Guidance on Classification and Terminology Standards for Ireland

17 December 2013
About the Health Information and Quality Authority

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

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

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

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

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

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

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

Health is information intensive, generating huge volumes of data every day. Health and social care workers spend a significant amount of their time handling information, collecting it, looking for it and storing it. It is therefore imperative that information is managed in the most effective way possible in order to ensure a high quality, safe service.

Safe, reliable healthcare depends on access to, and the use of, information that is accurate, valid, reliable, timely, relevant, legible and complete. For example, when giving a patient a drug, a nurse needs to be sure that they are administering the appropriate dose of the correct drug to the right patient and that the patient is not allergic to it. Similarly, lack of up-to-date information can lead to the unnecessary duplication of tests – if critical diagnostic results are missing or overlooked, tests have be repeated unnecessarily and, at best, appropriate treatment is delayed or at worst not given. In addition, health information has a key role to play in healthcare planning decisions – where to locate a new service, whether or not to introduce a new national screening programme and decisions on best value for money in health and social care provision.

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

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

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

Information can be lost, documentation is poor, and there is over-reliance on memory. Equally those responsible for planning our services experience great difficulty in bringing together information in order to make informed decisions. Variability in practice leads to variability in outcomes and cost of care. Furthermore, we are all being encouraged to take more responsibility for our own health and well-being, yet it can be very difficult to find consistent, understandable and trustworthy information on which to base our decisions.

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

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

One of the areas currently being addressed through this work programme is the need to set standards to enable information to be shared electronically, commonly referred to as interoperability standards. A public consultation document on eHealth\(^1\) was published by the Authority in 2011. The feedback from the consultation identified the need to provide a guidance document on terminology and classification systems. This document outlines specific guidance as to the approach to be adopted to support terminology and classification systems in Ireland.

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\(^1\) eHealth Definition – ‘eHealth is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies.... the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology\(^{(1)}\)
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1 Introduction

Safe, reliable healthcare depends on access to and use of information that is accurate, valid, reliable, timely, relevant, legible and complete. Ensuring that information can be shared efficiently and effectively and in a manner which protects the privacy and confidentiality of patients is critical. eHealth can enhance the quality, accessibility and efficiency across all healthcare services through the secure, timely, accurate and comprehensive exchange of clinical and administrative data.\(^2\)

Patients benefit from a reduction in medication errors through ePrescribing, more timely access by health professionals to the right medical information at the right time and improved support for patient-centred integrated care and patient self-management.

Further benefits include more cost-effective delivery of health care, more efficient national planning, and improved research through the provision of more timely, higher quality information.

In order to deliver these benefits, several key building blocks must be put in place which can, importantly, bring benefits in their own right and together provide the basis for building a robust eHealth infrastructure (See Figure 1).

The ultimate goal of most national eHealth programmes is the development of a national Electronic Health Record (EHR).\(^2\) However, it is the view of the Authority and many others that it would be premature for Ireland to begin development of such an EHR without a number of key enablers or building blocks being in place. These are illustrated in Figure 1 below.

![Figure 1: Building blocks: towards a national EHR](image)
Under section (8)(1)(k) of the Health Act 2007, the Authority has responsibility for setting standards for all aspects of health information including, for example, information governance, identification, common data definitions, and the exchange of electronic health information. The Authority has previously published recommendations in respect of identifiers for individuals\(^{(3)}\) and for professionals and organisations.\(^{(4)}\)

1.1 Definitions

To provide clarity and consistency throughout this report, the following terms will be used:

- **terminological system** – an umbrella term to include terminology, classification, vocabulary and thesaurus.

- **classification** – a classification is a method of organising/grouping ‘concepts’ in a systematic way (e.g. into classes) within a particular domain for a specified purpose. They are arranged into categories according to common attributes, qualities or properties.

- **terminology** – is a list of terms referring to concepts in a particular domain.\(^{(5)}\)

- **concept** – is used to describe the combination of a code (unique numeric or alphanumeric number) and an associated textual description, more formally known as a rubric. For example, the entry in the Internal Classification of Diseases for Acute Myocardial Infarction is ‘(I21) Acute myocardial infarction,’ (I21) is the code and ‘Acute myocardial infarction’ is the rubric.

- **clinical coding** – is the translation of medical information relating to a patient's encounter with a health care provider into alphanumeric code(s). This process makes it possible to perform analysis on health care activity by grouping diagnoses and procedures together.

1.2 Background

In order to consult with stakeholders on the development of eHealth standards the Authority produced a consultation document: *Developing National eHealth Interoperability Standards for Ireland: A Consultation Document*.\(^{(6)}\)

The document emphasised that any eHealth initiatives selected for use in Ireland and endorsed should be underpinned by internationally proven standards. Terminological systems or messaging standards adopted or adapted by the Authority will be derived from international standards and a localised specification maintained by the Authority.
The public consultation identified the need for guidance documents in three areas – namely, general interoperability standards, terminology standards and messaging standards – to ensure that meaningful information can be exchanged electronically in a safe and efficient way.

The purpose of this document is to provide high level guidance in respect of terminology standards in Ireland for the short to medium term. The Authority has developed this guidance to provide the health information community with an understanding of terminological systems and factors which need to be considered when adopting a classification or a terminology. It provides an overview of common clinical classifications and terminologies available and in use internationally and provides guidance for future projects in Ireland.

Guidance in respect of messaging\(^{(7)}\) and guidance on interoperability\(^{(8)}\) have already been published.

### 1.3 Intended audience

This guidance is being developed to inform key stakeholders such as public and private service users, vendors, purchasers and implementers of health information systems, healthcare providers, the wider health informatics community and any other interested parties, about the proposed future direction of terminology standards in Ireland, and to encourage wider participation in standards development. The guidance is targeted principally at those involved in specifying the requirements for and the development and implementation of new health information systems and eHealth applications, both locally and nationally.

### 1.4 Drivers for change

The guidance is based on key considerations including work completed to date by the Authority on interoperability standards that includes terminologies, a review of international experience and guiding principles on interoperability standards developed by the Authority. The guiding principles to assist the development of interoperability standards for Ireland are also applicable to messaging standards and are listed in Appendix A.

Adherence to these principles will ensure that we can leverage best international practice and avoid duplication of effort, as well as ensuring that only tried and tested standards which are already available in software products are selected for use.

### 1.5 Terminological systems

The collection and analysis of basic clinical facts multiple times is needed from different perspectives and for different purposes across the healthcare system. By using classifications and terminologies together, they provide the common medical
language necessary for epidemiology purposes, clinical trials, bio surveillance, reimbursement and ultimately an EHR.\(^{(9)}\)

Clinical documents, classifications and terminologies are different in origin, size and purpose,\(^{(10)}\) as illustrated in Figure 2. Documents, clinical notes and free text entries sit at the bottom of the pyramid and are the largest in scale and size.

Terminologies, such as SNOMED CT attempt to define all concepts of medicine and sit between documents and classifications. Classifications generally consist of fewer concepts when compared to terminologies.

Classifications attempt to group similar concepts to support epidemiological and management purposes.

Diagnosis related groups (DRGs) sit at the top of the pyramid. The original objective of DRGs was to develop a classification system that identified the ‘products’ that the patient received and were designed to be homogeneous units of hospital activity to which binding prices could be attached.

