International Review of Data Quality

April 2011

Safer Better Care

About the Health Information and Quality Authority

The Health Information and Quality Authority is the independent Authority established to drive continuous improvement in Ireland's health and social care services.

The Authority's mandate extends across the quality and safety of the public, private (within its social care function) and voluntary sectors. Reporting directly to the Minister for Health, 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 health and social care services in Ireland (except mental health services)

Social Services Inspectorate — Registration and inspection of residential homes for children, older people and people with disabilities. Inspecting children detention schools and foster care services. Monitoring day and pre-school facilities[1]

Monitoring Healthcare Quality — Monitoring standards of quality and safety in our health services and investigating as necessary serious concerns about the health and welfare of service users

Health Technology Assessment — Ensuring the best outcome for the service user by evaluating the clinical and economic effectiveness of drugs, equipment, diagnostic techniques and health promotion activities

Health Information — Advising on the collection and sharing of information across the services, evaluating information and publishing information about the delivery and performance of Ireland's health and social care services

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[1] Not all parts of the relevant legislation, the Health Act 2007, have yet been commenced.

Overview of Health Information function

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

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

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

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

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

Although there are a number of examples of good practice the current ICT infrastructure in health and social care 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 for information governance in Ireland. This international review is the first step in the process of developing standards for data quality which is part of the information governance standards development programme.

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Executive Summary

Background

Safe, reliable health and social care depends on access to, and the use of, high quality information. High quality information is an important resource for service providers in planning, managing, delivering and monitoring high quality safe care.

The *National Health Information Strategy* (2004)[1] also known as the NHIS focuses, as a central theme, on the use of information to support the delivery of safe and high quality service user care.

The *Draft Health Information Bill*[2] and the 2008 *Report of the Commission on Patient Safety*[3] state that high quality information should be the basis on which all decisions relating to the care and safety of service users are made. All efforts to improve service user safety and quality of care are dependent on improvements in access to, and use of, good quality information.

Data and information are terms that are sometimes used interchangeably in literature; however, data is the raw product that precedes information. Data are the building blocks for information and have been described as "numbers, symbols, words, images, graphics that have yet to be organised or analysed"[4]. Information is "data that has been processed or analysed to produce something useful"[4]. Once data is collated, analysed and contextualised, it then becomes information. Good quality information is dependent on good quality data.

Data quality refers to data that is accurate, valid, reliable, relevant, legible, complete and available in a timely manner to decision-makers for healthcare delivery and planning purposes. Good quality data is data that meets the requirements of data users to support service delivery, quality improvement, performance reporting and planning. The NHIS[1] states that data quality includes the accuracy of coding and data entry, the timeliness of data, the comprehensiveness of data collection and the degree to which all relevant records are captured.

National standards for data quality identify what structures and processes organisations should have in place to create a supportive environment for data quality. Standards for data quality outline a framework to enable the collection, analysis, sharing and use of good quality data to support the delivery of health and social care and to report on performance. As good quality health information is dependent on good quality data, it is therefore logical that efforts to improve the information on which decisions are based will start with ensuring that data is collected, processed and analysed appropriately.

Organisations are ultimately responsible for the quality of the data they produce. Healthcare organisations produce a large volume and variety of data ranging from

administrative data used to manage healthcare organisations to the numerical values of laboratory results and subjective descriptions of a service user's state of health. This data is collected both electronically and manually in paper-based records, however data quality is becoming increasingly linked with digital information systems as more and more data is held in electronic repositories and databases[5]. The quality of this data is important as it contributes to improved outcomes when it can be relied upon to support decision-making.

The development of national standards for health information governance (IG) in Ireland will contribute to delivering better, safer care. Service users can have confidence that organisations will use high quality information to support care delivery and their personal health information will be handled legally, securely, efficiently and effectively. This involves respecting the rights of individuals to control their personal information and using that information to improve health and social care outcomes.

While IG is most often associated with privacy, security and confidentiality, it is also concerned with the quality of information. The forthcoming Health Information Bill will include legislative provision for the development of Information Governance Standards, which will include standards for data quality. The Authority will be responsible for setting these standards.

