire to be profit making, while in others they must be not-for-profit enterprises. However, both insurance companies and providers are usually in the private sector (van der Zee & Kroneman, 2007). Countries with Bismarck model systems, sometimes also called 'managed competition' models (Read, 2009), include Germany, Holland, Switzerland and Japan (Lameire, et al., 1999).

A variant on these two models, the national health insurance (NHI) model, combines aspects of both Beveridge and Bismarck. Under this model, there is one, mandatory, state-run insurance system which collects premiums from citizens and negotiates prices with and pays privately run providers (Read, 2009). It is thus, like Beveridge, a 'single payer' system. However, the Beveridge model, especially as operated in the UK is both payer and provider, whereas the NHI model allows for private provision of health care. It is like the Bismarck system in that monies collected are ear-marked for healthcare funding. The premier example of an NHI system is Canada, with variants in South Korea and Taiwan (Read, 2009).

The third type of healthcare model is the private payer model, where healthcare is funded either through private health insurance or through out of pocket payments. Outside of the developing world there is probably no purely privately funded model of healthcare. Read (2009) points out that the U.S. system has a number of different funding models: for most working people below retirement age there is a Bismarck system of health insurance paid for by employees and employers or in the case of some lower income groups, by the states (Medicaid); for retired citizens there is an NHI model (Medicare); for current and retired military personnel and Native Americans there is a Beveridge-type system; and for uninsured persons at the time Read's book was written, an out-of-pocket or charity funded system.

Similarly in Ireland there is a mixture of systems: for the privately insured the system is Bismarckian; for those with medical cards the Beveridge model applies; for those above the income threshold for a medical card, but without private health insurance an NHI model (with co-payments) applies for primary care, while an out-of-pocket system applies in the area of primary care (Harvey, 2007).

Table 4.1: Features Of Universal Health Coverage Systems

Feature	Bismarck	Beveridge	National Health Insurance	Private Payer
Entitlement Basis	Contribution	Citizenship/ residence	Contribution	Contribution
Funding Basis	Mandated Health Insurance	Taxation	Earmarked Taxation	Optional Health insurance/Out-of-Pocket
Benefit Package	Explicit	Implicit	Implicit	Explicit
Payer	Private	Government	Government	Private
Provider	Private/Public	Public	Private/Public	Private

The table above, which is adapted from a similar one comparing Bismarck and Beveridge only (Kutzin, 2011), summarises some features of present-day implementations of the various systems. In Bismarck

or private payer systems the benefits available are explicitly defined, whereas in Beveridge and National Health Insurance systems the Government may ration or restrict healthcare when resources are scarce. In the original Bismarck incarnation providers were mainly in the private sector, but as countries such as Switzerland, with mixed systems, move towards some version of the Bismarck model, publicly owned providers may be drawn into the managed competition model (Daley, et al., 2013). Similarly under NHI systems, though the vast majority of Canadian hospitals are privately owned (Irvine, et al., 2013) , South Korea has mixed public/private provision (AngloINFO, 2013)

4.4 The Dutch Scheme

The Dutch system of universal access in a 'managed-competition' market was introduced by the Health Insurance Act (2006), and after a period of bedding down, has been acclaimed in comparative reports as one of the best, if not the best health systems in the world (Davis, et al., 2010), (Björnberg, 2012).

Healthcare in the Netherlands is divided into two streams, each with their own method of funding. The 'cure' stream comprises primary and short term or acute secondary services, whereas the 'care' stream covers exceptional medical expenses, often for the long-term or chronically ill. The latter is funded through an NHI-type insurance fund collected through the taxation system (Government of the Netherlands, n.d.).

Prior to 2006 a dual system of public and private health insurance funded curative care (Schäfer, et al., 2010). For the 65% of persons on low and middle incomes a mandatory insurance system applied, while persons above the income threshold for the mandatory scheme generally opted for private health

insurance (the uninsured amounted to about 1.5% of the population in 2005) (van de Ven & Schut, 2008). Rising costs in the 1970's and 1980's had led the government to replace an open-ended fee-per-service funding model with a system of capitation fees for practitioners and budgets for institutions. Capitation payments and budgets incentivise the minimisation of care volumes, whereas fee-per-service funding has the opposite effect (Hasaart, 2012). Budgets often lead to the rationing of care and a lack of incentives for providers to seek efficiencies, and as this came to pass in the Netherlands it led to public dissatisfaction and the development of the managed competition model (van de Ven & Schut, 2008).

The 2006 Health Insurance Act requires all persons resident in the country for four months or more to purchase a basic health insurance package which covers them for GP visits, acute inpatient stays, medicines and medical devices. Children under 18 are covered under a parent's policy, and are covered for dental treatment in addition (Expatica Communications BV, 2012). Individuals or families pay a flat rate payment to their chosen insurer, and employers pay an additional percentage of salary into a Health Insurance Fund. The flat rate payment is subject to open enrolment (insurance companies cannot refuse to cover a person for reasons of age or health status), community rating (the same flat rate premium applies to all subscribers) and lifetime cover (policies cannot be terminated by the company for reasons of age or health status). There is freedom to choose between insurance companies, and persons can switch companies once a year. The Health Insurance Fund is used to subsidise premiums for low income persons or households and also acts as a risk equalisation fund, whereby companies incurring higher claims costs than their competitors are compensated for their higher risk (Schäfer, et al., 2010). Additional voluntary insurance is available for those who wish to purchase it. These packages cover services not available under the flat rate package, such as private

rooms or (adult) dental services (Browne, 2012).

The principle of 'money follows the patient' is applied to hospital reimbursement for both curative and long-term care. In the acute sector, hospitals are reimbursed by means of 'Diagnosis Treatment Combinations', packages encompassing all inputs to individual episodes of treatment (Hasaart, 2012). DTCs are similar to Diagnosis Related Groups (DRGs), the method used for classifying hospital patients in many countries, including Ireland (HOPE - European Hospital and Healthcare Federation, 2006). However the Dutch decided to create their own classification system because DRGs related only to the hospital element of the care episode and in addition did not encompass outpatient care. DTCs, of which there are approximately 29,000 (Hasaart, 2012), (Oostenbrink & Rutten, 2006), are used to reimburse both hospitals and medical specialists and encompass both inpatient and outpatient episodes.

The Dutch system of curative care has therefore introduced managed competition, under the supervision of independent agencies, into the three elements of the system; the insurers, the providers and the insured population. Insurers, which are permitted to be for-profit entities, compete for customers, and have been given limited powers to negotiate with providers. Providers have been encouraged to compete for custom, in the belief that this will drive efficiency and innovation. And the insured have been allowed free choice of insurance company, and the right to switch insurers at regular intervals (Schäfer, et al., 2010). As stated at the beginning of this section the outcome is a system judged to be one of the best in the world. It ranked highest of thirty-four countries in the Euro Health Consumer Index 2012 (it should be noted that the current Irish system ranked thirteenth overall, just after the United Kingdom at twelfth, scoring above average on outcomes, preventative measures and

access to pharmaceuticals) (Björnberg, 2012). However, some commentators have noted that the availability of supplemental insurance packages, which are not subject to open enrolment and community rating, create the potential for companies to risk select by linking these packages to the basic mandatory package (Klazinga, 2009). Individuals are however free to purchase their basic and supplementary packages from different insurers (Expatica Communications BV, 2012). Concern has also been raised about rising costs, driven by an increased volume of care (Westert, et al., 2010).

4.5 The Implementation of UHI in Ireland

While the Government have been careful to avoid giving a detailed structural overview of how UHI would operate in the Irish context (Department of Health, 2012), it is possible to postulate a model based on the Programme for Government (Fine Gael and the Labour Party, 2011), the current Dutch model, and the current system of voluntary private health insurance in Ireland. The core system of 'managed competition' is common to all three, and it can probably be assumed that this will remain at the heart of the Irish model. This assumption leads in turn to the assumption that a basic insurance package, covering all essential curative hospital care, will be mandated. It can probably also be assumed that insurance companies will be permitted to offer supplemental insurance packages, as they are in Holland.

The principles of open enrolment, lifetime cover, community rating and risk equalisation are fundamental to the policy as set out in the Program for Government (Fine Gael and the Labour Party, 2011) and currently apply in the private health insurance market (Citizens Information Board, 2012). It can be assumed that these will be retained in any UHI system. One difference however, between the

Dutch system and the current private health insurance system in Ireland, is in the area of risk equalisation. The Dutch Risk Equalisation Fund is, as set out above, resourced from an NHI-type flat rate payroll tax, whereas the Irish system is administered by the health insurance companies and comprises a mixture of levies per insured person and age related tax credits (The Health Insurance Authority, 2012). The Government has announced changes to the current scheme, effective 1 January 2013, whereby higher levies and tax reliefs will apply to plans providing cover to private hospitals, and additional risk factors, such as gender and health status will be taken into account.

Perhaps the most fundamental difference between the Dutch model and what appears to be current thinking in the DOH is that the Dutch system is entirely insurance-based, a combination of an NHI and a Bismarck model. The model that appears to be taking shape in Ireland would combine Beveridge and Bismarck, in that the 'care' arm and any state contributions to the 'cure' arm would be funded from taxation. While mention is made of ring-fencing these funds (Department of Health, 2012), there appear to be no plans to delineate a percentage of taxation, for example, to this end.

Methods of reimbursement are key to the question whether UHI could be used to drive the development of an EHR for Ireland. It is not clear from the available literature how hospitals and medical specialists would be paid for their services, other than that the principle of 'money-follows-the-patient' would apply. A key to the successful transition to UHI in Holland was the prior development of Diagnosis and Treatment Combinations for reimbursement (Helderman, et al., 2005). As stated above, these resemble DRGs in that they classify episodes of healthcare. They differ from DRGs in that they encompass all elements of care, both hospital and professional, from first contact with the health services to completion of treatment. There appears to be no comparative development occurring in Ireland. Public hospitals code episodes of care using the Australian

Modification of ICD-10 diagnosis and procedure codes and these data, along with age, sex and discharge status are used to group clinically similar episodes of care into DRGs. The Irish Casemix Programme then uses these DRGs to compare hospital activity and to construct a budgeting model for hospitals. However, the model does not determine budgets, which are mainly based on prior year figures, adjusted for relevant developments. It is used rather as a marginal adjuster to the budgets already calculated (Casemix/HIPE Unit, 2012). Thus DRGs are not used in a MFTP fashion to reimburse for individual episodes of care. Whether they could be so used is a matter for debate. There are less than 700 DRGs in the implementation currently in use in Ireland, the Australian Refined version (AR-DRG). The private health insurers use procedure based and length of stay based reimbursement systems, and the numbers of procedures they cover number in the thousands. As already noted, the Dutch have some 29,000 DTC combinations, though plans are afoot to reduce then to some 3,000 'care products' (Hasaart, 2012). DRGs on their own may lack sufficient specificity to drive a MFTP system. It would in any case be important that the insurance companies be furnished not just with DRGs, but with the diagnoses and treatments that lay behind them, for audit, management information and utilisation review purposes.