![Figure 2- Types, size and purpose of clinical coding systems](image)

Neither a classification system nor a clinical terminology system alone can serve all purposes for which health information is currently used or indeed, will likely be used in the future.\(^{(11)}\)

Terminologies are used primarily to capture clinical information at the point of care. As such, they are usually highly detailed and are fine grained systems. Classification systems are intended for use with secondary use data such as reimbursement, statistical and public health reporting, operational and strategic planning, quality of care measurements, and other administrative functions.\(^{(10)}\) The differences are illustrated in Table 1 below.
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Terminologies</th>
<th>Classifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actor</td>
<td>Healthcare providers</td>
<td>Healthcare records departments personnel</td>
</tr>
<tr>
<td>Available Information</td>
<td>Whatever the provider can observe, test or obtain otherwise</td>
<td>The healthcare record as documented during the patient encounter</td>
</tr>
<tr>
<td>Timing</td>
<td>While the patient is present</td>
<td>After the patient has left</td>
</tr>
<tr>
<td>Goal</td>
<td>Document information about the patient and the encounter according to professional standards and to meet the information needs of the health system</td>
<td>Identify a single primary discharge diagnosis or procedure for the purposes of morbidity and mortality statistics OR for reimbursement purposes</td>
</tr>
<tr>
<td>Code system</td>
<td>Multi-hierarchical terminology.</td>
<td>Mono-hierarchical, with inclusion and exclusion criteria to avoid overlap.</td>
</tr>
<tr>
<td></td>
<td>Clinician may be as general or as specific as they want.</td>
<td>Not Otherwise Specified (NOS) categories to code cases where the clinical record is not specific enough for the code system.</td>
</tr>
<tr>
<td></td>
<td>Specificity is served by allowing multiple codes, a combination of codes and where necessary uncoded free text.</td>
<td>Not elsewhere classified (NEC) categories to code cases where the clinical record is more specific than the code system.</td>
</tr>
<tr>
<td></td>
<td>NOS and NEC values are generally not included in the system.</td>
<td></td>
</tr>
</tbody>
</table>

**Table 1: classifications and terminologies satisfy different business need**

Terminologies can be mapped to broader classifications for administrative, regulatory, oversight and fiscal requirements. Further detail on classifications and terminologies is provided in Appendices B and C.
2 Assessment tool

The adoption, adaption or development of standards and associated technical materials to support eHealth will be based on the Authority’s standard procedures and processes for the development of technical standards. These processes and procedures are broadly in line with the World Trade Organization (WTO) Code of Good Practice for the Preparation, Adoption and Applications of Standards(6).

As part of the standards development process an options analysis tool is utilised to assess candidate standards. The tool was developed by the Authority and is based on a Canadian model that is used for the selection and approval of their health information standards.(12) It comprises five principles, with each principle consisting of specific criteria. These are detailed in Table 2 below.

<table>
<thead>
<tr>
<th>No.</th>
<th>Principle/criteria</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>Clinical appropriateness</td>
<td>Where relevant, the standard must support clinical practice.</td>
</tr>
<tr>
<td>1.2</td>
<td>Cross discipline</td>
<td>Where relevant, the standard should be provider independent, i.e. use across disciplines (physicians, nurses, pharmacists, laboratory professionals, allied health professionals etc.).</td>
</tr>
<tr>
<td>1.3</td>
<td>Cross healthcare delivery setting</td>
<td>The standard should be healthcare-delivery-setting independent, i.e. appropriate for use across health sectors (acute care, community, long-term care, etc.).</td>
</tr>
<tr>
<td>1.4</td>
<td>Clinical outcomes</td>
<td>The standard should support patient care. Message types should be defined across administrative, clinical, requesting and prescribing use cases, and support the carrying of clinical information and requests for results and services.</td>
</tr>
<tr>
<td>2.1</td>
<td>Business need</td>
<td>The standard should be developed based on a defined business requirement and should be validated to ensure it meets the business requirements.</td>
</tr>
<tr>
<td>2.2</td>
<td>Maturity/stability</td>
<td>The standard must be assessed to determine how widely it has been implemented and tested, as well as to determine if it requires further development.</td>
</tr>
<tr>
<td>2.3</td>
<td>Feasibility</td>
<td>It should be possible to implement the standard within a reasonable time, budget, and resource skill set. Known critical dependencies impacting implementation must be identified (for example, other components or standards that are not yet developed).</td>
</tr>
<tr>
<td>2.4</td>
<td>Workflow</td>
<td>The use of this standard must be assessed in regard to the user’s workflow or workload. Impact to workflow must be balanced with improvements to patient care either directly or indirectly.</td>
</tr>
<tr>
<td>3.1</td>
<td>Vendor neutral</td>
<td>The standard should be vendor independent.</td>
</tr>
<tr>
<td>No.</td>
<td>Principle/criteria</td>
<td>Definition</td>
</tr>
<tr>
<td>-----</td>
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<td>----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>3.2</td>
<td>Backward compatibility</td>
<td>Where appropriate, the standard should be backward compatible and interoperable with previous versions of the standard.</td>
</tr>
</tbody>
</table>

4. Standards must be financially viable

| 4.1  | Affordability               | The standard should have viable licensing and maintenance fees as well as a feasible funding strategy. |
| 4.2  | Implementation costs        | The implementation of the standard should be financially viable.                              |

5. Standards must have established governance and processes

| 5.1  | Intellectual property       | The intellectual property or licensing issues relating to the standard should be documented.   |
| 5.2  | Governance structure        | In keeping with the Authority’s standards decision-making process, the designation of a standard as an Authority standard is governed by the Authority’s standards development process. |
| 5.3  | Irish influence             | The standards should have been developed and maintained through an open and transparent process with opportunity for Irish stakeholders to be engaged. |
| 5.4  | Sustainability              | Document the established or planned processes and resources to maintain this standard; to enhance the standard when necessary and monitor conformance to the standard. |

Table 2. Options Analysis Tool

The consultation document\(^6\) identified six candidate standards which could be adopted or adapted as national standards for Ireland. The candidate standards include the Systematized Nomenclature of Medicine Clinical Terms (SNOMED CT), Logical Observation Identifiers Names and Codes (LOINC), the Read Codes, the International Classification of Primary Care, Second Edition (ICPC-2), the International Classification of Diseases Version 10 Australian Modification (ICD-10-AM) as used in the Hospital In-Patient Enquiry scheme (HIPE) and the Office of Population Census and Surveys Classification of Surgical Operations and Procedures Fourth Edition (OPCS-4).

SNOMED CT, LOINC, and Read Codes may all be considered terminology systems. ICPC-2, ICD-10 and ICD-10-AM and OPCS-4 may be considered classifications. A review of each of the candidate standards is provided in Appendix D. An assessment of each of the candidate standards now follows using the options analysis tool.
3 Options Analysis

Each of the candidate standards will be assessed under the principles and criteria as defined above in the options analysis tool. The principles are:

- standards must be clinically relevant
- standards must meet a specific business need
- standards must be vendor neutral and backward compatible
- standards must be financially viable
- standards must have established governance and processes.

3.1 Standards must be clinically relevant

The criteria under this principle include clinical appropriateness, cross discipline, cross healthcare delivery setting and clinical outcomes.

3.1.1 Clinical appropriateness

Clinical practice can be supported by using both classifications and terminologies in combination to satisfy coding requirements.\(^9\)

Terminologies are used primarily to capture clinical information at the point of care. As such, they are highly detailed, have predefined relationships and are fine grained.

Classifications are more suited to the recording and analysis of secondary use data such as research or epidemiology purposes. Classification systems are intended for secondary data use, including quality of care measurement, reimbursement, statistical and public health reporting, operational and strategic planning, and other administrative functions.

Terminologies and classifications are designed for distinctly different purposes and to satisfy diverse user data requirements. They should be considered as complementary to each other, as neither a clinical terminology nor a classification can, by itself, serve all the purposes for which health information is currently used, or will be used in the future.\(^{13}\)

It is necessary to select classifications and terminologies in combination to enable complete coverage of data and information requirements across all of healthcare.

The full benefits of clinical terminologies are realised when they are used to collect clinical information as part of the clinical encounter at the point of care and are linked and integrated with clinical classifications for the purpose of generating data for secondary use for statistical and epidemiological analysis, external reporting requirements, measuring quality of care and monitoring resource allocation.
3.1.2 Cross discipline

Terminologies

SNOMED CT\(^{(14)}\) fully supports a wide range of healthcare professionals in their various roles as it is considered the most comprehensive clinical terminology currently available internationally. SNOMED CT covers many aspects of healthcare including clinical findings, procedures, body structures, organisms, substances, and pharmaceutical and biological products.

LOINC\(^{(15)}\) is primarily used by laboratory staff and pathologists. It covers the laboratory domain and includes codes for haematology, biochemistry, microbiology, serology, toxicology and identifiers for drug and cell counts and antibiotic susceptibility. LOINC includes entries for clinical observations, nursing diagnosis, nursing interventions, outcomes classification, and patient care data sets.