As a first step in the process of developing standards and guidance for data quality the Authority has conducted a review of international practice. The purpose of the review was to inform the Authority of existing standards or other initiatives to support data quality in healthcare in the selected countries.

Findings from international review

The countries were chosen based on a desktop review that identified a range of initiatives across the countries that could potentially contribute to developing data quality standards in Ireland. Additional factors contributing to the selection of these countries for the review include the availability of information in the English language, access to personnel in each jurisdiction and geographic spread.

The review examines the following countries:

- England
- Wales
- Canada
- New Zealand

Each of the countries reviewed had data quality initiatives, particularly in relation to national collections, in place. However, some variation was apparent with countries such as England having more advanced structures and processes in place than others.

For example, of the countries reviewed, unique to England was significant interaction between organisations responsible for national data collections and data providers. This interaction was primarily through the provision of education, guidance and feedback on the results of data quality assessment.

Data quality standards

Standards for data quality identify arrangements that organisations should have in place to promote data quality. For example, organisations should have an education and training programme that enables staff fulfill their obligations in relation to data quality.

The Audit Commission has published standards for data quality as a resource for all public bodies to drive improvements in data quality. These standards, however, are voluntary and are intended to be a resource for all public bodies in England and Wales. In England the Care Quality Commission includes a standard for records management in their Essential Standards for Quality and Safety and NHS Wales includes a standard dealing with information and communications technology in the NHS Standards for Health services in Wales. Canada and New Zealand have many initiatives that support data quality but this review did not identify any national standards for data quality.

Data quality guidance

For the purpose of this review guidance are defined as resources that promote data quality by identifying how data should be collected, processed and analysed. Guidance is mainly provided through the provision of coding manuals, data dictionary services and the provision of education, primarily by organisations responsible for national data collection holdings and predominantly on the topic of coding.

In addition to coding manuals and a data dictionary, guidance is available in England electronically via websites such as NHS Connecting for Health that provides guidance on information governance and The NHS Information Centre that hosts a searchable web library called the Data Quality Lexicon containing a number of data quality resources.

The NHS Wales also has access to a data dictionary, which is hosted by Health Solutions Wales together with a helpline service for data standards, data definitions and for coding related queries.

In Canada the Canadian Institute for Health Information publishes reports annually on the quality of data submitted by each of the regions to its national collections. The organisation also hosts a coding query service and publishes edit specifications to support vendors develop abstracting software. Also in Canada the Newfoundland and Labrador Centre for Health Information provides guidance through the provision of feedback to organisations within the province of Newfoundland and Labrador on the quality of data submitted to them.

In New Zealand the Ministry of Health provides guidance through the publication of a number of technical documents that support organisations to collect good quality, comparable data such as data dictionaries, guidance on ICD-10-AM coding, procedures for the collection of ethnicity data and specifications on file formats for returning data.

Data quality support and education

In England the NHS Classification Service has developed a training and accreditation strategy to ensure that clinical coders receive core training and to support continuous professional development of NHS clinical coders. The NHS Information Centre supports organisations improve data quality by hosting the Data Quality Guild which is a network of data quality champions and practitioners. Members of the guild can become members of an online community called "Guildspace" that provides access to various data quality tools and expertise from fellow guild members.

Health Solutions Wales employs a clinical coding tutor to provide training to clinical coders throughout Wales on topics such as medical terminology, anatomy and physiology and the use of ICD. In Canada the Canadian Institute for Health Information provides support for data quality improvement through participation in regional data quality committees and the provision of education sessions to data providers on data collection and submission requirements.

In addition to the provision of a coding query service and education on clinical coding by the New Zealand Ministry of Health some District Health Boards have data quality teams that address data quality issues as they arise.

Data quality assessment

This review found that the assessment of data quality is commonly carried out by organisations responsible for regional or national collections. Healthcare provider organisations submit data to regional or national organisations that are mandated to collect the data. They then apply quality checks and provide feedback to the data providers on the quality of the data submitted. Feedback can be in the format of data quality annual reports, data quality KPI reports or data quality dashboards. Healthcare providers are then expected to institute data quality improvements based on these reports and in some cases can be penalised financially for poor quality data.