4.6 The Current Private Health Insurance Market

In many ways the current private health insurance market in Ireland is structured much as the Dutch UHI system is and the proposed Irish UHI scheme would be. A number of private HI companies compete among themselves and with a publicly owned insurance company. All companies are obliged to offer open enrolment and lifetime cover to all of the packages that they offer. All packages must be community rated, and a system of risk equalisation has been set up.

5. An EHR for Ireland

5.1 Introduction

In this chapter a possible route towards devising a national EHR is described. Section 5.2 advocates an incremental approach to the construction of an EHR, Section 5.3 deals with the question of a demographic dataset, section 5.4 describes the health insurers proposed e-claims dataset and how that might be used to populate an EHR , and section 5.5 looks at the National Healthlink Project and how that might contribute to an EHR. Section 5.6 revisits the question of standards for interoperability, outlines the deficiencies in the proposed EHR model as outlined and how in the future they might be addressed, while section 5.7 considers the question of consumer involvement and control of the data and makes a recommendation for a system architecture. Finally, section 5.8 draws some conclusions about the feasibility of beginning the development of an EHR for Ireland.

5.2 Taking the Correct Approach

In Chapter 3, two broad strategies for the construction of national EHRs were outlined, the all-at-once or 'big-bang' approach, and the incremental approach. It was noted that the all-at-once approach failed, rather spectacularly, in England and Wales, while the incremental approach seems to be working in Canada, and particularly in Denmark, a country more like Ireland in size. An all-at-once attempt to create a national EHR for Ireland is unlikely to prove successful in the near future. In June 2008 the Government issued a discussion paper and invited submissions for a proposed Health Information Bill (Health Research Board, 2008). In this paper there was some discussion of ERHs. Developments in

Canada, Australia, New Zealand and England and Wales were noted, with most discussion focussing on the system for England and Wales, which the paper described as “the most developed EHR system in the world”. The paper did note concerns about costs, lack of engagement with providers, security and privacy issues and an overall absence of direction. As already stated, development of the system for England and Wales was discontinued in September 2012 because of such concerns (DoH Media Centre, 2012). In any case the discussion paper did seem to lean towards favouring what it called ‘distributed’ systems rather than overly centralised ones. In 2008 at the annual Health Informatics Society of Ireland (HISI) conference, an Assistant Secretary from the Department of Health told attendees that an EHR for Ireland was “a long way off”, and that the forthcoming Health Information Bill would provide for a framework to enable EHR development rather than any prescriptive plan (Spillane, 2008). Though the bill had not yet been published when the Government’s health strategy document was issued in 2012, that document also stated that the legislation would act as a blueprint for the management of health information (Department of Health, 2012), and appears to be an approach similar to that taken in Canada.

However, as outlined in section 3.2.2, there were other factors which contributed to the Danish success story. Among these were ingredients such as larger primary care practices, fewer actors such as pharmacies, laboratories and other healthcare institutions, a ‘tech savvy’ population, common health IT frameworks , and smaller population size and homogeneity (Castro, 2009). Some of these characteristics are present to some extent in the current Irish system, but others are not. Sweden, for example has a state monopoly pharmacy (ibid.), whereas in Ireland there are, according to one web site, 1,500 privately owned and run community pharmacies (Irish Pharmacy Union, 2013) . Smaller GP practices are also more the norm in Ireland, though there is a trend towards more group practices. In

1996, 42% of GP practices were single member ones, whereas this figure had dropped to 37% by 2005. However the number of practices with five or more members in 2005 was still only around 10% (O'Dowd, et al., 2006).

On the question of digital connectedness Ireland seems more like Denmark: a study in 2013 estimated that there are an average of four potential online devices in every Irish home (eircom, 2013), and the country is forecast to rise from its current 11th position to 3rd in the world for new media adoption by 2015 (Barnard, 2013).

There is also movement towards the development of common Health IT frameworks, including the national demographic dataset, the health insurers e-claims dataset and the National Healthlink Project, and it is proposed in this document that these 'building-blocks', among others, could be used to incrementally construct an EHR.

5.3 A Demographic Dataset

The necessity for the establishment of a national demographic dataset was addressed in Section 2.5, where it was regarded as an essential element of the creation of an Individual Health Identifier for each healthcare consumer. Both the demographic dataset and the IHI would of course be the necessary precursors to the creation of a national EHR, and would in fact form the basic underpinning of the system. It is unclear as yet how the Government would go about the establishment of such a dataset, whether, for example, people would be invited or required to submit their details, whether the data

would be collected as people have contact with the health services, or whether data from existing official or healthcare databases would be collated. HIQA (2009) specifies as a requirement of the IHI that it be capable of incremental implementation such as at specific healthcare organisations or regionally.

Harney (2012) suggests two so-called 'trusted data sources' (TDS) that could be used to initially populate the demographic dataset pending consumers attendance at a healthcare provider, where the data could be verified. The first of these is the Client Identity Services (CIS) database maintained by the Department of Social Protection (DSP). This database contains Personal Public Service (PPS) numbers and demographic data and has wide population coverage. However, the database is known to contain inaccuracies and duplication (Lavery, 2011) and work is on-going to cleanse it. Once this work has been done the PPS data should be of a sufficient standard for use in an IHI (HIQA, 2009). The National Client Index (NCI) used by the Health Service Executive (HSE) to support its Primary Care Reimbursement Service (PCRS) is the other suggested TDS, and the data in this could be used to supplement the PPS data (Harney, 2012). However, there would clearly be data protection implications in using the CIS, and establishing a linkage between it and the IHI could have the effect of lowering public support and acceptance for the latter. The PPS number is also used by, among others, the Revenue Commissioners, and HIQA's IHI consultation process revealed "serious concerns" about linking the PPS and the IHI (HIQA, 2009).

Other possible trusted data sources not considered by Harney (2012) are the health insurance companies, who presently hold basic demographic data about all their customers, including company

specific unique patient identifiers, names, dates of birth, gender, address and, in the case of family policies, familial relationships. These data are supplied for the purposes of receiving healthcare cover, and may therefore be less problematic from a data protection point-of-view than would PPS data. They are also likely to be more accurate as there is little incentive to furnish incorrect data. In the managed competition UHI scenario as previously outlined, all permanent residents of the state would be required to register with one of the competing companies. Between themselves the insurance companies would therefore hold basic demographic data about all potential healthcare consumers. Assuming consent to participate in the EHR scheme had been obtained, the insurance companies could therefore be mandated to upload these data to the national demographic dataset, which would form the backbone of the EHR. The companies could be required to ensure that their data is in compliance with any national standards that are in place. The name, address and unique identifier code of the consumer's GP could also be recorded in this section. A drawback to this suggestion however, is a requirement for a face-face registration process (Harney, 2012), as the insurance companies would probably not be able to comply with this, though a course of action similar to that suggested by Harney, where IHIs are confirmed by healthcare providers as the consumer comes in contact with the health services, could provide a possible solution.

5.4 The e-Claims Dataset

The latest version of the health insurance companies e-claims submission dataset (available from eHealthClaims.ie and partially reproduced in Appendix 1) facilitates the collection of a wide range of data in relation to episodes of care in hospitals and other healthcare facilities, as well as to certain GP

and specialist encounters. Data of interest to this dissertation include demographic, diagnosis and treatment details, as well as medical history relevant to the episode of care that is the subject of the claim, details of any injuries where these are the reason for the care episode, and data relating to childbirth and delivery, including demographic data for the newborn.

5.4.1. Care Episode Summary

Over time, data collected for payment purposes could contribute to a longitudinal health record containing data from various sources. Figure 5.1 below illustrates what a top level view of such a record might look like.

Patient ID : 99999999 Name Mr Mxxxxx Myyyyyy

Care Episode Summary

Care Episode Type	Date From	Date To	Location	DRG	Click for Details of: Diagnosis	Treatment
GP Procedure	15-May-10	15-May-10	Doctor's Surgery	OTHER SKIN "&" SUBCUTANEOUS TISSUE PROCEDURES		
Specialist Consultation	23-Nov-11	23-Nov-11	Consultant's Rooms	NON-COMPLEX ANTERIOR SEGMENT EYE PROCEDURES		
Daycase Hospital Admission	18-Jan-12	18-Jan-12	St. Columcille's Hospital, Loughlinstown	NON-COMPLEX UPPER GASTROINTESTINAL ENDOCSOCPY		
Inpatient Hospital Admission	04-Jul-12	06-Jul-12	St Michael's Hospital, Dun Laoghaire	OTHER GASTROENTERITIS "&" ABDOMINAL PAIN		

Fig. 5.1: Example of Care Episode Summary

An authorised healthcare professional could therefore get an overall summary of the consumer's contacts with the subscribing healthcare institutions and practitioners, and quickly identify which episodes might be relevant to the current reason for attendance. Drilling down, the practitioner could then access more granular data relating to diagnoses or treatments. These data would be coded using a recognised international coding system, in all likelihood the Australian Revised version of ICD-10

currently in use in the public hospital system (the coding in these examples are in ICD-9-CM as the examples available to the author are in this version).

5.4.2 Diagnosis Details

In the example illustrated in Figure 5.2 a primary and up to four secondary diagnoses are allowed. However, according to the ESRI, up to nineteen secondary diagnoses are allowed in the latest version of ICD-10 in use in the public hospitals (ESRI, n.d.).