Read Codes\(^{(16)}\) are used largely throughout primary care in the UK. The type of content covered in the Read Codes that assist general practitioners include occupations, history, symptoms, examination, sign, diagnostic procedures, laboratory procedures, radiology, physics in medicine, preventative procedures, operations, procedures, sites, other therapeutic procedures and administration.

Classifications

ICPC-2\(^{(17)}\) is designed primarily for use in general practice but can also support practitioners in secondary care. It can be used by general practitioners in paper-based statistical collections and in electronic information systems to record the reason for the encounter, the healthcare practitioner's assessment of the diagnosis or problem and process of care arising out of the encounter.

The International Classification of Diseases (ICD)\(^{(18)}\) is the international standard diagnostic classification for epidemiological reporting, health management purposes and clinical use. These include the analysis of the general health situation of population groups and monitoring of the incidence and prevalence of diseases and other health problems in relation to other variables, such as the characteristics and circumstances of the individuals affected, reimbursement, resource allocation, quality and guidelines. The classification is the latest in a series which has its origins in the 1850s. ICD contains:

- tabular lists containing cause-of-death titles and codes
- inclusion and exclusion terms for cause-of-death titles
- an alphabetical index of diseases and nature of injury, external causes of injury, table of drugs and chemicals
- descriptions, guidelines, and coding resources.
The OPCS-4\(^{(19)}\) coding system has a specific clinical focus for coding surgical operations and procedures, and is therefore used primarily by healthcare practitioners in secondary care.

### 3.1.3 Cross-healthcare delivery setting

#### Terminologies

SNOMED CT is described as the lingua franca within electronic patient records (EPRs) and electronic health records (EHRs). It has a broad scope of coverage and includes concepts representing the wide range of types of information that need to be recorded in clinical records. SNOMED CT has a logical multi-axial subtype hierarchy, which allows it to express information with different levels of detail and precision. As a result, practitioners from different disciplines and specialties can record appropriate data at different stages in the delivery of patient care.

LOINC was developed to support the electronic movement of clinical data from laboratories that produce the data to hospitals, physician's offices, and payers who use the data for clinical care and management purposes. LOINC also includes concepts to identify clinical assessments and findings.

Read Codes are oriented towards general practice and its scope is the coding of any clinical data in a GP’s EPR or practice management system. The Read coding system has a broader scope than ICPC as during the development of Read version 3 significant input was received from special interest groups across multiple specialties and the allied health professions.

#### Classifications

ICPC-2 is established in general practice in Ireland and is used for disease coding. The Irish Primary Care Research Network\(^{(20)}\) extracts data coded with ICPC-2 and ICD-10 codes from GP practice management systems and the General Practice Information Technology Group Coordinators work with GPs on the use of ICPC-2 in coding of clinical encounters and subsequent auditing of clinical practice.

ICD-10-AM is used for health information purposes in public health, primary, secondary and tertiary care settings. In Ireland, ICD is used in both primary and secondary care settings. ICD-10-AM is used in the HIPE in Ireland.

OPCS-4 is specific to secondary care specifically the surgery domain though there are some diagnostic codes included in OPCS. OCPG-4 was previously used in the HIPE systems but is not currently used in Ireland.
3.1.4 Clinical outcomes

Clinical terminologies support patient care by facilitating the coding of clinical information captured in an EHR/EPR during the course of a patient’s encounter. Clinical terminologies have much greater flexibility than classifications and are expressed in “natural” language and are considered “input” systems.

Clinical terminologies are generally more comprehensive, precise and offer a more accurate representation of the healthcare domain. However, clinical terminologies are not suitable for all healthcare scenarios if used in isolation across the whole of the health sector for data collection and reporting because of their immense size, complex granularity and complex hierarchies.

Classification systems play a key role in supporting patient care and are regarded as the most widely used approach to coding data in healthcare today. Classifications are used to group similar diseases and procedures based on pre-determined categories, for example, for body systems or the cause of a disease. This allows specific diseases and procedures to be grouped into broad-based categories which can then be used for reporting purposes. This is because they organise related concepts, making it easier to retrieve information from computer systems in the form of reports. They are therefore considered output or reporting systems rather than input systems. Classifications are also used for reimbursement purposes.

3.2 Standards must meet specific Irish business needs

Principles under this category include a standard should be developed based on a defined business requirement, is mature and stable, that it is feasible to implement the standards, and that the standard can enhance clinical workflow.

3.2.1 Business need

As discussed in section 1.4, terminologies and classifications serve different business needs. Terminologies aid workflow by assisting healthcare professionals and clinicians to capture clinical information at the point of care, improving clinical decision making and patient safety. Classifications are more appropriate for retrospective data entry of clinical information and for reporting purposes and facilitate clinical and administrative staff to carry out their functions, particularly concerning secondary data use.

3.2.2 Maturity/Stability

Terminologies

SNOMED CT has been adopted by 15 countries as a national terminology. However, despite its growing popularity internationally, the use of SNOMED CT is still limited in Ireland. SNOMED CT has been adopted as the preferred terminology in the NHS.
and will be the chosen terminology and mandatory for use in the English and Welsh NHS by 2015.

There is significant international adoption of LOINC with projects in more than 140 countries using the terminology.\(^{(22)}\) It is widely used in Canada, Germany, Switzerland, Australia, South Korea, Estonia, Brazil, New Zealand and the US.\(^{(23)}\) In addition, a number of efforts have been undertaken to translate the LOINC documents and terms into various languages, including Chinese, French, German and Spanish.\(^{(22)}\) LOINC is in use in Ireland and was selected as the terminology to support the identification of laboratory orders for the Standardisation of Laboratory Test Codes project.

In April 1999 Read Codes were mandated for use by GPs in the NHS.\(^{(24)}\) As of 2010, READ versions 2 and 3 remained the core clinical terminology used in UK primary care with 90% of coding by general practitioners carried out using Read version 2. The United Kingdom Terminology Centre (UKTC) maintains the Read Codes. The Read Codes will be not be maintained in the UK after 2015.

**Classifications**

ICPC-2 is recognised as a suitable classification for general practice,\(^{(21)}\) having achieved recognition from the World Health Organization (WHO). It is currently the most widely used in countries such as Australia, the Netherlands, Spain, Norway, Slovenia, Denmark, Finland and France.\(^{(21)}\) ICPC-2 has been translated into 19 languages.

The International Classification of Diseases, Tenth Revision (ICD-10) was endorsed by the Forty-third World Health Assembly in 1990 and came into use in WHO member states in 1994. ICD-10 is used in about 110 countries for cause of death reporting and statistics. Some 25 countries use ICD-10 for reimbursement and resource allocation in their health system. A few countries made modifications to ICD to better accommodate this use.\(^{(25)}\) ICD-10 is available in the six official languages of the WHO (Arabic, Chinese, English, French, Russian and Spanish), as well as in 36 other languages.\(^{(26)}\) The 11th revision of the classification is expected to be released in 2015.\(^{(26)}\)

The first NHS procedural classification was published in 1987 by the Office of Population Censuses and Surveys as the Classification of Surgical Operations. In 1992 the 4th revision was released as the OPCS Classification of Surgical Operations and Procedures (4th revision) (OPCS-4.2). Since the implementation of OPCS-4.3 in April 2006 there have been three further revisions to OPCS-4, with each becoming the mandated classification on 1 April in the year of publication. The United Kingdom Terminology Centre (UKTC) maintains OPCS. The most recent version was OPCS-4.6, release in 2011. OPCS-4.7 is under development.
3.2.3 Feasibility

Terminologies

The Authority undertook an international review of five countries in 2011 as part of an assessment to evaluate purchasing a national licence for Ireland. Some important lessons were learned from the review that would impact on the feasibility of introducing SNOMED CT. Some key resources are required to carry out the following functions to ensure the terminology is implemented appropriately. The include personnel to:

- run a national release centre and provide administrative support for the implementation of SNOMED CT, including issuing licences
- provide education and raise awareness and sell SNOMED CT to users
- develop SNOMED CT subsets. SNOMED CT is implemented using subsets of the overall coding system; for example, a pharmacy subset may be required. Domain expertise is necessary to develop subsets.