Next steps

Using relevant information from this international review, the next step in this work is to identify best practice options that may be tailored appropriately to Ireland and which will inform the development of standards and guidance for data quality to support the delivery of better safer care in Ireland.

1. Introduction

Safe, reliable health and social care depends on access to, and the use of, high quality information. High quality information is an important resource for service providers in planning, managing, delivering and monitoring high quality safe care.

The Departments of Health and Children's National Health Information Strategy[1] (NHIS) has the use of information to support the delivery of safe and high quality service user care as its central theme. NHIS states that data quality includes the accuracy of coding and data entry, the timeliness of data, the comprehensiveness of data collection and the degree to which all relevant records are captured. If data is not of good quality it can lead to mistakes and be harmful for service users. As a result, NHIS recommends the development or adoption of information standards to facilitate pooling of data from different sources, enable the accurate comparison of data both within and between organisations and assist the sharing of information between primary and secondary care.

The report of the Commission on Patient Safety and Quality Assurance "*Building a Culture of Patient Safety*"[3] also highlights the importance of information standards to facilitate information sharing and re-use. This report clearly states that high quality information should be the basis on which all decisions regarding healthcare, from individual patient care to national strategic planning, should be made. The report recommends a standards-based approach to health information incorporating clinical terms, coding and classification and messaging to support the interoperability of information systems and the sharing of information.

Data are numbers, symbols, words, images and graphics that have yet to be organised or analysed. Information is data that has been processed or analysed to produce something useful and can be used intelligently in practice. Health information is defined as information, recorded in any form or medium, which is created or communicated by an organisation or individual relating to the past, present or future, physical or mental health or social care of an individual or cohort. Data quality refers to data that is accurate, valid, reliable, relevant, legible, complete and available in a timely manner to decision-makers for healthcare delivery and planning purposes.

Data can be said to be of good quality when it meets the requirements of people who need to access data and information to support service delivery, quality improvement, performance reporting and planning. For example, healthcare professionals need access to good quality data on patients such as known allergies or previous adverse reactions to drugs prior to prescribing or administering medications. Hospitals need access to good quality data on the incidence of certain infections such as *Clostridium difficile (C. difficile)* so that major outbreaks can be identified and vulnerable members of the public and patients are warned and protected.

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.

Health information also 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.

National standards for data quality identify the structures and processes organisations should have in place to create an environment that enables data quality. Standards for data quality outline a framework to enable the collection, analysis and use of good quality data to support the delivery of health and social care and to report on performance. As good quality health information is dependent on good quality data the most appropriate starting point for this work will focus on efforts to improve the information on which decisions are based to ensuring that data is collected, processed and analysed appropriately.

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. In addition, the Authority is charged with evaluating the quality of the information available on health and social care (section (8) (1) (i)) and making recommendations in relation to improving the quality and filling in gaps where information is needed but is not currently available (section (8) (1) (j)).

The forthcoming Health Information Bill will include legislative provision for the development of Information Governance (IG) Standards. IG standards identify how information should be collected, processed and used. The Health Information and Quality Authority (the Authority), in consultation with stakeholders, will be responsible for setting these standards and developing supporting guidance. The Authority will develop national standards for data quality as part of the overall IG framework.

These statutory functions provide the basis for the Authority to develop national standards for data quality and to establish a method to monitor compliance. The standards will outline the structures and processes health and social care organisations should have in place to support the collection, sharing and use of high quality data.

As a first step in the process of developing standards and guidance for data quality the Authority has conducted a review of international practice. The purpose of the review was to inform the Authority of existing standards or other initiatives to support data quality in healthcare in the selected countries. The countries were chosen based on the availability of information in the English language, access to personnel in each jurisdiction and geographic spread.The findings of the review will inform the Authority on how best to approach the development and monitoring of national standards for data quality and the development of supporting guidance.

The review examines the following countries:

- England
- Wales
- Canada
- New Zealand

In order to provide context to the review the international review is preceded by a chapter discussing the concept and benefits of data quality.