Patient ID : 99999999 Name Mr Mxxxxx Myyyyyy

Diagnosis Details

Care Episode: Inpatient Hospital Admission to St Michael's Hospital, Dun Laoghaire from 04-Jul-12 to 06-Jul-12

Diagnosis Type	Code	Description
DRG	064171	OTHER GASTROENTERITIS & ABDOMINAL PAIN
Primary Diagnosis	78900	ABDMNAL PAIN UNSPCF SITE
1st Secondary Diagnosis	55321	INCISIONAL HERNIA
2nd Secondary Diagnosis		
3rd Secondary Diagnosis		
4th Secondary Diagnosis		

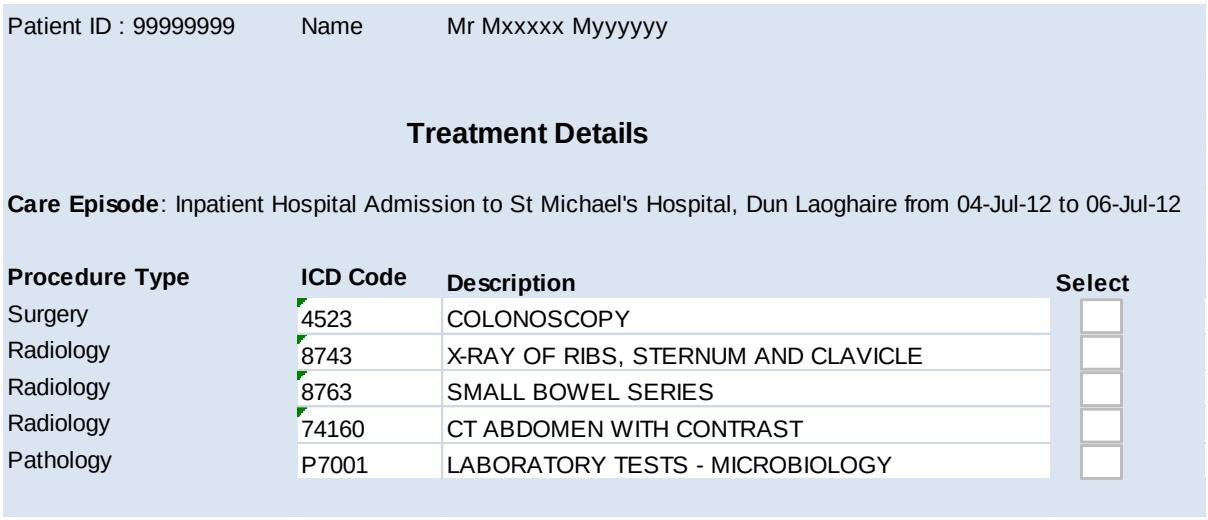
Fig. 5.2: Example of Diagnosis Details for an Individual Episode of Care

5.4.3 Treatment Details

At present the individual companies use proprietary coding systems for procedures. However the requirement for ICD coding necessitate that all proprietary procedure codes must be mapped to the

equivalent ICD codes, so either the mapped codes or the software to carry out the mappings could be made available to the EHR. In many cases the healthcare institutions may receive a package price covering all aspects of the patient's treatment for a particular episode, meaning that only one code is required for reimbursement. For example there may be a single proprietary code for a hip replacement. Thus data relating to pathology, radiology and any other aspects of the overall care delivered are lost. However, the individual practitioners are generally reimbursed on a fee-for-service basis. Therefore much of that data lost from the hospital claim details could be captured from the professional fees claims. Additionally, some elements of hospital care are also reimbursed on a fee-per-service basis, for example high cost drugs, and some prostheses and scans. Therefore it is still possible to obtain details of treatments at a fairly granular level.

Figure 5.3 below gives an example of what a Treatment Details screen might look like. In this example the consumer had had a colonoscopy, x-rays, a C.A.T. scan and laboratory tests.



Patient ID : 99999999 Name Mr Mxxxxx Myyyyyy

Treatment Details

Care Episode: Inpatient Hospital Admission to St Michael's Hospital, Dun Laoghaire from 04-Jul-12 to 06-Jul-12

Procedure Type	ICD Code	Description	Select
Surgery	4523	COLONOSCOPY	
Radiology	8743	X-RAY OF RIBS, STERNUM AND CLAVICLE	
Radiology	8763	SMALL BOWEL SERIES	
Radiology	74160	CT ABDOMEN WITH CONTRAST	
Pathology	P7001	LABORATORY TESTS - MICROBIOLOGY	

Fig. 5.3: Example of Treatment Details for an Individual Episode of Care

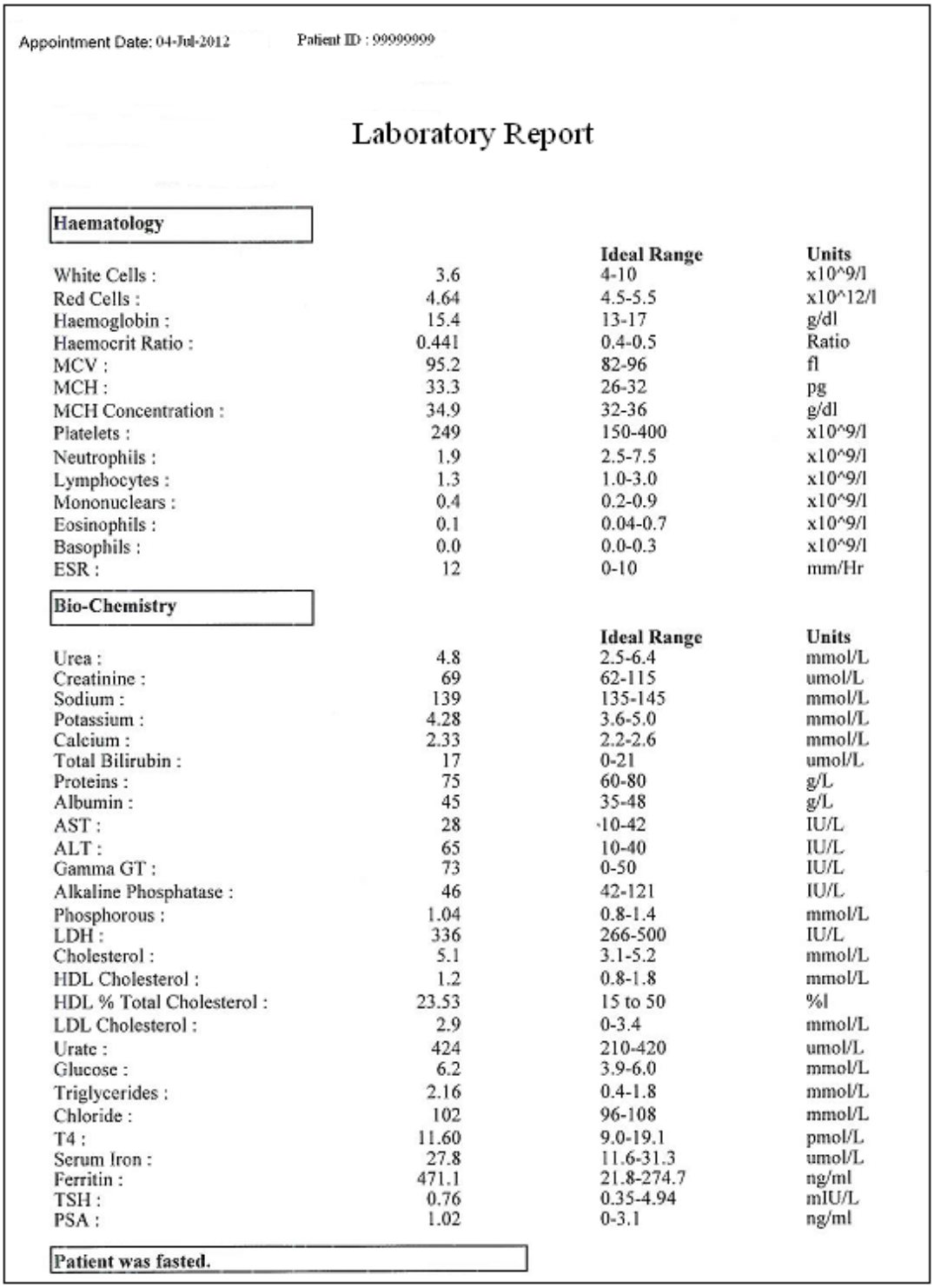
Drilling down on individual procedure line would provide further information, such as the date and time of the procedure, whether it was carried out under anaesthesia, and if so the anaesthesia type, and the name of the practitioner who performed the procedure. Practitioners also have the option to supply further information they may feel is relevant, or to explain apparently excessive lengths of stay.

5.4.4 Reasons for Treatment and Test Results

In general, only the fact that tests or imaging have been carried out are reflected in current hospital claims. The results of these tests are not supplied. The available data concerning tests are therefore of very limited use. However ever-increasing cost pressures on insurers are leading them to adopt strategies to try to control those costs, including the specification of clinical indications for certain procedures (see Appendix 1) , and the clinical audit of claims (O'Regan, 2013). Thus insurers are increasingly requiring to know not only that fact that procedures or tests have been carried out, but also the reasons for these tests, and in some cases, the outcomes of the tests. The e-claims submission dataset, for example, includes a field for the results of a scan.

5.4.5 Scanned Documents

The dataset also includes a functionality to receive scanned documents. Therefore, laboratory test results and possibly images could be supplied as scanned documents in early implementations of the



Appointment Date: 04-Jul-2012 Patient ID : 99999999

Laboratory Report

Haematology

		Ideal Range	Units
White Cells :	3.6	4-10	x10^9/l
Red Cells :	4.64	4.5-5.5	x10^12/l
Haemoglobin :	15.4	13-17	g/dl
Haemocrit Ratio :	0.441	0.4-0.5	Ratio
MCV :	95.2	82-96	fl
MCH :	33.3	26-32	pg
MCH Concentration :	34.9	32-36	g/dl
Platelets :	249	150-400	x10^9/l
Neutrophils :	1.9	2.5-7.5	x10^9/l
Lymphocytes :	1.3	1.0-3.0	x10^9/l
Mononuclears :	0.4	0.2-0.9	x10^9/l
Eosinophils :	0.1	0.04-0.7	x10^9/l
Basophils :	0.0	0.0-0.3	x10^9/l
ESR :	12	0-10	mm/Hr

Bio-Chemistry

		Ideal Range	Units
Urea :	4.8	2.5-6.4	mmol/L
Creatinine :	69	62-115	umol/L
Sodium :	139	135-145	mmol/L
Potassium :	4.28	3.6-5.0	mmol/L
Calcium :	2.33	2.2-2.6	mmol/L
Total Bilirubin :	17	0-21	umol/L
Proteins :	75	60-80	g/L
Albumin :	45	35-48	g/L
AST :	28	10-42	IU/L
ALT :	65	10-40	IU/L
Gamma GT :	73	0-50	IU/L
Alkaline Phosphatase :	46	42-121	IU/L
Phosphorous :	1.04	0.8-1.4	mmol/L
LDH :	336	266-500	IU/L
Cholesterol :	5.1	3.1-5.2	mmol/L
HDL Cholesterol :	1.2	0.8-1.8	mmol/L
HDL % Total Cholesterol :	23.53	15 to 50	%l
LDL Cholesterol :	2.9	0-3.4	mmol/L
Urate :	424	210-420	umol/L
Glucose :	6.2	3.9-6.0	mmol/L
Triglycerides :	2.16	0.4-1.8	mmol/L
Chloride :	102	96-108	mmol/L
T4 :	11.60	9.0-19.1	pmol/L
Serum Iron :	27.8	11.6-31.3	umol/L
Ferritin :	471.1	21.8-274.7	ng/ml
TSH :	0.76	0.35-4.94	mIU/L
PSA :	1.02	0-3.1	ng/ml

Patient was fasted.