Some experience in LOINC exists in Ireland. LOINC concepts are used for laboratory ordering, Emergency Department alerts and referrals to hospital outpatient services. To implement LOINC at a national level would require resources and expertise from pathologists and other laboratory, clinical and technical experts.

There is a long legacy of using Read Codes in primary care in the UK. There is no real benefit in replacing current primary care coding systems with Read Codes given that the UK are mandating the use of SNOMED CT by 2015 and Read Codes will become obsolete and support for them will be discontinued.

Classifications

There is some experience with ICPC-2 coding in Ireland. A project conducted in the late 90s by a group of GPs and the South Eastern Health Board piloted morbidity data collection in five practices. More recently, the Irish College of General Practitioners undertook a feasibility project, which was funded by the Authority, to assess the feasibility of ICPC coding in the Irish general practice setting. The aim was to create an anonymized database detailing episodes of care in general practice. ICPC-2 is well established in general practice in Ireland and is used for disease coding. In order to achieve the ICGP certification general practice software management systems are required to support the coding of information using ICPC-2 and ICD-10.

The coding classification currently used in Ireland is the International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM). The HIPE scheme was established in 1971 and is currently maintained by the Economic and Social Research Institute (ESRI) in association with the Health Service Executive (HSE). HIPE is a computer-based health information system, designed to collect national data on coded discharge
summaries and morbidity information from acute hospitals in Ireland. All acute hospitals participate in HIPE, reporting on over 1.3 million records annually. Clinical coders use ICD-10-AM for coding diagnoses in the acute hospitals. Additionally, the Australian Classification of Health Interventions (ACHI) is used to record procedures to the HIPE system. There is a commitment to move to ICD-11 in the future. The data collected by the HIPE system can logically be grouped into demographic, clinical and administrative data. HIPE data is used in research and planning, for example, in hospital activity statistics related to diseases or procedures, for quality assurance studies and drug trials. It is also used by the Department of Health and the HSE in the planning, provision and capacity of acute hospital services.

OPCS-4 is specific to the UK and was designed for use by in the NHS in England. The most recent version is OPCS-4 version 4.6, which was mandated for use in England in 2011. The OPCS-4 classification system is used typically in secondary care in the UK to code procedures during hospital stays. The original version of OPCS was used in the HIPE system in Ireland for coding procedures up until 1990. It was decided not to continue with the revised OPCS version and was replaced by ICD-9-CM.

3.2.4 Workflow

It is important that clinical coding will complement a user’s workflow or workload and must be balanced with improvements to patient care either directly or indirectly.

Terminologies are very much aligned with clinical workflow, particularly for supporting clinicians and healthcare professionals with coding clinical information when the patient is present. Hence, they serve primarily as an ‘input’ system and are conducive to how clinicians carry out their role.

Terminologies aid workflow by assisting healthcare professionals and clinicians to capture clinical information at the point of care, improving clinical decision making and patient safety. A terminology such as SNOMED CT also serves as a good reporting tool as it is granular in structure and because it contains relationships between concepts.

The purpose of a classification system is primarily to facilitate healthcare records departments to code information that has been recorded during the patient’s encounter, typically following the patient’s visit. They are not designed to capture clinical information at the point of care. As mentioned, they are designed for reporting purposes and are considered ‘output’ systems.

Classifications are more appropriate for retrospective data entry of clinical information and for statistical and epidemiological reporting purposes, and facilitating clinical and administrative staff to carry out their functions, particularly concerning secondary data use.
3.3 Standards must be vendor neutral and backward compatible

Criteria under this principle are that standards should be vendor neutral and backward compatible.

3.3.1 Vendor neutral

Terminologies

All candidate standards systems are vendor neutral. Intellectual property rights to SNOMED CT are owned by IHTSDO. LOINC is owned and maintained by the Regenstrief Institute. Read Codes are owned and maintained by the UKTC on behalf of the Crown copyright.

Classifications

ICPC-2 is owned and governed by WONCO. ICD is owned by the WHO and the different versions of OCPS are owned and maintained by the UKTC on behalf of the Crown copyright.

3.3.2 Backward compatibility

Terminologies

SNOMED CT is backward compatible between releases and SNOMED CT concept identifiers are never reused. It does allow for concepts to be made inactive but a concept is never deleted from the terminology. If a concepts if superseded by another concept links are created between the relevant concepts.

LOINC is backward compatible, concepts are never deleted from the terminology and identifiers are never reused. It may have multiple entries for very similar concepts. The LOINC coding system doesn’t deprecate or reuse codes but does allow for duplication of concepts.

Read Codes are backward compatible within the different releases of the maintained versions and mapping exists to map similar concepts between the maintained versions.

Classifications

Early indications are that ICPC-3 will be a significant change on ICPC-2 and may not be completely backward compatible.
There was considerable change between the ICD-9 and ICD-10 systems, which were not necessarily backward compatible. A small proportion of codes had their meaning redefined during this process. ICD-10 is intermittently updated and backward compatibility is maintained between these releases. ICD-11 will support a change history, and upkeeps compatibility with previous editions. While new diseases are certainly introduced as they emerge, outdated concepts of diseases, symptoms or syndromes will not be deleted, but will become inactivated instead.

OPCS is backward compatible between versions. New entries may be added with subsequent versions and when the meaning of a concept changes the existing concept is retired and a new concept is created. The changes are made usually to reflect changing clinical practice.

3.4 Standards must be financially viable

The affordability of introducing and supporting any terminology standard is a key consideration and must take into account the licensing costs of the standard, the membership of the standards development organisation (SDO) and the resources to support the implementation of the standard.

3.4.1 Affordability

Terminologies

SNOMED CT has been licensed in at least 30 countries worldwide and can be purchased at a national level or project level. The cost of an annual licence for Ireland is in the region of $60,000, doubled in the first year. Organisational or affiliate licences can be purchased for between $500-$1600 dollars depending on the size and type of the organisation.\(^{(30)}\)

IHTSDO encourage the use of SNOMED CT in research. Research projects may qualify for a free license if they:

- are supported by a formal proposal that has been peer reviewed,
- have been ethically approved in accordance with the prevailing legislation, regulations and guidelines in effect in the relevant territory,
- are conducted within a definite timeframe, and
- the results of the research are offered for publication in peer-reviewed public journals and are provided to the licensor free of charge.

The LOINC database and associated documents and programs are copyrighted, but the copyright permits all commercial and non-commercial uses at no cost\(^{(31)}\).

Licence application and distribution for the Read Codes is via the UKTC Reference Data Update Distribution service.\(^{(32)}\)
Classifications

Commercial or national use of ICPC-2 requires a formal licence from WONCA. In the first instance, the regional members of the WONCA International Classification Committee should be contacted for advice regarding licences.

The World Health Organization (WHO) requires that an ICD licence is needed for commercial, research and organisational use.

As an NHS publication, OPCS-4 is covered by Crown copyright. For non-NHS users a licence is required for OPCS-4 in electronic format.

3.4.2 Implementation costs

Implementation costs for both terminologies and classifications are multi factorial. Obvious costs include the purchasing of licences, but the other costs are less obvious. These range from education and training of clinicians and clinical coders, the costs of change to business practice and daily workflow, and development costs associated with supporting classifications and terminologies within ICT systems. Recent research in the US suggests that costs of the migration to ICD-10 for a small practice could be up to $38,000. Another study indicated that the price per patient varies across the size of the organisation implementing terminologies and classifications. It was estimated that for large organisations the cost could be in the region of $11 per patient, but for smaller organisations the costs can be in the region of $38 per patient.

3.5 Standards must have established governance and processes

The criteria included under this principle include intellectual property rights, governance structure, Irish influence and sustainability.

3.5.1 Intellectual property

Terminologies

SNOMED CT was acquired in April 2007 by IHTSDO. IHTSDO purchased the intellectual property of SNOMED CT and antecedent works from the College of American Pathologists (CAP), which created and maintained it for more than 40 years. The IHTSDO is responsible for ongoing maintenance, development, quality assurance, and distribution of SNOMED CT. Members own the intellectual property rights to additions and extensions they may make to the international release but IHTSDO reserves the rights to have the changes and any associated intellectual property rights transferred back to the international edition of SNOMED CT.