2. Data quality

Data quality has been defined as:

> "the totality of features and characteristics of a data set, that bear on its ability to satisfy the needs that result from the intended use of the data"[6].

Data quality therefore refers to data that is fit for purpose or "fit for use"[7]. This generally accepted view recognises that the quality of data is determined by the consumer – the person who will use it and who will ultimately decide if it is fit for whatever purpose it is intended[7].

The Canadian Institute for Health Information[8] (CIHI) define data quality in the context of users of the data and whether the data satisfies the users' specific needs. Therefore, a realistic target for healthcare organisations is to produce data that is sufficiently accurate, timely and consistent to make appropriate and reliable decisions[9]. Data can be considered to be of good quality when the correct data is available to decision-makers when and where they need it and in a format they can rely on.

One of the main principles that contributes to data quality involves reducing the burden of data collection on individuals and organisations to a minimum[10]. This involves identifying the data required for a particular purpose and providing clear definitions to be incorporated in a minimum data set[2]. Reducing the burden of data collection is supported by ensuring that data is collected only once and used many times for different purposes.

Data should be considered as a product rather than a by-product[11] of care, emphasising its importance to healthcare, both operationally and strategically. By focusing on data as a product, it is more likely to be of sufficient quality to contribute to informed decisions on planning and delivering care. Data as a product requires the application of sound management principles involving[12;13]:

- understanding the needs of people using the data
- assessing data for quality at source
- creating a data quality culture through training and education
- developing procedures and metrics for ongoing analysis and improvement
- managing the life cycle of the data
- appointing a manager responsible for the quality of the data.

Sound management principles, such as those outlined above in support of data quality, are reflected in the total quality management approach (TQM). Specifically, data quality

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[2] The minimum set of data elements that are required to be collected for a specific purpose

has been included in the model as – total data quality management[14]. TQM is a participative approach to management based on continuous improvement involving all staff within an organisation to either meet or exceed customer expectations. The origins of TQM are most often attributed W. Edwards Deming.

Deming's cycle of Plan, Do, Check and Act[15] involves analysing current processes in order to identify where improvements are required, implement changes to the processes, analyse whether the changes resulted in improvements and finally standardise the process if desired improvements are achieved.

TQM is based on the principle of doing things right first time and minimising resources required to correct mistakes. It involves creating a culture of quality throughout all levels of an organisation, providing training to staff so that they can provide a quality service and prioritising quality over short-term financial gains.

2.1 Total Data Quality Management

TDQM involves defining, measuring, analysing and continuously improving data quality[16]. TDQM is an iterative process and is often referred to as the TDQM Cycle[17] (see Figure 1).
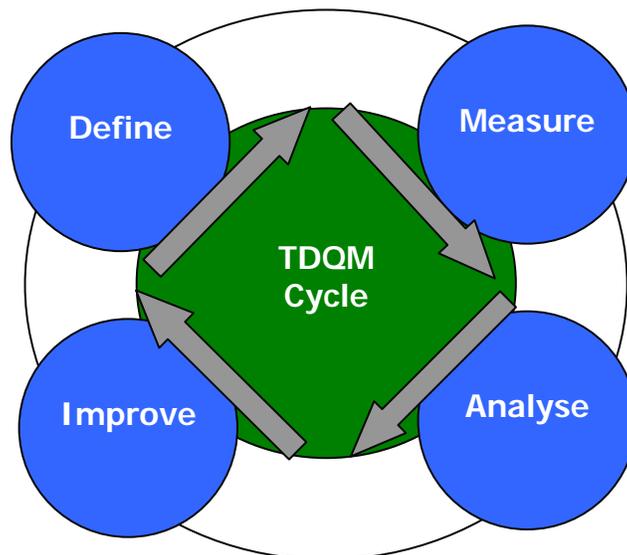

Figure 1: The TDQM Cycle[16]

2.1.1 Defining data quality

It is necessary to understand what is meant by data quality before it can be managed or improved[18]. According to Statistics Canada[19] data quality is relative and not absolute and is dependent on financial and human resources; the quality and quantity of data must be balanced against available resources. The quality of data can be defined by three attributes in order to be fit for use[8]:

- utility – refers to the usefulness of the data for the user
- objectivity – refers to whether the data is accurate, reliable and unbiased
- integrity – refers to the security of the data from unauthorised access or revision

Data quality can be further defined by a set of attributes, namely dimensions, which describe different aspects of data that are considered important to the users.