Fig. 5.4: Example of Scanned Laboratory Test Results

EHR, obviating the need to immediately integrate hospital laboratory information systems (LIS) into the e-claiming system in order to make these data available to the EHR (see Figure 5.4).

Table 5.1: Currently agreed scanned documents list

	Document Type
1	Length of Stay Report
2	Histology Report
3	Medical Necessity Report
4	Report to confirm that payment conditions associated with the service provided have been satisfied
5	Discharge Summary Report
6	Radiology Report
7	Convalescence Report
8	Medical Report
9	Claim form type -clinical data
10	Neo-natal ICU Form
11	Hospital ICU Form
12	Anaesthetist ICU Form
13	Ambulance Transportation Form
14	Member Authorisation Image
15	Referral Letter
16	Theatre Notes
19	Manufacturer Invoice for High Cost Drugs
18	Manufacturer Invoice for Prosthesis
19	Pre Authorisation form

The e-claiming system's ability to receive scanned documents has great potential for the harvesting of medically relevant data, from hospital claims, and perhaps in the future from GP systems and other legacy systems. Currently the agreement between the insurers and hospitals allows for documents as set out in Table 5.1 above. However, once the functionality exists there is no reason why it could not be expanded to include other data, for example medications and allergies lists.

5.4.6 Discharge Status

Discharge status is currently limited to one of six options, 'home', 'still in hospital', 'transferred to another hospital', 'convalescence', 'long term care' or 'deceased'. However, as can be seen in Table 5.1 above, the option exists to receive a scanned copy of the discharge summary report.

5.4.7 Other Data

There remains of course the option to require the hospitals to supply additional data, such as medication lists. However individual hospitals' internal systems may not be ready as yet to supply these data in an automated fashion, and it is probably not desirable to place too much of a data entry burden on hospital staff. The scanned document solution suggested in Section 5.4.6 could provide an interim solution to this problem also.

5.5 The National Healthlink Project

Another possible approach to the harvesting of diagnostic test results is to gain access to the data now being exchanged through the National Healthlink project. The project, which has been running since 1995 (HealthLink, 2013a), provides a secure messaging system from hospitals to GPs for the transmission of laboratory test results, radiology results, and some other data including discharge summaries and A&E notes (HealthLink, 2013b). In its latest newsletter, dated June 2013, Healthlink lists 34 'live' hospitals, which accounts for most of the acute public hospitals in the country. It has also

begun to engage with some of the private hospitals. The majority of the 'live' hospitals are sending laboratory and radiology results through the system, and other services are gradually being added (HealthLink, 2013c).

HealthLink also provides the capability for GPs to electronically refer patients to the national cancer centre, and to contact consultant neurologists on line for diagnosis and advice, and if necessary, to then refer on. A general referral service is also currently being piloted. (HealthLink, 2013b). In the four month period from 1 January 2013 to 30 April 2013, some 4,214 electronic referrals were made to the eight public specialist cancer centres and two private hospitals, and, in the pilot project, 160 general referrals had been made (HealthLink, 2013c).

HealthLink accredits six practice management software packages, and it is apparent from the demonstrations on their website (HealthLink, 2013d), as well as from some of the software developers websites (Helix Health, 2012), (Socrates, 2013), that these systems have considerable capability to aggregate patient information into pre-formatted templates and to transmit these data across the system. The electronic referrals include details of medications , vital signs, medical notes, medical history, and laboratory and radiology results stored on the practice management system. The software developers also appear to be very responsive to customer needs: when the National Cancer Control Programme requested that their referral form be incorporated into the GPs practice management systems, they were quick to comply (The National Cancer Control Programme, 2011).

The Irish College of General Practitioners claims 2,515 members and associates which, it says, amounts to over 90% of those operating in the Republic of Ireland (ICGP, 2013). The National Healthlink Project's figure for GPs connected to the system as of 29th July 2013 is 3,028 (HealthLink, 2013a), which makes the ICGP's number something of an underestimate (the imprecision is likely due to the fact that there is no national register of GPs (irishealth.com, 2013)), and indicates that most, if not all of the countries' GPs have computerised practice management systems and are now connected to the messaging system. It is apparent therefore, that the capability exists to transmit a great deal of healthcare data from GP practices. What is lacking is system to receive and aggregate these data.

5.6 Standards for Interoperability

The necessity for agreed standards for interoperability as an essential pre-requisite to an EHR was addressed In Section 2.5, where the most common healthcare information standards, EDIFACT, HL7v2.x, HL7v3 and CDA were briefly described. HIQA , the body tasked by the government with setting standards for health information, assessed these four standards under the headings of clinical relevance, the ability to meet specific business needs, financial viability, the presence of established governance and processes, and backwards compatibility and vendor neutrality (HIQA, 2012). The authority found that all of the standards met the requirements clinical relevance, the presence of established governance and processes, and backwards compatibility and vendor neutrality. However it concluded that moving from HL7v2.x, the current most commonly used health information standard, to HL7v3, could not be justified either on feasibility or economic grounds because of the significant time, effort and costs involved, firstly in up-skilling and training and then in re-engineering current processes.

Moving to the EDIFACT standard, which the authority described as “so similar in structured and purpose” to HL7v2, could also not be justified on grounds of cost or feasibility.

In the course of its assessment of the four health information standards, the HIQA addressed the so-called ‘messaging versus document paradigm’, the question whether a message or a document is the better vehicle for the transmission of health information. Messages are dynamic and real-time, suitable for the transmission of current information in machine-readable format, whereas documents are persistent, self-contained, and human readable, often containing post-event information. Examples of the former could include a list of current medications or laboratory results, while the latter might include a discharge summary, a medical report or a referral letter. Both messages and documents are required for adequate health information exchanges, and for this reason the authority recommended that the approach to be adopted be based on a combination of both types. The current widespread use of HL7v2.x and the lack of justification for a move to either of the other messaging standards led it to conclude that this standard should be adopted as the national messaging standard. CDA was the only document standard examined, and its specificity to healthcare and the fact that documents adhering to it can be transported in HL7v2, led the authority to recommend its adoption as the document part of the messaging/documentation standards combination. The potential, noted in section 2.4, to incrementally increase the amount of structured content contained in CDA documents as healthcare IT systems become capable of generating it in a suitable format, was an additional factor in its favour.

While this dissertation does not examine in any detail the technical aspects of how the EHR could be implemented, it would appear that the application of a combination of HL7v2 and CDA should be adequate to capture all of the health insurance e-claims data described in Section 5.4 above. Standardised and coded data such as dates of admission and discharge, diagnoses and treatments and so on, should be capable of transfer in HL7v2.x compliant formats, while it should be possible to convert non-standardised data, in the form of documents and reports , into CDA.

It was noted in Section 5.5 that, as of June 2013, the vast majority of the countries' acute public hospitals, and two private hospitals, are now transmitting laboratory and radiology results via Healthlink (HealthLink, 2013c). HealthLink adheres to the HL7v2.4 standard (HIQA, 2012).

5.6 Stakeholder Engagement

The importance of stakeholder engagement as one of the most critical factors contributing to the successful introduction of an EHR was noted in Section 2.5.5. HIQA (2009) reported the results of an opinion poll that found widespread support among the Irish population for the sharing of health information. However, there is little evidence of a public discussion about the implications of an EHR, probably because the probability of its introduction seems remote. In the event that the introduction of an EHR were to go ahead, there would be a need for a large public information exercise before the plan was finalised. Fahy (2012) concluded that the large scale of the nationwide campaign of information and continuous stakeholder involvement contributed to the near universal acceptance of the Emergency Care Record in Scotland. He also pointed to the model of consent adopted for that

roll-out. While consent to inclusion in the scheme was assumed, all consumers were given the right to opt-out. Once the record had been created, the consumer had complete control over who had access to it. Healthcare workers were required to seek the explicit consent of the subject of a record prior to viewing it. Fahy reported the view of the Data Protection Commission that this consent model would be a "good fit" for an Irish EHR.

However, with a comprehensive EHR it might not always be possible to obtain the explicit consent for each individual healthcare professional to view the record, or a part of it. During the course of an in-patient admission, for example, a number of people might have a need to access the record for clinical or administrative reasons. It would probably be impractical to require explicit consent for all of these people, and a more general consent, covering all hospital personnel with a need to do so, might be required. For this reason it is important that that a rigorous audit trail, showing the names of all persons who accessed the record, and the parts of it they had accessed, be maintained and made available to the consumer. A survey of Canadians attitudes to electronic health information and privacy found that 77% would feel more comfortable if they could see who had viewed their data (EKOS Research Associates, 2007). It would also be important to ensure that authorisation to access EHR data is tailored to role so that portions of the record would be viewable only by those with a genuine need to do so (Blobel, 2004).

The desirability of, or perhaps even the necessity to involve the consumer in the EHR project has been referred to a number of times in this dissertation. In Section 2.6 the Markle Foundation's healthcare Consumer Principles were cited; in summary they propose that consumers should have full and

meaningful access to their health data, and that they should have full control of how, where, when and by whom they are accessed (The Markle Foundation, 2005). The Institute of Medicine (2001) also advocates consumer empowerment, and many countries now designing or producing EHRs incorporate these principles into their systems (Häyrinen & Saranto, 2005).

As the Dutch experience showed, the consumer is not the only stakeholder who needs to be engaged with the process; healthcare professionals' acquiescence and support cannot be assumed (van de Ven & Schut, 2008). A survey of Irish healthcare professionals' attitudes towards an EHR found 87% of doctors and 90% of nurses in favour of it, on the grounds of better patient safety and improved care (O'Malley, et al., 2011). However a majority of both the doctors (61%) and nurses (49%) felt that its introduction could compromise privacy. On a note of caution, the sample size for this survey was small (23 doctors and 51 nurses) and roughly a third of each group had studied or had an interest in health informatics, so the extent of support for an EHR may be overstated.