The Regenstrief Institute owns the copyright to LOINC and the supporting materials. The LOINC database and associated documents and programmes are copyrighted,
but the copyright permits all commercial and non-commercial uses at no cost. If the LOINC database or its contents are distributed as a database, such distributions must include all parts of the formal LOINC term, the LOINC short name, the LOINC code, the deprecated flag, and the copyright. The copyright notice is needed to prevent variants, which would defeat the purpose of this standard. No such notice is required when LOINC codes are used in messages to report test results.

The Read Codes are maintained by the UKTC. Versions are released biannually, in October and April. Licence application and distribution is via the UKTC Reference Data Update Distribution service.

**Classifications**

ICPC-2 is available in both written and electronic form. Commercial or national use requires a formal licence from WONCA. In the first instance the regional members of the WONCA International Classification Committee should be contacted for advice regarding licences.

The World Health Organization (WHO) requires that an ICD licence is needed for commercial, research and organisational use. Both electronic and bound versions of ICD-10 can be purchased from the WHO. The WHO issues licences for:

- commercial licences to companies wishing to incorporate and distribute WHO classifications in their software products for sale to customers in certain countries
- internal licences to organisations wishing to incorporate WHO classifications into their internal information systems for use by employees for administrative purposes, e.g. health records management
- for non-commercial use; if an organisation is planning to use WHO classifications for non-commercial or research purposes, then you may qualify for a licence for non-commercial research use.

As an NHS publication, OPCS-4 is covered by Crown Copyright. NHS bodies are not required to apply for a licence and are permitted to reproduce OPCS-4 codes for administrative purposes within the NHS only. For non-NHS users a licence is required for OPCS-4 in electronic format.

**3.5.2 Governance structure**

**Terminologies**

IHTSDO is an international not-for-profit organisation based in Denmark which owns and is responsible for the development, quality assurance, administration of the rights to SNOMED CT and its distribution. IHTSDO was formed in 2007 with the aim of improving the health of humankind by fostering the development and use of
suitable standardised clinical terminologies, notably SNOMED CT, in order to support the safe, accurate and effective exchange of health information.

The IHTSDO General Assembly (GA) is the highest authority of the Organisation and is composed of representatives from all member countries with equal representation. The GA is collectively charged with assuring that the purpose, objects and principles of the Organisation are pursued and that the interests of the IHTSDO are safeguarded. Arrangements for governance of the IHTSDO and SNOMED CT are set out in the IHTSDO Articles of Association. The GA appoints the Management Board (MB), which has overall responsibility for the management and direction of the IHTSDO.

The development and maintenance of LOINC is a voluntary effort, carried out by a not-for-profit medical research organisation called the Regenstrief Institute. The Institute is endorsed by the American Clinical Laboratory Association and the College of American Pathologists.

The UKTC is responsible for the management of Read Codes, the maintenance of the UK SNOMED CT release, and other healthcare terminology products and clinical classifications such as the NHS Dictionary of Medicines and Devices.\(^{(34)}\)

**Classifications**

WONCA owns the intellectual property rights to ICPC-2. The World Organization of Family Doctors (WONCA) is a global not-for-profit professional organisation in official collaborative relations with the World Health Organization (WHO), representing family doctors and family medicine from all regions of the world. The mission of WONCA is to maintain and improve the quality of life of the peoples of the world through defining and promoting its values, and by fostering and maintaining high standards of care in general practice/family medicine.\(^{(35)}\) The ICGP is a member of WONCA.

The World Health Organization (WHO) is a specialized agency of the United Nations (UN) that is concerned with international public health. It was established on 7 April 1948, with its headquarters in Geneva, Switzerland. The WHO is a member of the United Nations Development Group. ICD-10 was endorsed by the Forty-third World Health Assembly in May 1990 and came into use in WHO member states as from 1994. The 11th revision of the classification has already started and will continue until 2015.\(^{(36)}\)

The first NHS procedural classification was published in 1987, by the Office of Population Censuses and Surveys as the Classification of Surgical Operations.\(^{(37)}\) In 1992 the 4th revision was released as the OPCS Classification of Surgical Operations and Procedures (4th revision).\(^{(38)}\) Responsibility for maintaining the OPCS classification systems rests with the NHS Classification Service in the Health and Social Care Information Centre.\(^{(29)}\)
3.5.3 Irish influence

Terminologies

IHTSDO releases SNOMED CT twice annually, incorporating updates from charter members and working groups into the new releases. Ireland does not have a national SNOMED CT licence and does not provide new codes for inclusion in releases at a national level. LOINC accepts submissions electronically for new entries to the classification and incorporates these into subsequent releases.\textsuperscript{(29;31)} The Irish College of General Practitioners is a member of the WONCA organisation. OCPS are currently maintained by the UKTC and new codes are added as required.

Classifications

ICPC-2 is currently stable and ICPC-3 will be developed in conjunction with its members.

ICD are currently developing ICD-11 and actively encourage all member states to get involved in the development process.

Read Codes are currently maintained by the UKTC and new codes are added as required. The requirements are generally driven by the UK’s requirements. Read Codes are to be retired in 2015.

3.5.4 Sustainability

Terminologies

SNOMED CT is actively maintained by IHTSDO with new releases twice yearly.

The Regenstrief Institute manages the maintenance of LOINC, including receiving submissions in relation to new content/requests from the user community, making updates available twice yearly, the addition of codes for clinical specialties, maintaining short names for laboratory tests, and the maintenance of RELMA.\textsuperscript{(39)}

Updates to Read 1 and Read 2 are released six-monthly to coincide with the equivalent SNOMED CT release, and updates are released monthly for drugs.\textsuperscript{(16)} The UKTC continues to maintain and distribute a number of Read Code-based products, including cross-maps to the UK-mandated classifications OPCS-4 and ICD-10 pathology lists.\textsuperscript{(16)} The Read Codes are currently maintained by the UKTC but SNOMED CT has been mandated for use in the NHS from 2015 and the Read Codes will not be maintained after that date.

Classifications

ICPC-2 is supported by the WHO through WONCA and ICPC-3 is in active development.
ICD is maintained by the WHO. ICD-11 is in development and is scheduled to be released in 2015. ICD-10 is periodically updated as required. OPCS-4 is maintained by the UKTC and new codes are added as required.

4 Conclusions

Classifications and terminologies are designed for distinctly different purposes and to satisfy diverse user requirements. They should be considered as complementary to each other, as neither a clinical terminology nor a classification can, by itself, serve all the purposes for which health information is currently used, or will be used in the future. It is necessary to select different classifications and terminologies in combination to enable coverage of business requirements across all of healthcare.

The full benefits of clinical terminologies are realised when they are used to collect clinical information as part of the clinical encounter at the point of care and are linked and integrated with clinical classifications for the purpose of generating data for secondary use for statistical and epidemiological analysis, external reporting requirements, measuring quality of care and monitoring resource allocation.

Different terminology systems are more suited to different healthcare settings but mapping can facilitate cross-healthcare delivery between them.

The terminologies and classifications reviewed have the ability to support and improve care delivered to patients. This is achieved by improved data quality, use of data and clinical decision making at the point of care facilitated by a clinical terminology such as SNOMED CT. Equally, a classification can improve patient care by enhancing secondary use data through research and epidemiology statistics.

All standards reviewed are mature and have been implemented in a variety of countries for a satisfactory period of time. Read codes and the OPCS-4 were developed primarily for use in the UK. The stability of each standard is reflected in the revision cycles that each standard is passed through.

It is important that clinical coding will complement a user’s workflow or workload and must be balanced with improvements to patient care either directly or indirectly. As previously mentioned, classifications and terminologies serve different purposes and hence facilitate user’s workflows in different ways.

Classifications are more appropriate for retrospective data entry of clinical information and for reporting purposes and facilitate clinical and administrative staff to carry out their functions, particularly concerning secondary data use. Terminologies aid workflow by assisting healthcare professionals and clinicians to capture clinical information at the point of care, improving clinical decision making and patient safety. A terminology such as SNOMED CT also serves as a good
reporting tool as it is granular in structure and because it contains relationships between concepts.