Dimensions of data quality

The quality of data can be determined through assessment against a number of dimensions. Data quality dimensions can be defined as:

> "a set of data quality attributes that represent a single aspect or construct of data quality"[7].

By identifying different aspects or constructs of data quality it is then possible to measure the quality of data against those aspects or constructs identified. Numerous dimensions including, for example, timeliness, accuracy, coherence, have been identified in the literature and there is frequently overlap in dimensions and their interpretation.

While each of the dimensions may be considered equally important, there may be instances where the relative importance of one dimension is greater than another. The relative importance of each dimension is based on the requirements of the data user. For example, to satisfy the timeliness dimension, it may be necessary to sacrifice some element of completeness as by the time the required data is deemed complete it may not be available in a sufficiently timely manner to support decision-making. The dimensions most frequently cited in the literature are in Table 1.

Table 1: Dimensions of data quality

Accessibility
Accessibility of data refers to how easily it can be accessed, the awareness of data users of what data is being collected and knowing where it is located.
Accuracy
Accuracy of data refers to how closely the data correctly captures what it was designed to capture. Verification of accuracy involves comparing the collected data to an external reference source that is known to be valid. Capturing data as close as possible to the point of activity contributes to accuracy[20]. The need for accuracy must be balanced with the importance of the decisions that will be made based on the data and the cost and effort associated with data collection. If data accuracy is compromised in any way then this information should be made known to the data users[21].
Coherence
Coherence of data refers to the internal consistency of the data[22]. Coherence can be evaluated by determining if there is coherence between different data items for the same point in time, coherence between the same data items for different points in time or coherence between organisations or internationally. Coherence is promoted through the use of standard data concepts, classifications and target populations[23].
Comparability
Comparability of data refers to the extent to which data is consistent between organisations and over time allowing comparisons to be made. This includes using equivalent reporting periods[24].
Completeness
Completeness of data refers to the extent to which the data collected matches the data set that was developed to describe a specific entity. Monitoring for incomplete lists of eligible records or missing data items will identify data quality problems[21].
Interpretability
Interpretability of data refers to the ease at which the user can understand the data. Is there any ambiguity in understanding the data and is there information available to help the user understand the terminology?
Relevance
Relevance of data refers to the extent to which the data meets the needs of users. Information needs may change and is important that reviews take place to ensure data collected is still relevant for decision makers.
Reliability
Reliability of data refers to the extent to which data is collected consistently over time and by different organisations either manually or electronically.
Timeliness
Timeliness of data refers to the extent to which data is collected within a reasonable time period from the activity or event and is available within a reasonable timeframe to be used for whatever purpose it is intended[20]. Data should be made available at whatever frequency and within whatever timeframe is needed to support decision making.
Usability
Usability of data refers to the extent to which data can be accessed and understood[24].
Validity
Validity of data refers to data that has been collected in accordance with any rules or definitions that are applicable for that data. This will enable benchmarking between organisations and over time.

2.1.2 Measuring data quality

There are a number of ways in which the quality of data can be assessed with individual organisational needs determining the most appropriate. Some options include the measurement of data quality using metrics based on dimensions such as accuracy, timeliness and completeness. The measurement is based on the comparison of data with reference values that are considered acceptable for that dimension. For example, the measurement of accuracy can be determined through the comparison of data in a database with records that are known to be correct and this objective assessment can usually be expressed as a quantitative value, such as 98% accurate.

The subjective assessment of data quality reflects the user or collector's perspective and their interpretation of the quality of the data. A potential difficulty with the subjective assessment of data quality is that data considered to be of poor quality by one user may be of sufficient quality for another user. The result of the subjective assessment can be influenced by the intended use for the data. For example, one user might determine that data is of good quality because it is sufficiently complete whereas another user of the same data may determine that it is of poor quality because it is not available in a timely manner.