The users of the system also need to be involved at every stage of planning and development. The top down nature of the EHR project for England and Wales, and the failure to engage with local actors had been long identified as a major drawback (EHR Inplementation Project, 2010), and was eventually given as the reason for its failure (Martin, 2011).

5.7 Governance and Leadership

The importance of good governance and strong leadership for the successful development of an EHR was noted in Section 2.5. Clearly there is a need to establish an entity with responsibility for bringing the idea to fruition, and to then operate and maintain the EHR. In this document we have referred to this putative entity as the Electronic Health record Authority (EHRA). The EHR Implementation Project (2010), while recognising the importance of political vision and commitment at the policy and strategy level, recommends that implementation be the responsibility of an autonomous entity more responsive and adaptable to issues that arise during implementation. Fahy (2012) makes the case that this entity should be independent of healthcare provider organisations in order to avoid conflicts of interest.

5.8 Conclusion

In section 2.5 above some of the pre-requisites for the successful development of an EHR were set out. No progress can be made without unique identifiers for individuals, healthcare professionals and healthcare institutions and their related demographic and identifier datasets, and while they are reported to be in the pipeline, the details have yet to emerge from the Department of Health.

Standards for interoperability are also essential, and HIQA has recently recommended a combination of HL7v2.x and CDA. These standards would appear to be a good fit for the healthcare data that are currently available.

In section 2.3 it was noted that he Canadian Auditor General has defined the core elements of an EHR as comprising consumer and provider registries, a diagnostic imaging archival and communication system, and medication and laboratory information systems. The registries are not yet available in Ireland. However diagnostic imaging and laboratory results from the majority of the state's acute hospitals are now available through the HealthLink system. Hospital prescribed medications data are not yet widely available, but details of hospital diagnoses and treatments are starting to come on stream through the health insurers e-claims project, and it would appear that this project could provide a relevant block of data for an EHR. Finally, the vast majority of the state's GPs now seem to be signed up to the HealthLink project and while it is not clear how many of them have compatible practice management systems (as opposed to using the HealthLink web portal) it can be assumed that a large proportion do. These systems are relatively sophisticated, and have the capability to collate and transmit data. It would appear therefore that a number of major building blocks necessary for the construction of a comprehensive EHR are ready or in preparation, and what is needed is the vision and the commitment to bringing them together.

The experience in other countries of attempting to introduce an EHR show that it is best approached incrementally, in consultation and co-operation with all stakeholders, and with a willingness to learn and adapt along the journey. The proposition put forward in this dissertation is that a confluence of events, the proposed introduction of UHI, the development by the health insurers of a common e-claims system, and the success of the HealthLink project in connecting GPs and hospitals, provide an opportunity to begin that journey.

6 Conclusion

6.1 The Research Question

The question posed at the start of this dissertation was whether the proposed introduction of Universal Health Insurance in Ireland could provide an opportunity to initiate the development of a national Electronic Health Record. Such records are almost universally acknowledged to be of benefit and to contribute to the quality, safety, efficacy, and efficiency of healthcare delivery. The research method was entirely qualitative, examining policy documents and statements about the proposed universal coverage system, the available literature on healthcare systems around the world and literature on systems and methods to make healthcare information readily available to both consumers and relevant providers.

6.2 A Universal Health Insurance Model for Ireland

Based on policy documents issued by the present government both before and after their election in 2011, a managed competition model of Universal Health Insurance, similar in many ways to the current Dutch system, was identified as the most likely model to be adopted. Competing health insurance companies would be required to offer a standard insurance package which covered all essential hospital care. All adults entitled to use the healthcare system would be mandated to purchase this package, with financial assistance being afforded to those on lower incomes. Children would be covered for free. Hospitals and healthcare institutions would be funded on a 'money-follows-the patient' basis, thus encouraging competition between them and, it is hoped, improved standards and efficiency. The

principle of social solidarity would be enforced through the prohibition of risk-rating of the basic insurance package, the spreading of risk among the insurance companies to prevent cherry-picking of younger, healthier customers, and a requirement that the insurance companies must accept any consumer who applies to them for cover and retain him or her for so long as the customer chooses. These three precepts, community rating, risk equalisation and lifetime cover would ensure that the young would support the old, and the healthy the less well.

6.3 EHR Implementation Successes and Failures

There are very few examples internationally of the successful development of a comprehensive electronic health record. However, some countries are further along the road than others, and it was possible to discern from both the successes and the failures some characteristics of the more successful projects. One of the main lessons to be learned from other countries' experiences is that an incremental approach to the development of an electronic health record is to be preferred over the 'big bang' route. Countries that have established frameworks and set standards, and provided encouragement and support to the various healthcare actors to connect as they become capable of meeting these standards, seem to be reporting more success that those who set up large projects to achieve comprehensive systems. Scalability is important when taking the incremental route, in order that professionals and institutions can connect to the framework with as little disruption as possible to their existing systems. Portability is also important, to allow maximum flexibility in moving between regions, institutions, providers and insurers. Finally, many countries are moving from the vision of a provider-centred record to one where consumers are encouraged and empowered to play an active role

their own healthcare, and to take control over healthcare data. Web-based systems seem to provide the easiest and most efficient way to achieve scalability, portability and consumer empowerment.

6.4 Developments in the Irish Healthcare System

A number of developments in the Irish healthcare system indicate that the time may be approaching whereby the creation of an Electronic Health Record might be considered. These include

- The proposal to introduce Universal Health Insurance;
- The health insurance companies initiative to develop a common e-claiming system;
- The progress being made by the National HealthLinks Project in providing an electronic messaging system between the primary and secondary care sectors;
- On-going work by the Health Information and Quality Authority in laying the groundwork for health identifiers for individuals, professionals and institutions, for a national demographic database, and for standards for the exchange of healthcare data.

6.5 The Importance of Leadership and Governance

The experience in other countries who have attempted or succeeded in developing EHRs indicate that strong, autonomous leadership and governance is paramount in bringing the project to fruition. This must be tempered, however, by pragmatism and adaptability, and a willingness to learn along the way. Overall policy must of course be set at the ministerial and departmental level. However, implementation should be devolved to an autonomous body charged with turning the political vision

into a practical reality. Ideally this body should be non-profit, and independent of Government, consumers, providers and insurers. It should, however, be mandated to establish formal mechanisms of consultation with all stakeholders for the lifetime of the development process.

6.6 Personal Control, Scalability and Portability

The personally controlled EHR model, though mainly found in the private sector at the present time, seems to offer a blueprint for future development. The idea that consumers should be actively involved in their own healthcare is gaining momentum around the world, and the EHR is seen as an ideal way in which to inform and empower them. As has been discussed, the incremental approach to EHR development has provided tangible successes, and web-based systems facilitate this approach. They also offer a degree of portability and personal control that is lacking in more tethered systems.

6.7 Limitations of Research Findings

The research presented here was entirely qualitative. No interviews were carried out with stakeholders to establish how useful the EHR proposed in this dissertation would prove. In addition, no technical assessments have been carried out into the feasibility of connecting data from the e-claims dataset, HealthLink data originating in healthcare facilities, and HealthLink data originating in GP surgeries.

The research findings also make a number of crucial assumptions, any of which, if not realised, would spell failure for the EHR. Universal Health Insurance is the first of these, and while it is still Government policy, there may be some who doubt its feasibility. The introduction of individual, practitioner and facility health identifiers and a national demographic dataset are other crucial assumptions. These again are Government policy and reported to be in the pipeline, but delivery may prove far from simple.

6.7 Suggestions for Further Research

As pointed out in the previous paragraph, no interviews or discussions were carried out with stakeholders, a deficiency that might strike some readers as ironic, given the emphasis laid in this dissertation on the engagement with and involvement of stakeholders. Suggestions for further research would therefore include consultations with providers on which types of data they would like to see in an EHR.

Another area for research would in the area of hospital data not currently available through HealthLinks or the e-claims dataset; how easy would it be to include some of these data in either reporting system.

Finally, there is a need for a technical assessment of the proposals put forward in this document, and for a financial assessment of their cost

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Appendix

The e-Claims Dataset

#	Section	Field Description	Mandatory / Optional / Conditional	Business/ Technical	Multiple Fields per Single Claim Type	Multiple Claimsets	Dependency
1.000	Hospital Details	Name or number of bed occupied by member during an admission					
1.000	Hospital Details	Invoice value of facility charges for the admission					
1.000	Hospital Details	Name of Hospital					
1.000	Hospital Details	Captures the number of beds in the ward occupied by the member					
1.000	Hospital Details	Captures the number of days occupied in each ward					
1.000	Hospital Details	Room name/ number occupied by member during admission					
1.000	Hospital Details	Ward name/ number occupied by member during admission					
1.000	Hospital Details	The type of ward occupied by member during an inpatient admission: 1. Private 2. Semi-private 3. Day-ward 4. Public 5. ICU/(No Suggestions)					
1.0000	Hospital Details	Insurer specific identifier	M	B			
1.0100	Hospital Details	Identifies the provider submitting the claim	M	B			
1.0101	Hospital Details	Technical field requirement Values agreed to date: 1.Vhi Healthcare Organisation Identifier 2. Quinn Healthcare Organisation Identifier 3. Aviva Organisation Identifier 4. Healthcare Organisation Identifier	M	T			
1.0001	Hospital Details	Patient Medical Record Number	M	B			
1.0002	Hospital Details	Provider generated unique claim submission reference. Also known as episode or V number	M	B			

1.0200	Hospital Details	Different datasets are required per claim type. Values agreed to date are: Hospital Direct Maternity Direct Oncology/Radiotherapy Outpatient Scans Outpatient Surgical Levy	M	B
1.0300	Hospital Details	Agreement with facility of reimbursement method for treatment performed in the facility The reimbursement methods are: 1. FPP 2. PP 3. HRS 4. Per Diem 5. Public 6. Levy 7. No Reimbursement method	M	B
1.0400	Hospital Details	Indicates that member was a public patient	C	
1.0500	Hospital Details	Date that member was admitted to hospital	M	B
1.0600	Hospital Details	Time that member was admitted to hospital	M	B
1.0700	Hospital Details	Date that member was discharged from hospital	M	B
1.0800	Hospital Details	Time that member was discharged from hospital	M	B