The presumed advantage of choosing a vendor-neutral model is that the best technology can be used at any time. Candidate standards should also be backward compatible. This is important because it eliminates the need to start over when upgrading to a new version of a standard. A standard is backward compatible if it is compatible with earlier versions of the same standard. However, it is sometimes necessary to sacrifice backward compatibility to take advantage of a new and improved standard with a completely different architecture.

Though licensing costs vary across the different terminologies and classification the cost of licensing is only a small part of the cost of implementing either classification or terminologies. Other countries have invested heavily in implementing both. Ireland, through the ESRI and the HIPE system is well placed with respect to the implementation of diagnostic and procedure coding in Ireland. An incremental approach will be required in Ireland when implementing any terminology or classification system at a regional or national level.

All standards reviewed are mature and have been implemented in a variety of countries for a satisfactory period of time. Read Codes and the OPCS-4 were developed primarily for use in the UK.

There is strong governance by organisations which maintains each standard and all organisations are open to contribution from Irish stakeholders. All standards are maintained with one exception: the Read Codes will not continue to be developed and supported by the UKTC after 2015.

Licensing is required for all terminological systems reviewed in this assessment. However, it is required at different levels, e.g. commercial, non-commercial or for research. SNOMED CT issue different categories of licensing, including research, national and organisation-based licences.

The purpose of this guidance is to provide direction on classification and terminology standards in Ireland for the short to medium term. The Authority will review the document in 18 months’ time and update the recommendations should new evidence become available.

Across Ireland, the exchange of administrative and clinical information is managed using many different types of systems and computer software. The standards that are used to communicate information unambiguously between different systems vary and may include bespoke, proprietary, or commonly used international terminology standards such as LOINC, SNOMED CT, or ICD-10 and its different international versions. To safely send and receive information such as referrals and laboratory orders and results between different types of systems, a standard exchange format and semantics are required.
The classification systems where substantial expertise and experience are available in Ireland is predominantly ICD-10-AM in the acute and some primary care settings. Clinical coders in the acute hospitals use ICD-10-AM for coding diagnoses. ACHI is used for procedures. There is some experience in using LOINC for laboratory coding and ICPC-2 in primary care. It is feasible to continue to use ICD and LOINC for the purposes that they were designed for.

There is minimal knowledge and expertise of SNOMED CT. However, if sufficient resources become available and given the significant benefits of introducing such as terminology, it would be feasible to introduce the standard in Ireland. The Read Codes will become redundant and will not be supported by 2015 and are therefore not a feasible option.

To provide direction and to assist the health IT community to make decisions in relation to health messaging standards, the Authority makes the following recommendations:

A combination of classifications and terminologies is required. As terminologies and classifications are more suited to different healthcare settings it is recommended:

- The use of LOINC coding should continue to be developed and implemented in Ireland. There is a need arising to develop a national catalogue of laboratory codes to support interoperability requirements in that area and that deficiency, as identified by the subgroup of the national messaging body, should be addressed.
- ICD-10-AM should continue to be used in the coding systems used in the Hospital Inpatient Patient Enquiry System for the coding of episode of care.
- It is recommended that SNOMED CT continues to be assessed and where opportunities arise to upskill this should be undertaken. With the development and roll out of national programmes it may become appropriate to purchase a national SNOMED CT licence and formally support the classification.
- ICPC-2 and ICD-10 should continue to be supported in primary care.
- As Read Codes will not be supported in the United Kingdom after 2015 there is very little benefit in introducing or migrating to these in primary or secondary care.
Reference List


(44) International Health Terminology Standards Development Organisation. SNOMED CT Concepts. 2013. Available online from:
Guidance on Classification and Terminology Standards for Ireland
Health Information and Quality Authority


Appendix A – Guiding Principles

1. The development of standards and associated technical materials to support eHealth will be based on the Authority’s standard procedures and processes for the development of technical standards. These are broadly in line with the World Trade Organization (WTO) Code of Good Practice for the Preparation, Adoption and Applications of Standards(6).

2. Open non-proprietary standards will be preferred over proprietary ones.

3. International standards which have been fully implemented and validated will be preferred.

4. There should be minimum adaptation of the international standards to meet the requirements of the Irish health sector.

5. Where there is no international standard available, and only as a last resort, will the Authority consider developing a new standard for Ireland.

6. Industry developments and health service delivery opportunities will be taken into account.

7. The standards proposed will ensure value for money and minimise cost of compliance.
Appendix B – Classification Systems

Classification systems are by far the most widely used approach to coding healthcare data in existence today. They group similar diseases and procedures based on pre-determined categories such as the cause of a disease. This allows specific diseases and procedures to be grouped into broad-based categories, making it easier to retrieve information from computer systems in the form of reports. They are therefore considered ‘output’ rather than ‘input’ (e.g. data entry) systems. Another use of classification systems is for reimbursement purposes. International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM) is widely used to code data for case-mix and reimbursement in many countries, including the Hospital In-patient Enquiry Scheme (HIPE) in Ireland. The benefits of using classification systems include:

- organisation of information into standard groupings of diseases, which allows for easy storage, retrieval and analysis of health information
- sharing and comparing health information between hospitals, regions and countries
- data comparisons in the same location across different time periods
- provide the basis for the compilation of national mortality and morbidity statistics
- direct surveillance of epidemic or pandemic outbreaks.

However, classifications are not intended or designed to document clinical care\(^{(10)}\) and are not the most appropriate system to use to code the clinical aspects of an episode of care. They are incapable of supporting all requirements of clinical coding because they are not sufficiently fine-grained and fail to define all of the individual concepts within a given healthcare domain.\(^{(6)}\)

Some of the most recognised classification systems used in healthcare include ICD, which is used internationally, and its extensions such as ICD-10-AM, which is used in Ireland. ICPC-2 is used successfully for coding primary care data and the OPCS for coding surgical operations and procedures used specifically in the UK.
Appendix C – Clinical Terminologies

A clinical terminology is a structured collection of descriptive terms for use in clinical practice. Terminologies are defined as ‘standardised terms and their synonyms which record patient findings, circumstances, events, and interventions with sufficient detail to support clinical care, decision support, outcomes research, and quality improvement.’ Clinical terminologies such as the SNOMED CT are essential to support full semantic interoperability between systems so as to ensure that the information shared/sent can be mutually and unambiguously understood.

Clinical terminologies, when compared to classifications, are generally more comprehensive, precise and offer a more accurate representation of the healthcare domain. However, clinical terminologies used in isolation are not suitable for all healthcare scenarios and can be difficult to implement because of their immense size, complex granularity and complex hierarchies.

The full benefits of clinical terminologies are realised when they are used to collect clinical information as part of the clinical encounter at the point of care, and are linked and integrated with clinical classifications for the purpose of generating data for secondary use for statistical and epidemiological analysis, reporting requirements, measuring quality of care and monitoring resource allocation. They can facilitate the coding of clinical information captured in an EHR/EPR during the course of patient care. Clinical terminologies have much greater flexibility than classifications and are expressed in ‘natural’ language. As such, they are considered ‘input’ systems. Some key benefits of using clinical terminologies in healthcare records are summarised as follows:

- more accurate and precise recording of clinical information
- more efficient searching of patient records
- improved retrieval of relevant clinical information
- sustained point of care decision support
- support for automatic identification of patient risk factors
- enabling clinical audit
- alerting of possible drug interactions
- monitoring of the responses of treatments
- long term population diseases or outcomes
- large number of coded medical records potentially available for research
- enable communication of patient information with other healthcare professionals.

Commonly used terminology systems include: LOINC, the most widely used lab reporting terminology worldwide; Read Codes, used mainly in primary care in the UK; and SNOMED CT, which is becoming known as the de facto terminology standard worldwide.
Appendix D – Optional Analysis Tool

1. Standards must be clinically relevant

1.1 Clinical appropriateness – where relevant, the standard must support clinical practice.

1.2 Cross discipline – where relevant, the standard should be provider independent, e.g. use across disciplines (physicians, nurses, pharmacists, laboratory professionals, allied health professionals etc.).

1.3 Cross-healthcare delivery setting – the standard should be healthcare-delivery-setting independent, i.e. appropriate for use across health sectors (acute care, community, long-term care, etc.)