2.1.3 Analysing data quality

Analysing data quality involves gaining an understanding of what contributed to the measurement results. Where data is of good quality the analysis will involve identifying what the organisation is doing right and if the measurement indicates poor quality data then analysis will involve determining the root cause for data quality problems.

2.1.4 Improving data quality

Improving data quality involves implementing improvements based on the organisation's definition of data quality, the results of the measurement of data quality and the root cause analysis of data quality problems. Improvements in data quality will result from correcting processes that have been identified as contributing to or causal of poor quality data.

2.2 Benefits of data quality

Good quality health and social care is dependent on the access to and use of good quality data. The benefits of good quality data include:

- service users are more likely to receive better safer care if healthcare professionals have access to accurate and reliable data to support decision making. Access to accurate and reliable data such as the results of investigations, allergies, potential drug interactions or past medical history supports healthcare professionals provide care that is appropriate to assessed needs.

- service users are more likely to receive better care if performance data used to support quality improvement is of good quality and reflects actual performance. Healthcare organisations institute quality improvement initiatives based on performance measurement[25].

- healthcare organisations can more effectively and efficiently plan and provide for service user needs if the data used to support decision making is of high quality. For example, good quality demographic data that highlights an aging population or a significant increase in immigrants in a specific catchment area can enable organisations plan for the specific needs of that area

- healthcare research contributes to improved outcomes by providing evidence to support particular care processes. This research can only be relied on if it is based on good quality data.

3. England

3.1   Introduction

The National Health Service (NHS) was established in 1948 and provides free healthcare to all residents of the UK with the exception of some charges for dental, optical and prescriptions. The NHS is managed separately in England, Scotland, Wales and Northern Ireland even though it is funded centrally from national taxation. In England responsibility for the NHS is devolved to 10 Strategic Health Authorities (SHA) that are responsible for providing strategic leadership for the NHS in each of their geographical areas. The NHS is also divided into a number of trusts, each of which is responsible for different aspects of healthcare. Primary Care Trusts (PCTs) are responsible for providing primary and community services and commissioning secondary care services for residents of their respective areas. Acute trusts, also known as hospital trusts, manage hospitals and are commissioned by PCTs to provide secondary health services. There are also a number of other types of trusts including mental health trusts, care trusts and ambulance trusts.

3.2   Initiatives to support data quality

There are a number of programmes within the UK that support the collection and use of information to enable the delivery of high quality, safe care and to support service user choice. These programmes aim to achieve their objectives through a range of methods including programmes to improve information infrastructure, the development of information standards and programmes to improve and monitor data quality. Resources that support data quality initiatives in England include:

- NHS Connecting for Health
- Information Governance Toolkit
- The Information Centre
- Secondary Uses Service
- Care Quality Commission
- The Audit Commission

3.2.1   The NHS Connecting for Health

The NHS Connecting for Health[25] (CfH) is a directorate of the Department of Health and was established in April 2005 primarily to deliver the National Programme for Information Technology (NPfIT).

The NPfIT is a national initiative with the aim of developing and modernising IT infrastructure to support patient-centred care and services. The infrastructure will form the basis for the integration and sharing of patient information across the NHS[26]. Data quality will be improved through the management of information in a common manner across the NHS, based on national information standards.

The NPfIT aims to achieve its goals through a number of initiatives:
- NHS Care Records Service – is a secure service that enables authorised NHS staff to securely access patient care records
- Choose and Book – allows patients to electronically book a first OPD appointment with a specialist of their choice and at a time and date of their choosing
- Electronic Prescription Service – allows GPs and practice nurses to send prescriptions electronically to the pharmacy chosen by the patient
- Picture Archiving and Communications System (PACS) – allows images such as x-rays and scans to be stored electronically and viewed remotely
- GP2GP – allows patients to transfer from one GP to another and have their records securely and directly transferred
- Other initiatives – include NHSmail, which gives NHS staff a single e-mail address that will be their e-mail address for life anywhere within the NHS and allows staff to securely exchange patient information. There is also a project to secure improvements to the broadband network.