1.0900	Hospital Details	Treatment Settings are: 1. Theatre 2. Sideroom 3. Outpatient Department 4. A& E Department 5. Radiology Centre 6. Consultant/GP Rooms 7. Minor injury Unit 8. Private 9. Semi-private 10. Day-ward 11. Public 12. ICU 13. HDU 14. NICU 15. CCU	M	B	x	
1.1000	Hospital Details	Bed identifier in facilities	C	B	X	1.09
1.1100	Hospital Details	Details the start date that the bed was occupied	C	B	x	1.1
1.1200	Hospital Details / New		C		x	1.1
2.000	New	ID assigned to every Vhi member				
2.000	Policy Details	Indicates if patient has died during admission				
1.120	Hospital Details	Government owned identifier allocated to every individual (Required if UHI introduced)	O	B		
1.130	Hospital Details	Linked to UHI and relates to funding models where "funds" distribute the claim cash	O			
1.140	Hospital Details	Required for electronic resubmissions, i.e. late invoices, resubmission of pended claims, resubmission of returns.	C	B		

1.150	Hospital Details	Indicates the staged submission type: Level 1. Electronic submission of Member and Hospital Data & Hospital invoice Level 2: Electronic Submission of Member, Hospital, Clinical data & Hospital Invoice Level 3: Electronic Submission	M		
1.150	Hospital Details	Required for electronic resubmissions, i.e. late invoices, resubmission of pended claims, resubmission of returns where insurer claim number has been generated	O	B	1.14
2.0100	Policy Details	Insurer policy number	M	B	
2.0200	Policy Details	Name of Policy Holder	M		
2.0300	Policy Details		M		
2.0400	Policy Details	Address of Subscriber	M		
2.0500	Policy Details	Patient First name	M	B	
2.0600	Policy Details	Patient Surname	M	B	
2.0700	Policy Details	Date of birth of patient	M	B	
2.0800	Policy Details	Contact phone number for member	M	B	
2.0900	Policy Details	E-mail address for member	O	B	
2.1000	Policy Details	Indicates if address change is a permanent address change	M		
2.1100	Policy Details	Address of Patient	M	B	
3.000	History of Illness	Indicates if expenses are recoverable from a third party			
3.000	History of Illness				
2.1200	Policy Details	To indicate if member wishes to view claim documentation online rather than receive paper statement	O		
3.000	History of Illness / New				

3.0100	History of Illness	Values are Y/N. Determines if data items from 3.02 - 3.063 are required.	M	B		
3.0200	History of Illness	Name of doctor first attended	C	B		3.01
3.0300	History of Illness	Address of doctor first attended	C	B		3.01
3.0400	History of Illness	First date that the member consulted a practitioner in relation to the condition being treated	C	B		3.01
3.0500	History of Illness	Date that symptoms first arose Values: 1.Hours 2. Days 3. Weeks 4.Months 5.Years	C	B		3.01
3.0600	History of Illness	Determines reoccurrence of condition	C	B		3.01
3.0610	History of Illness	Captures the dates that member was previously treated for the same condition	C	B		3.01
3.0620	History of Illness	Start date of similar illness	C	B		3.061
3.0630	History of Illness	Descriptive field for more detail of similar illness	C	B		3.061
3.0700	History of Illness	Indicates if expenses are recoverable from another insurance company	M	B		
3.0710	History of Illness	Other insurer Details	C	B		3.07
3.0800	History of Illness	Captures number of weeks a member was waiting for an outpatient appointment following referral	O	B		
3.0900	History of Illness	Number of weeks a member was waiting prior to admission	O	B		
3.1000	History of Illness	Number of weeks a member has to wait for MRI Scan post referral from GP	O	B		
3.1100	History of Illness	Confirmation that member elected to be a private patient	M	B		1.01
3.1200	History of Illness	Indicates if treatment received was part of a Clinical Trial (supplied by member)	M	B		
4.000	Injury Details / New				x	
4.000	Injury Details / New				x	
4.000	Injury Details / New				x	
4.0100	Injury Details	Drives the validation for the Injury section	M	B		
4.0200	Injury Details	Accident/Injury date	C	B		4.01
4.0300	Injury Details	Place of Injury	C	B		4.01
4.0400	Injury Details	Description of injury	C	B		4.01

4.040	Injury Details / New		C				
4.0500	Injury Details	Member acknowledgement of whether expenses may be recoverable from a third party	C	B			4.01
4.0600	Injury Details	Solicitor Name	O	B			4.05
4.0610	Injury Details	Solicitor Address	O	B			4.05
4.0800	Injury Details	Signature if over 18	C		x		
4.0900	Injury Details	Policy Holder signature	C		x		
5.0000	Member Authorisation	Patient/Policy Holder Signature	M	B			
5.0100	Member Authorisation	Date of signature	M	T			
6.000	Medical History	Dates where member was previously treated for the same condition					
6.000	Medical History	Details of treatment administered previously					
6.000	Medical History	Not required by VHI					
6.000	Medical History	Indicates type of treatment received for Oncology patients					
6.000	Medical History / New						
6.0100	Medical History	Confirms Admitting Consultant	M	B			
6.0200	Medical History	Referring doctor	M	B			
6.0300	Medical History	Referring doctor & specialty for Outpatient Scans only Agreed values are: Consultant General Practitioner Self-Referral	C	B			9.01
6.0400	Medical History	Description of symptoms of the treated condition	M	B		x	
6.0500	Medical History	Hours, days, weeks, months or years	M	B		x	
6.0600	Medical History	1st consultation date with consultant	M	B			
6.0700	Medical History	Indicates if admission is planned or an emergency	M	B			
6.0800	Medical History	Indicates if patient has a history of the treated condition	M	B		x	
6.0900	Medical History	Indicates if patient was admitted previously for the treated condition	M	B			
6.0910	Medical History	Provides the dates that the member was treated previously for the same condition	C	B	X		6.09
6.0920	Medical History	Provides details of previous treatment for the same condition	C	B	X		6.09
6.1000	Medical History	Confirms if treatment received is part of a clinical trial (supplied by consultant)	M	B			

7.000	Medical Investigations	Medical condition which necessitated MRI referral		X	
7.000	Medical Investigations	Date of MRI/PET Scan		X	
7.000	Medical Investigations	Indicates if pathology tests were performed during the admission		X	
7.000	Medical Investigations	Indicates if pathology tests were performed in a different facility to the admitting facility		X	
7.000	Medical Investigations	MRI Procedure Code		X	
7.000	Medical Investigations	Indicates if MRI Scan was performed in a different facility to the admitting facility		X	
7.000	Medical Investigations	Transfer facility where pathology tests were performed		X	
7.000	Medical Investigations	Transfer facility where Radiology tests were performed		X	
7.000	Medical Investigations	Indicates if radiology tests were performed during the admission		x	
7.000	Medical Investigations	Indicates if any radiology tests were performed in a different facility to the admitting facility		X	
7.000	Medical Investigations	Description of pathology tests performed		x	
7.000	Medical Investigations	Description of radiology tests performed			
7.000	Medical Investigations / New	Medical reason for PET			
7.000	Medical Investigations / New				
7.0100	Medical Investigations / New	Indicates if medical investigations were performed (Inclusive of SP claim form)	M	x	
7.0110	Medical Investigations / New	List of agreed values	C	x	7.01
7.0111	Medical Investigations / New	List of agreed values	C	x	7.011
7.0112	Medical Investigations / New	Name of consultant who performed the consultation	C	x	7.011
7.0113	Medical Investigations / New	Specialty of Consultant who performed the consultation	C	x	7.011
7.0120	Medical Investigations	Procedure code of investigation/test	C	x	7.01

7.0130	Medical Investigations	Procedure description of investigation/test	C		x		7.01
7.0131	Medical Investigations / New	Clinical Indication code for MRI - Agreed to capture description only	C				7.011
7.0132	Medical Investigations	Clinical Indication Code for Scan	C		x		7.011
7.0140	Medical Investigations	Date of Test	C		x		7.01
7.0150	Medical Investigations / New	Time of Test	C		x		7.01
7.0160	Medical Investigations / New	Insurer Specific Practitioner Code	C		x		7.01
7.0200	Medical Investigations	Coded site of Scan	C		x		
7.0210	Medical Investigations	Results of Scan	C		x		
7.0200	Medical Investigations	Indicate if test performed at another facility	M				
7.0210	Medical Investigations	Name of facility where test was performed	C				7.02
8.000	Diagnosis / New						
8.0100	Diagnosis	Primary medical condition which necessitated hospital admission	M	B		x	
8.0200	Diagnosis	Primary Diagnosis Type	M	B		x	8.01
8.0300	Diagnosis	Any other medical conditions that contributed or required treatment during the admission	O	B	x	x	
8.0400	Diagnosis	Secondary Diagnosis Type	O	B	x	x	8.03
8.0500	Diagnosis	Value of Y/N	M	B		x	
8.0510	Diagnosis	DSM Code assigned for psychiatric treatment	O	B	x	x	8.05
8.0060	Diagnosis	ICD code is assigned for all illnesses treated during admission	O	B	x	x	
8.0700	Diagnosis	Version of ICD code	O	B		x	
8.0800	Diagnosis	Indicates if treatment received was in relation to addictive illnesses	M	B		x	
8.0810	Diagnosis	Start date of treatment for addictive illness	C	B	x	x	8.08
8.0820	Diagnosis	End date of treatment for addictive illness	C	B	x	x	8.08

9.000	MRI Details	Medical Reason for MRI					
9.000	Treatment Section	Indicates if Pathology test required with procedure	M				
9.000	Treatment Section	Procedure Charge for 'Minor Surgical' type procedures	C				
9.000	Treatment Section	Date of treatment for minor surgical procedures which are performed in an outpatient setting	C				9.01
9.000	Treatment Section	Time of MRI Scan	C				9.01
9.000	Treatment Section	Indication of Practitioner Participation	C				9.01
9.000	Treatment Section		C				9.01
9.000	Treatment Section		C				
9.010	Treatment Section	Drives the data required for surgical procedures performed	M				
9.0100	Treatment Section	Insurer specific procedure code for all services/treatments performed,e.g. . Surgical,Anaesthetist Pathology, Radiology,etc.	C	B	X	x	
9.0200	Treatment Section	Description of procedure performed	C	B	X	x	9.01
9.0300	Treatment Section	Date procedure was performed	C	B	X	x	9.01
9.0400	Treatment Section	Time procedure was performed. Time of Procedure is required to enable the insurers to identify duplicate submission of charges. There are currently a high volume of pended queries regarding clarification of duplicate charges.	C	B	X	x	9.01
9.0500	Treatment Section	Specified procedures require clinical indications to determine the eligibility of the charge.	C	B	X	x	9.01
9.0600	Treatment Section	Type of Anaesthesia administered	C	B	X	x	9.01
9.0501	Treatment Section		C				9.05
9.0502	Treatment Section		C				9.05
9.0503	Treatment Section		C		x		9.04
9.0700	Treatment Section	Describes why anaesthesia was required for MRI Scan	C	B		x	9.01
9.0800	Treatment Section	Coded site of Scan	C	B	x	x	9.01