1.4 Clinical outcomes – the standard should support patient care. Message types should be defined across administrative, clinical, requesting and prescribing use cases, and support the carrying of clinical information and requests for results and services.

2. Standards must meet specific Irish business needs

2.1 Business need – the standard should be developed based on a defined business requirement and should be validated to ensure it meets the business requirements.

2.2 Maturity/Stability – the standard must be assessed to determine how widely it has been implemented and tested, as well as to determine if it requires further development.

2.3 Feasibility – it should be possible to implement the standard within a reasonable time, budget, and resource skill set. Known critical dependencies impacting implementation must be identified (for example, other components or standards that are not yet developed).

2.4 Workflow – the use of this standard must be assessed in regard to the user’s workflow or workload. Impact to workflow must be balanced with improvements to patient care either directly or indirectly.

3. Standards must be vendor neutral and backward compatible

3.1 Vendor neutral – the standard should be vendor independent.

3.2 Backward compatibility – where appropriate, the standard should be backward compatible and interoperable with previous versions of the standard.
4. Standards must be financially viable

4.1 Affordability – the standard should have viable licensing and maintenance fees as well as a feasible funding strategy.

4.2 Implementation costs – the implementation of the standard should be financially viable.

5. Standards must have established governance and processes

5.1 Intellectual property – the intellectual property or licensing issues relating to the standard should be documented.

5.2 Governance structure – in keeping with the Authority’s standards decision-making process, the designation of a standard as an Authority standard is governed by the Authority’s standards development process.

5.3 Irish influence – the standards should have been developed and maintained through an open and transparent process with opportunity for Irish stakeholders to be engaged.

5.4 Sustainability – document the established or planned processes and resources to maintain this standard; to enhance the standard when necessary and monitor conformance to the standard.
Appendix E – Candidate Standards

The candidate standards selected for clinical coding in Ireland are based on international uptake and the clinical coding standards that currently exist in Ireland. The classifications selected include ICD-10-AM, ICPC-2 and OPCS-4 for classification systems. The terminologies selected for assessment include SNOMED CT, LOINC and Read Codes. The following section will provide an overview of each of the standards.

Systematised Nomenclature of Medicine – Clinical Terms (SNOMED CT)

Systematised Nomenclature of Medicine Clinical Terms (SNOMED CT) is a comprehensive, multilingual terminology system. It is the largest clinical terminology currently available internationally and covers many aspects of healthcare, including diseases, symptoms, procedures and medical devices. It aims to improve the quality and safety of healthcare by improving the accuracy of storage and/or recording of clinical data in patient records, by recording healthcare encounters and by delivering decision support to healthcare providers. SNOMED CT is neither a clinical information system nor a decision support system but can be used to integrate decision support systems within clinical information systems. In theory, it attempts to be the periodic table of elements for healthcare information.

The core components of SNOMED CT consist of concepts, descriptions, hierarchies and relationships. The components are defined below as:

- **concepts**: basic unit of meaning designated by a unique numeric code, unique name (Fully Specified Name), and descriptions, including preferred term and one or more synonyms
- **descriptions**: terms or names (synonyms) assigned to a concept
- **hierarchies**: 19 higher level hierarchies; each has sub-hierarchies
- **relationships**: link concepts either within a hierarchy or across hierarchies

Relationships between data are pre-defined, which means that SNOMED CT defines concepts through meaningful (semantic) relationships with other concepts rather than a coding hierarchy as is the case with ICD. The codes used to represent concepts are designed specifically to facilitate computer processing.

SNOMED CT has been described as ‘context less’ meaning that it aims to be applicable and cover all medical scenarios. SNOMED CT consisted of more than 300,000 active concepts, over 1 million English-language descriptions and over 1 million logically-defining relationships linking concepts. Hence, SNOMED CT is large in size. If an individual spent one minute examining each description, and spent 40 hours per week looking at SNOMED CT it would take over six and a half years to examine all active descriptions. Generally, end users only need access to a limited subset of all of the terms contained within SNOMED CT, for example, an epilepsy subset. SNOMED CT facilitates cross mapping to other classification and terminology systems such as ICD-10, LOINC, Read Codes and OPCS-4.
SNOMED CT attempts to be the lingua franca within electronic patient records (EPRs) and electronic health records (EHRs). It aims to achieve improved quality and safer care for patients through improved data quality. SNOMED CT does not attempt to standardise the whole of the medical language and is not intended to get all clinicians to speak and use the same terms.\(^{(21)}\) It attempts to provide the language to adequately reflect the meaning and use of medical concepts.

A survey (2010) was carried out by Elhanan et al to determine users impressions and preferences regarding the content and quality of SNOMED CT.\(^{(45)}\) According to responders, some deficiencies were encountered at least ‘somewhat often,’ including incorrect and missing data. Respondents indicated that significant resources should be allocated to further enhance content coverage. An evaluation report carried out by the Scottish NHS raised further issues regarding SNOMED CT revealing that there was too much choice available and it ‘looked’ complicated to implement. Additionally, until EHRs and clinical information systems exist the introduction of SNOMED CT would be more of a cost than a benefit.

**Logical Observation Identifier Names and Codes (LOINC)**

The Logical Observation Identifier Names and Codes (LOINC®) system is a widely used terminology system, developed to provide a definitive standard for identifying clinical information in electronic reports.\(^{(31)}\) One of the main goals of LOINC is to facilitate the exchange and grouping of test results for clinical care, healthcare management and research. LOINC is distributed to the public by providing a database of codes. It provides a universal code system that includes a set of names and ID codes for identifying medical laboratory information and clinical test results. For example, it is used to identify laboratory tests when test results are messaged electronically from laboratories to healthcare professionals.\(^{(31)}\) When hospitals or other healthcare organisations receive such messages from multiple laboratories, they can automatically file the results in the correct location of their medical records and can use the data for clinical care and management purposes.\(^{(39)}\)

LOINC now contains over 30,000 concepts in the laboratory domain and includes identifiers for haematology, biochemistry, microbiology, serology, toxicology and identifiers for drug and cell counts and antibiotic susceptibility. The clinical section of the LOINC database includes entries for clinical findings and findings when undertaking procedures such as cardiac tests and ultrasounds. Over time the database has increased its scope to include other code names for clinical observations, nursing diagnosis, nursing interventions, outcomes classification, and patient care data sets.\(^{(46)}\) The most recent version of LOINC was released in June 2013 and contained over 72,000 terms.\(^{(46)}\)

A unique LOINC concept is made up of a code and a rubric. LOINC codes are numeric codes that have a fixed field length of seven characters. Current codes are between three to seven digits long. The last digit of the LOINC code is a check digit and is always preceded by a hyphen (dash). An example of a LOINC code made up of a number with a check digit is the code 2863-9 for Albumin.\(^{(31)}\) Each observation within the LOINC database includes a long formal name code, a ‘short’ 30-character
name which is less formal and more readable, and also synonyms. The fully specified LOINC name consists of six fields including name, property, timing, specimen, scale and method. The LOINC short name is an abbreviation of the fully specified LOINC name consisting of less than 30 characters. The short names are unique, but are subject to change as better algorithms for generating them are developed\(^\text{(31)}\).

The database comes with a mapping programme called Regenstrief LOINC Mapping Assistant (RELMATM) to assist the mapping of local test codes to LOINC codes and to facilitate browsing of the LOINC results. Both LOINC and RELMA are available at no cost from www.loinc.org. RELMA is available as a Windows-based mapping utility and LOINC is available as a Microsoft Access database file and a tab-delimited text file.