The NHS CfH has a number of initiatives that support data quality including:
- NHS Terminology Service – is responsible for managing, distributing, supporting and controlling SNOMED CT, Read Codes and the Dictionary of Medicines and Devices in the UK
- NHS Classification Service – provides support and maintenance for OPCS4 and ICD-10 Classifications. This includes the provision of training in clinical coding, the provision of various coding manuals, the publication of a quarterly newsletter on data quality issues in clinical coding and the provision of a clinical coding helpdesk
- NHS Data Model and Dictionary Service – supports the recording, sharing, exchange and comparison of data across the NHS. The service is available online and provides a reference point for information standards within the NHS in England
- Standards Consulting Group – provides guidance and assistance to all NHS CfH programmes to ensure standards are developed and implemented consistently. This will facilitate the development of a longitudinal electronic healthcare record to support clinical practice
- Information Quality Assurance Programme (IQAP) – ensures that guidance documents are issued to advise the NHS and Local Service Providers of the data quality related standards necessary for the NHS Care Records Service (NHS CRS). Guidance documents have been published primarily in relation to data cleansing and data migration.

3.2.2 Information Governance Toolkit

The Information Governance Toolkit[27] (IGT) is a web-based application, hosted by CfH, and designed to facilitate organisations self-assess the way they handle or process information. The origins of the development of the IGT were based on supporting and obtaining assurance that recommendations made in the Caldicott Committee Review of Patient-Identifiable Information in 1997[28] were being progressed. The toolkit enables

organisations to measure their compliance with a range of information handling requirements.

These requirements include the:
- Data Protection Act 1998 (England)[29]
- Common law duty of confidentiality (England)
- Confidentiality NHS Code of Practice[30]
- NHS Care Record Guarantee for England[31]
- Social Care Record Guarantee for England[32]
- International Information Security Standard: ISO/IEC 27002: 2005[33]
- Information Security NHS Code of Practice[34]
- Records Management NHS Code of Practice[35]
- Freedom of Information Act 2000 (England)[36]

The original assessment methodology (introduced around 2000/2001) was based on a paper "Caldicott Audit" questionnaire by Trusts and GP Practices. This paper based methodology was replaced with the online IG toolkit in 2002. The Toolkit is reviewed and updated annually and version 8 was released in June 2010. The toolkit consists of 45 requirements that are subdivided into 6 work areas:

- Information Governance Management
- Confidentiality and Data Protection Assurance
- Information Security Assurance
- Clinical Information Assurance
- Secondary Use Assurance
- Corporate Information Assurance.

Even though the toolkit is primarily concerned with confidentiality, security and data protection, it is also concerned with data quality and this is covered under Clinical Information Assurance and Secondary Use Assurance.

Clinical Information Assurance refers to the process of assuring that data is of sufficient quality for the provision of care. It covers the skills, knowledge and experience within an organisation to support information quality and records management. Information quality refers to the procedures and processes that organisations have in place to ensure that information is accurate, timely, free from duplication and free from confusion. Records management refers to the processes within an organisation for maintaining records from creation to destruction or archival. Compliance with clinical information insurance includes:

- that arrangements are in place to ensure senior management comply with obligations and are kept informed of changes and performance that need to be addressed

- there is sufficient expertise within the organisation and responsibilities are appropriately assigned
- there are individuals within the organisation with clear responsibility for the quality of data and for records management
- that organisations comply with confidentiality and data protection guidance, protocols and legal requirements
- training needs are met in relation to information quality and records management and some personnel may require specific training or qualifications to fulfill their roles
- service users records should be identified by their NHS number and this should be used for all communication
- clinical records are audited by multi-professionals from all specialties
- procedures are in place to ensure the accuracy of services user records on all systems and records.

Secondary Use Assurance refers to the process of assuring that data is of sufficient quality for purposes other than direct clinical care such as planning, clinical audit, benchmarking, performance improvement and research. Compliance with secondary use assurance includes:

- organisations should comply with national data definitions and standards where they exist and validation programmes are incorporated within key systems
- external data quality reports are used for monitoring and improving data quality
- organisations should have procedures in place for local and national benchmarking to identify data quality issues
- organisations should have a programme of internal and external auditing of clinical coding
- organisations should have procedures in place to support the regular audit of service user data for accuracy, completeness and validity
- clinical/care staff are involved in validating information derived from clinical/care activity to demonstrate the link between improved information quality and organisational performance and service user care
- organisations should ensure that staff involved in clinical coding are appropriately trained.