9.0900	Treatment Section	Results of Scan	C	B	x	x	9.01
9.1000	Treatment Section	Number of drug eluting stents used	C	B		x	9.01
9.0700	Treatment Section	Provides description of why a member was detained in hospital when the procedure performed should have been performed in a daycare setting	C		X		
9.0800	Treatment Section	Indicates if patient was transferred from another facility	M		X		
9.0810	Treatment Section	Name of the facility if treatment was performed in a different facility to the admitting facility	C				9.08
9.0820	Treatment Section	Indicates if procedure was performed in a different facility	C				9.08
9.0830	Treatment Section / New		C		x		9.08
9.0840	Treatment Section / New		C		x		9.083
9.0850	Treatment Section / New		C				9.08
9.0900	Treatment Section	Confirms if IV Meds were administered	M				
9.1100	Treatment Section	Indicates that claim is part of a course and cycle of treatment	C	B		x	9.01
9.1101	Treatment Section	Consistency check of number of sessions performed against multiple capture of DOA's & DOD's for each treatment with a C&CT indicator	C	B		x	9.11
9.1200	Treatment Section	Description of Medical Attendance treatment	C	B		x	
9.1201	Treatment Section	Start date of Medical Attendance	C	B	x	x	9.12
9.1202	Treatment Section	End date of Medical Attendance	C	B	x	x	9.1201
9.1300	Treatment Section	Start date of IV Meds	C	B	x	x	
9.1301	Treatment Section	End Date of IV Meds	C	B	x	x	9.13
9.1000	Treatment Section / New		M				

9.1400	Treatment Section	List of values 1. Inpatient Major Consultation 2. Inpatient Minor Consultation 3. Inpatient Psychiatric Consultation 4. Inpatient Palliative Consultation 5. Inpatient Neurologist Consultation 6. Inpatient Geriatric Consultation 7. Inpatient Neonatal Paediatrician Consultation 8. Radiology Consultation 9. Pathologist Consultation	C	B	x	x	
9.1500	Treatment Section	Insurer Specific Practitioner Code	C	B	x	x	9.01 9.14
9.1501	Treatment Section	Technical requirement. Values agreed are: 1. Vhi Practitioner Identifier 1. Quinn Practitioner Identifier 1. Aviva Practitioner Identifier	C	T	x	x	9.15
9.1600	Treatment Section	Indicate if test performed at another facility	M	B		x	
9.1601	Treatment Section	Name of facility where test was performed	C				9.16
9.1700	Treatment Section	Confirmation that admitting consultant performed the treatment	M	B		x	
10.000	Other Services	Names of other consultants who attended the member during the admission					
10.000	Other Services	Indicates if other consultant services were requested					
10.000	Other Services / New						
9.1701	Treatment Section	Name of consultant who performed the treatment if not the admitting consultant	C	B		x	9.17
9.1800	Treatment Section	Determines if LOS is excessive for any claim type	M	B		x	
9.1801	Treatment Section	Detail required to support the assessment of additional benefit	C	B		x	9.18
9.1900	Treatment Section	Free text field to allow Practitioner/Hospital provide any additional information	O	B		x	

11.0100	Discharge Status	Indicates the discharge status 1. Home 2. Still in hospital 3. Transfer to another hospital 4. Convalescence 5. Long Term Care 6. Deceased	M	B		x	
11.0200	Discharge Status	Date of death	C	B		x	11.01
11.0300	Discharge Status / New	If discharge status is "Transfer" then must provide this	C				11.01
11.0310	Discharge Status / New	If discharge status is "Transfer" then must provide this	C				11.03
11.0400	Discharge Status	Indicates if future medical episodes will arise for this condition	M				
11.0410	Discharge Status	Description of any further treatment	C				11.04
12.0100	Practitioner Verification	Consultant Signature	M	B		x	
13.000	Details of Treatment Drugs	Cancer Chemotherapy drug code			x		
13.000	Details of Treatment Drugs	Cancer Chemotherapy drug code			x		
13.000	Details of Treatment Drugs	Cancer Chemotherapy drug code			X		
12.0200	Practitioner Verification	Technical requirement to capture date and time of verification	M	T		x	
12.0300	Practitioner Verification	Technical Requirement to capture Practitioner Identifier	M	T		x	
12.0400	Practitioner Verification	Technical requirement. Values agreed are: 1. Vhi Practitioner Identifier 1. Quinn Practitioner Identifier 1. Aviva Practitioner Identifier	M	T		x	
12.0500	Practitioner Verification	Technical requirement to submit practitioner username with the claim submission	M	T		x	
12.0600	Practitioner Verification	Unique identifier for the verification within the Claims Management System that can be used to identify the verification audit record	M	T		x	
13.0100	Drugs Administered	Insurer specific drug code	C	B	X	x	
13.0101	Drugs Administered	Specifies if drug is licensed or unlicensed	C	B	x	x	13.01
13.0200	Drugs Administered	Insurer specific drug description	C	B	x	x	13.01
13.0300	Details of Treatment Drugs	Drug Name	C				13.01

13.0400	Details of Treatment Drugs	Description of drug type administered during inpatient admission	C		x		13.01
13.0500	Details of Treatment Drugs	Description of dosage of drug	C				13.01
13.0600	Details of Treatment Drugs / New		C				13.01
14.0100	Inclusion of New Born Child	Authorises inclusion of newborn on policy	M	B			
14.0200	Inclusion of New Born Child	First name of newborn	C	B	x		14.01
14.0300	Inclusion of New Born Child	Surname of newborn	C	B	x		14.01
14.0400	Inclusion of New Born Child	Date of birth of newborn	C	B	x		14.01
14.0500	Inclusion of New Born Child	Gender	C	B	x		14.01
15.000	Delivery Details	Consultant Address					
15.000	Delivery Details	Consultant Name					
14.0600	Inclusion of New Born Child	Relationship to policy holder.	C	B	x		14.01
15.020	Delivery Details	Date that baby was delivered UB 13/12: Replaced by Date of Service(9.03)	C				
15.030	Delivery Details	Time of Delivery UB 13/12: Replaced by Time Of Delivery(9.11)	C				
15.050	Delivery Details	Description of maternity complications	C				
15.010	Delivery Details	Indicates normal delivery or Caesarean Section UB 13/12: Replaced by Procedure Code and Procedure Description (9.01 & 9.02)	C				
15.060	Delivery Details	Type of Anaesthesia administered during delivery	C				
15.0400	Delivery Details	Name of Practitioner who delivered the baby	C	B		x	
15.0500	Delivery Details	Date that baby was induced	O	B		x	
15.0510	Delivery Details	Provides reason for induction	O	B		x	15.05
15.0520	Delivery Details	Time of Induction	O	B		x	15.05
15.0600	Delivery Details	Reason why Caesarian Section was required	C	B		x	9.01
15.0700	Delivery Details	Indicates complications of homebirth	C				
15.0800	Delivery Details	Indicates if there were any maternity complications	C	B		x	
15.0800	Delivery Details	Description of maternity complications that necessitated longer stay	C				15.07
15.0900	Delivery Details	Report to explain extended Length of Stay.	C				
	Invoice	Itemised charge					
	New	Total of invoice line					
	New	Prosthesis invoice reference number					

	Practitioner Invoice / Procedure	Itemised charge	M			
16.0000	Invoice	Technical Requirement to identify changes in the invoice dataset for resubmissions		M	T	
16.01 1.01	Facility Invoice Line / Package	Facility Name		M	B	
16.0200	Facility Invoice Line / Package	Invoice Reference		M	B	
16.0200	Facility Invoice Line / Package	Technical Requirement to identify changes in the invoice dataset for resubmissions		M	T	
16.0400 1.0002	Facility Invoice Line / Package	Provider generated unique claim submission reference. Also known as Episode or V number		M	B	
16.050 1.0001	Facility Invoice Line / Package	Medical Record Number		M	B	
16.0600	Facility Invoice Line / Package	Insurer specific procedure code		M	B	x
16.0700	Facility Invoice Line / Package	Date of Service		M	B	
16.0800	Facility Invoice Line / Package	Description of Service Provided		M	B	
16.0900	Facility Invoice Line / Package	Start date of Package Procedure		M	B	
16.1000	Facility Invoice Line / Package	End Date of Package Procedure		M	B	
16.1300	Facility Invoice Line / Package	Total of invoice line		M	B	
16.1400	Facility Invoice Line / Package	Ward type or Treatment Setting		M	B	
16.1500	Facility Invoice Line / Package	Optional field specifying that no charge will be raised - required for collation fields		O	T	x
1.01 16.01	Facility Invoice Line / Per Diem	Name of Facility		M	B	
16.0200	Facility Invoice Line / Accommodation	Invoice Reference		M	B	
16.0300	Facility Invoice Line / Accommodation	Technical Requirement to identify changes in the invoice dataset for resubmissions		M	T	
16.0400 1.0002	Facility Invoice Line / Per Diem	Provider generated unique claim submission reference. Also known as Episode or V number		M	B	

16.0500 1.0001	Facility Invoice Line / Per Diem	Medical Record Number	M	B	
16.0800	Facility Invoice Line / Accommodation	Description of Service Provided	M	B	
16.0900	Facility Invoice Line / Accommodation	Start date of Service	M	B	
16.1000	Facility Invoice Line / Accommodation	End date of Service	M	B	
16.1100	Facility Invoice Line / Accommodation	Itemised charge	M	B	
16.1200	Facility Invoice Line / Accommodation	Number of Units	M	B	
16.1300	Facility Invoice Line / Accommodation	Total of invoice line	M	B	
16.1400	Facility Invoice Line / Accommodation	Ward type or Treatment Setting	M	B	
16.1600	Facility Invoice Line / Per Diem	Optional field specifying that no charge will be raised - required for collation fields	O	T	
16.01 1.01	Facility Invoice Line / Technical	Name of Facility	M	B	
16.0200	Facility Invoice Line / Technical	Invoice Reference	M	B	
16.0300	Facility Invoice Line / Technical	Technical Requirement to identify changes in the invoice dataset for resubmissions	M	T	
16.04 1.0002	Facility Invoice Line / Technical	Provider generated unique claim submission reference. Also known as Episode or V number	M	B	
16.05 1.0001	Facility Invoice Line / Technical	Medical Record Number	M	B	
16.0800	Facility Invoice Line / Technical	Description of Service Provided	M	B	
16.0600	Facility Invoice Line / Technical	Insurer specific procedure code	M	B	x
16.07	Facility Invoice Line / Technical	Date of Service	M	B	
16.1100	Facility Invoice Line / Technical	Itemised charge	M	B	
16.1200	Facility Invoice Line / Technical	Number of Units	M	B	
16.1300	Facility Invoice Line / Technical	Total of invoice line	M	B	