**Read Codes**

Read Codes are oriented towards general practice and their scope is the coding of any clinical data in a GP's practice management system. They have a broader scope than ICPC, which also applies primarily to general practice. They were developed in the early 1980s by Dr James Read, a general practitioner in the UK, and have been in use in the NHS since 1985 and are still widely used in primary care.\(^\text{(47)}\) Read Codes were subsequently sold to the Crown for £1.25 million\(^\text{(48)}\) and adopted as a national standard in the UK for recording the clinical information in general practice in April 1999.\(^\text{(24)}\)

Read Codes are a hierarchically-arranged terminology system and now consist of three maintained versions of differing complexity, known as Version 1, 2 and Clinical Terms Version 3 (CTV3).\(^\text{(49)}\) The original version was divided into chapters including symptoms, examination, investigations, procedures (including surgery), administration codes and diagnoses. Each entry was assigned a four digit code and therefore became known as the four-byte set. By 1986 the terminology system contained 40,000 terms.\(^\text{(43)}\)

In the late 1980s, Version 2 was expanded in structure with an additional alphanumeric code added and became known as the 5-Byte Read. Version 2 consisted of over 80,000 codes. The 5-Byte set was based on the contents of ICD-9 and OPCS-4.\(^\text{(43)}\)

Some of the limitations that were encountered with the earlier versions of the Read Codes were the complexity of the file structure and inadequate hardware that end-users had access to. Clinical Terms Version 3 (CTV3) of the Read Codes is a superset of all the codes from the earlier versions and was primarily developed for hospital use.\(^\text{(32)}\) CTV3 introduced some significant changes including modifications to the hierarchy and codes. Fifty-five special interest groups were formed to work on additional content to the Read Codes.

Version 2 and CTV3 can be cross-mapped to ICD-9, ICD-10, OPCS-4, and the British National Formulary (BNF) and Anatomical Therapeutic Chemical (ATC) Classification System, both of which are used for the classification of drugs.
The International Classification of Primary Care (ICPC-2)

The first version of the International Classification of Primary Care (ICPC) is known as ICPC-1 and was published in 1987 by the World Organization of Family Doctors (WONCA).\(^{(17)}\) It is a classification system for use in primary care. The second version ICPC-2 was published in 1998, followed by the ICPC-2-E released in 2000, which refers to an electronic version of the classification.

The ICPC-2 incorporated additional features to the original version such as inclusion and exclusion criteria for rubrics. It was designed as an epidemiological tool to enable healthcare providers to use a single classification system to code information for three aspects of the health care encounter, i.e. a patient’s reasons for encounter (RFE), the healthcare practitioner’s assessment of the diagnosis or problem (diagnoses or problems), and process of care (decision, action, or plans). The ICPC-2 is unique as it enables the provider to classify the initial episode of care from the time the patient first presents with a specific problem until the final encounter for the same problem resulting in a more defined diagnosis.\(^{(17;21)}\) In 2003 the World Health Organization (WHO) recognised ICPC-2 as a WHO-related classification for the recording of data in primary care.\(^{(21)}\)

ICPC-2 is based on a bi-axial structure (See figure X). It has 17 chapters on one axis, identified by a single alpha code and seven components on the other axis. Chapters are based on body systems with an additional chapter for psychological problems and one for social problems. Each chapter is subdivided into seven components (See figure X)\(^{(50)}\) identified by a range of two digit numeric codes. Component 1 facilitates coding for the patient RFEs and presenting symptoms and is therefore useful for describing a condition that is not yet well-defined. In contrast, Component 7 is used in each chapter to code diagnoses or problems managed and is therefore most often used when there is sufficient information available to determine a diagnosis in the medical record. Components 2-6 are process-codes and are common throughout all chapters.\(^{(50)}\)

ICPC-2 is designed for use in paper-based statistical collections and in electronic information systems for both encounters and episodes of care. It has inclusion and exclusion criteria in addition to paper-based and electronic indexes to guide appropriate usage. Maps are provided from other classifications such as ICD-10. ICPC-2 has been translated into 19 languages and is copyright property of WONCA. The revision cycle for ICPC-2 is 11 years.

A key attraction of ICPC-2 is the ability to record the reason for encounter as distinct from the practitioner’s observation. It is also praised for its ease of use due to the small number of codes that exist. However, it has been criticised for how slow development and upgrades to the coding system can be, resulting in some conditions that are regularly used by GPs not being included among codes, forcing practitioners to group these together in ‘other, non-specific’ categories.
**International Statistical Classification of Diseases and Related Health Problems (ICD)**

The most widely used diagnostic taxonomy in health care is the World Health Organization’s (WHO) International Statistical Classification of Diseases and Related Health Problems, more commonly known as ICD.\(^{(51)}\) ICD is an international coding system of diseases, signs, symptoms, abnormal findings, complaints, social circumstances, underlying causes of death and external causes of injury or diseases.\(^{(52)}\) ICD is used for health information purposes in public health, primary, secondary and tertiary care settings. It enables the storage and retrieval of diagnostic information for epidemiological, health management purposes and clinical use. It is also used for collating national mortality and morbidity statistics and for reimbursement.\(^{(52)}\) The most recent version available is ICD-10 in use since 1994. The 11th revision is currently being developed and is due for release in 2015.\(^{(52)}\)

Clinical coding is the translation of written clinical documentation about patient care into code format. ICD codes are updated by the WHO every decade.\(^{(53)}\) ICD-10 organises medical concepts according to a relevant body system (e.g. nervous system). It also consists of 'special groups' chapters relating to epidemic diseases, constitutional and general diseases, developmental diseases and injuries. The special groups chapters have arranged concepts according to aetiology to facilitate epidemiological research.\(^{(21)}\) Any healthcare condition can be assigned a unique category and given a code, up to six characters long. ICD-10 chapters are arranged in categorical blocks and each block has a three-character code with the option of adding a character to increase clinical specificity (e.g. H40 Glaucoma; H40.1 Primary open-angle glaucoma).\(^{(21)}\)

Significant differences exist between ICD-9 and ICD-10. Chapters, categories and titles in ICD-10 were changed and conditions were regrouped.\(^{(28)}\) ICD-10 is published in three volumes compared with two volumes in ICD-9.\(^{(53)}\) It has grown significantly in size and contains almost twice the number of categories. ICD-10 is still grouped by body systems, containing approximately 8,000 causes of death, almost double the 4,000 in ICD-9. It uses four to six-digit alphanumeric codes instead of the four-digit numeric codes from ICD-9. The original ICD structure has been retained, but the alphanumeric coding scheme makes it more flexible for adding new codes. Figure X below outlines the main differences between the features of ICD-9 and ICD-10.

<table>
<thead>
<tr>
<th>Comparisons of the ICD versions</th>
<th>ICD-9</th>
<th>ICD-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three to five characters in length</td>
<td>Three to seven characters in length</td>
<td></td>
</tr>
<tr>
<td>Approximately 4,000 categories</td>
<td>Approximately 8,000 categories. The expansion was mainly to provide more clinical detail for morbidity applications.</td>
<td></td>
</tr>
<tr>
<td>Four-digit numeric codes in ICD-9</td>
<td>ICD-10 uses four to seven-digit alphanumeric codes</td>
<td></td>
</tr>
<tr>
<td>Limited space for adding new codes</td>
<td>Flexible for adding new codes</td>
<td></td>
</tr>
</tbody>
</table>
Guidance on Classification and Terminology Standards for Ireland
Health Information and Quality Authority

<table>
<thead>
<tr>
<th>Lacks detail</th>
<th>Very specific</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lacks laterality</td>
<td>Has laterality (i.e. codes identifying right vs. left)</td>
</tr>
</tbody>
</table>

Table 3: Comparison of ICD versions

Office of Population Census and Surveys Classification of Surgical Operations and Procedures

The OPCS is a classification system for coding operations, procedures and interventions carried out on a patient during an episode of health care in a secondary care institution. It was designed for use in the United Kingdom and the NHS Classifications Service are responsible for the development, authoring and annual review cycle. As an NHS work, OPCS-4 is published under Crown copyright. It is published as two volumes, a tabular (volume 1) and an index (volume 2).

The classification consists of more than 6,000 concepts. It is composed of a list of alphanumeric codes comprising a letter followed by three numeric figures. OPCS-4 is based mainly on anatomical chapters that relate to the whole or part of a body system. Each chapter is assigned an alphabetic character. For instance, Chapter A covers the nervous system and Chapter K is assigned to the heart. The alphabetic character for each chapter forms the prefix of the three and four digit codes within it. It is possible to extend chapters using alphanumeric categories. There is an additional chapter (Chapter X) for operations on multiple systems using miscellaneous procedures.

The latest version of the OPCS Classification of Interventions and Procedures is OPCS-4.6. OPCS-4.7 is in development and is scheduled for implementation on 1 April 2014.