16.1600	Facility Invoice Line / Technical	Prosthesis invoice reference number	C	B	x	
16.1500	Facility Invoice Line / Technical	Optional field specifying that no charge will be raised - required for collation fields	O	T	x	
16.01 1.01	Practitioner Invoice / Consultation	Name of Facility	M	B		
16.0200	Practitioner Invoice Line / Consultation	Invoice Reference	M	B		
16.0300	Practitioner Invoice Line / Consultation	Technical Requirement to identify changes in the invoice dataset for resubmissions	M	T		
16.04 1.0002	Practitioner Invoice / Consultation	Medical Record Number	M	B		
16.1700	Practitioner Invoice Line / Consultation	Name of Practitioner	M	B		
16.1701	Practitioner Invoice Line / Consultation	Technical requirement. Values agreed are: 1. Vhi Practitioner Identifier 1. Quinn Practitioner Identifier 1. Aviva Practitioner Identifier	M	T		
16.0800	Practitioner Invoice Line / Consultation	Description of Service Provided	M	B		
16.0700	Practitioner Invoice Line / Consultation	Date of Service	M	B		
16.1700	Practitioner Invoice Line / Consultation	Length of Consultation	M	B		9.14
16.1800	Practitioner Invoice Line / Consultation	Start time of Consultation	C	B		9.14
16.1300	Practitioner Invoice Line / Consultation	Total of invoice line	M	B		
16.1500	Practitioner Invoice / Consultation	Optional field specifying that no charge will be raised - required for collation fields	O	T	x	
16.01 1.01	Practitioner Invoice / Attendance	Name of Facility	M	B		
16.0200	Practitioner Invoice Line / Attendance	Invoice Reference	M	B		
16.0300	Practitioner Invoice Line / Attendance	Technical Requirement to identify changes in the invoice dataset for resubmissions	M	T		
16.04 1.0002	Practitioner Invoice / Attendance	Medical Record Number	M	B		

16.1700	Practitioner Invoice Line / Attendance	Name of Practitioner	M	B	
16.1701	Practitioner Invoice Line / Attendance	Technical requirement. Values agreed are: 1. Vhi Practitioner Identifier 1. Quinn Practitioner Identifier 1. Aviva Practitioner Identifier	M	T	
16.0800	Practitioner Invoice Line / Attendance	Description of Service Provided	M	B	
16.0900	Practitioner Invoice Line / Attendance	Start date of Service	M	B	
16.1000	Practitioner Invoice Line / Attendance	End date of Service	M	B	
16.06	Practitioner Invoice Line / Attendance	Insurer specific procedure code	C	B	x
16.07	Practitioner Invoice Line / Attendance	Date of Service	C	B	
16.1300	Practitioner Invoice Line / Attendance	Total of invoice line	M	B	
16.1500	Practitioner Invoice / Attendance	Optional field specifying that no charge will be raised - required for collation fields	O	T	
16.01 1.01	Practitioner Invoice / Procedure	Name of Facility	M	B	
16.0200	Practitioner Invoice Line / Procedure	Invoice Reference	M	B	
16.0300	Practitioner Invoice Line / Procedure	Technical Requirement to identify changes in the invoice dataset for resubmissions	M	T	
16.04 1.0002	Practitioner Invoice / Procedure	Medical Record Number	M	B	
16.1700	Practitioner Invoice Line / Procedure	Name of Practitioner	M	B	
16.1701	Practitioner Invoice Line / Procedure	Technical requirement. Values agreed are: 1. Vhi Practitioner Identifier 1. Quinn Practitioner Identifier 1. Aviva Practitioner Identifier	M	T	
16.0600	Practitioner Invoice Line / Procedure	Insurer specific procedure code	M	B	x
16.0700	Practitioner Invoice Line / Procedure	Date of Service	M	B	

16.0800	Practitioner Invoice Line / Procedure	Description of Service Provided	M	B	
16.1100	Practitioner Invoice Line / Procedure	Itemised charge	M	B	
16.1200	Practitioner Invoice Line / Procedure	Number of Units	M	B	
16.1300	Practitioner Invoice Line / Procedure	Total of invoice line	M	B	
16.1500	Practitioner Invoice / Procedure	Optional field specifying that no charge will be raised - required for collation fields	O	T	x
16.0100	Transfer Test Invoice Line / Facility	Provider Code	M	B	
16.0101	Transfer Test Invoice Line / Facility	Technical field requirement Values agreed to date: 1.Vhi Healthcare Organisation Identifier 2. Quinn Healthcare Organisation Identifier 3. Aviva Organisation Identifier 4. Healthcare Organisation Identifier	M	T	
16.0200	Transfer Test Invoice Line / Facility	Invoice Reference	M	B	
16.0300	Transfer Test Invoice Line / Facility	Technical Requirement to identify changes in the invoice dataset for resubmissions	M	T	
16.0800	Transfer Test Invoice Line / Facility	Description of Service Provided	M	B	
16.0600	Transfer Test Invoice Line / Facility	Insurer specific procedure code	M	B	x
16.2000	Transfer Test Invoice Line / Facility	Description of procedure performed	M	B	x
16.2100	Transfer Test Invoice Line / Facility	Clinical Indication Code for Scan	C	B	x
16.0700	Transfer Test Invoice Line / Facility	Date of Service	M	B	
16.2200	Transfer Test Invoice Line / Facility	Time procedure was performed	O	B	x
16.1100	Transfer Test Invoice Line / Facility	Itemised charge	M	B	
16.1200	Transfer Test Invoice Line / Facility	Number of Units	M	B	

16.1300	Transfer Test Invoice Line / Facility	Total of invoice line	M	B	
16.0100	Transfer Test Invoice Line/ Consultant	Provider Code	M	B	
16.0101	Transfer Test Invoice Line/ Consultant	Technical field requirement Values agreed to date: 1.Vhi Healthcare Organisation Identifier 2. Quinn Healthcare Organisation Identifier 3. Aviva Organisation Identifier 4. Healthcare Organisation Identifier	M	T	
16.1700	Transfer Test Invoice Line/ Consultant	Name of Practitioner	M	B	
16.1701	Transfer Test Invoice Line/ Consultant	Technical requirement. Values agreed are: 1. Vhi Practitioner Identifier 1. Quinn Practitioner Identifier 1. Aviva Practitioner Identifier	M	T	
16.0200	Transfer Test Invoice Line/ Consultant	Invoice Reference	M	B	
16.0300	Transfer Test Invoice Line/ Consultant	Technical Requirement to identify changes in the invoice dataset for resubmissions	M	T	
16.0800	Transfer Test Invoice Line/ Consultant	Description of Service Provided	M	B	
16.0600	Transfer Test Invoice Line/ Consultant	Insurer specific procedure code	M	B	x
16.2000	Transfer Test Invoice Line/ Consultant	Description of procedure performed	M	B	x
16.2100	Transfer Test Invoice Line/ Consultant	Clinical Indication Code for Scan	C	B	x
16.0700	Transfer Test Invoice Line/ Consultant	Date of Service	M	B	
16.2200	Transfer Test Invoice Line/ Consultant	Time procedure was performed	O	B	x
16.1100	Transfer Test Invoice Line/ Consultant	Itemised charge	M	B	
16.1200	Transfer Test Invoice Line/ Consultant	Number of Units	M	B	
16.1300	Transfer Test Invoice Line/ Consultant	Total of invoice line	M	B	
	New		M		x

17.0100	Scanned Documents	Values agreed to date are: 1. Length of Stay Report 2. Histology Report 3. Medical Necessity Report 4. Report to confirm that payment conditions associated with the service provided have been satisfied 5. Discharge Summary Report 6. Radiology Report 7. Convalescence Report 8. Medical Report 9. Claim form type -clinical data 10. Neo-natal ICU Form 11. Hospital ICU Form 12. Anaesthetist ICU Form 13. Ambulance Transportation Form 14. Member Authorisation Image 15. Referral Letter 16. Theatre Notes 17. Manufacturer Invoice for High Cost Drugs 18. Manufacturer Invoice for Prosthesis 19. Pre Authorisation form	C	B	x	
17.0120		- Surgeon, Inpatient Attendance, Anaesthetist, Radiologist, Pathologist, Consultation	C		x	17.01
17.0130		Required only where scanned document type of invoice is selected	C		x	17.01
17.0110	Scanned Documents	Invoice Type	C	B	x	
17.0101	Scanned Documents	Values agreed to date are: 1. Surgical Invoice 2. Anaesthetist Invoice 3. Radiologist Invoice 4. Pathologist invoice 5. Physician Invoice 6. Consultation Invoice 7. Transfer Test invoice	C	B	x	

17.0120	Scanned Documents	Required only where scanned document type of invoice is selected	C	B	x	17.01
17.0121	Scanned Documents	Technical requirement. Values agreed are: 1. Vhi Practitioner Identifier 1. Quinn Practitioner Identifier 1. Aviva Practitioner Identifier	C	T	x	17.01
17.0140	Scanned Documents	Represents the actual document	M	T	x	
17.0150	Scanned Documents	Unique identifier per document	M	T	x	
17.0160	Scanned Documents	Indicates if a document has been added, updated or deleted for resubmissions. Values are: New Update Delete	O	T	x	
18.0100	Exceptions	Indicates if no invoice charges will be raised: Values Agreed to date are: 1. Facility invoice 2. Surgical Invoice 3. Anaesthetist Invoice 4. Radiologist Invoice 5. Pathologist invoice 6. Physician Invoice 7. Consultation Invoice	O	B	x	
18.0200	Exceptions	Indicates the Organisation Code if no hospital charge is to be raised	C	B	x	18.01
18.0201	Exceptions	Technical field requirement Values agreed to date: 1.Vhi Healthcare Organisation Identifier 2. Quinn Healthcare Organisation Identifier 3. Aviva Organisation Identifier 4. Healthcare Organisation Identifier	C	T	x	18.01
18.0300	Exceptions	Indicates the Practitioner Code if no hospital charge is to be raised	C	**B**	x	18.01

18.0301	Exceptions	Technical requirement. Values agreed are: 1. Vhi Practitioner Identifier 1. Quinn Practitioner Identifier 1. Aviva Practitioner Identifier	C	T	x	18.01