Each requirement within the toolkit is accompanied by supporting documents to assist organisations comply with information governance requirements. The self-assessment is submitted to CfH annually and facilitates organisations to assess compliance with IG requirements and institute improvements where required. The result of the self-assessment for each organisation is available on the CfH website.

3.2.3   Information Standards Board for Health and Social Care

Information standards provide guidance on the collection and sharing of information by providing a consistent language that supports a common understanding and defining technical criteria that supports interoperability of information systems[37]. The Information Standards Board for Health and Social Care (ISB) approves information standards for the NHS and adult social care in England. The ISB reports to and is accountable to the NPfIT programme board. The ISB consists of representatives from relevant stakeholders including the National Patient Safety Agency, the General Medical Council, the Care Quality Commission and the Nursing and Midwifery Council and therefore approval of standards represents a consensus of major organisations involved in health and social care. Prior to approving standards the ISB ensures that they are fit for purpose, can be implemented and support interoperability between systems.

3.2.4   The Information Centre

Within the NHS the *Information Centre (IC) for health and social care*[38] is a special health authority responsible for driving the use of information to improve decision making and deliver better care. Their stated objectives are:

- to improve information quality and data standards through:
    - information governance
    - information and data standards
    - data quality
    - streamlining data collection.

- improve access to information through
    - My IC facilitates the personalisation of the IC website so that information is easily accessible
    - NHS Choices website which is a comprehensive information service to facilitate service user choice and decision-making.

- provide relevant information for frontline services and for reporting purposes to the Department of Health and Care Quality Commission.

The IC is in the process of developing a Data Quality Service, which will be a national programme to improve data quality in health and social care. The data quality service will consist of a number of projects:

- Data Quality Guild will be a network of data quality champions within each organisation for the purpose of sharing issues, problems and solutions. Members of the guild can become members of an online community called "GuildSpace" that provides access to various data quality tools and expertise from fellow guild members

- The Data Quality Lexicon will be a searchable web library of comprehensive, up-to-date data quality resources
- The Data Quality Clinic will provide a mechanism for fixing data quality problems.

3.2.5 Secondary Uses Service

The Secondary Uses Service (SUS) is jointly delivered by the NHS-IC and the NPfIT. SUS provides a range of services to support the analysis and reporting of data collected during the provision of care and treatment for admitted patients, outpatients and patients attending emergency departments of NHS hospitals.

All secondary care providers in England must send a set of data files to SUS based on Commissioning Data Sets (CDS). There are a number of CDS based on the type of healthcare interaction such as Accident and Emergency (A&E) Attendance, Outpatient Attendance, Admitted Patient Care General Episode and Admitted Patient Care Birth Episode. Each CDS contains a set of data items relevant to that healthcare interaction. For example, an Accident and Emergency Attendance CDS will include data items that are common to all CDS such as name, address, date of birth, gender, and NHS number. In addition it will contain data items that are specific to that CDS such as A&E arrival mode, A&E arrival time, A&E initial assessment time, A&E departure time and A&E disposal.

SUS supports data quality through a number of resources including guidance the publication of protocols for data collection and submission, and KPI reports and data quality dashboards that enable providers to benchmark the validity of their data against national and regional averages.

3.2.6 Care Quality Commission

The Care Quality Commission (CQC) is the independent regulator for health and social care in England[39]. Health and social care providers are required to register with the CQC in order to provide services and to do this they must demonstrate that they are meeting Essential Standards of Quality and Safety[40]. The CQC will monitor compliance with standards by gathering information and visiting trusts for targeted inspection based on an analysis of the information collected. Outcome 21 requires that personal records, including medical records are accurate, fit for purpose, held securely and remain confidential[39].

Outcome 21: Records[40]

1. The registered person must ensure that service users are protected against the risks of unsafe or inappropriate care and treatment arising from a lack of proper information about them by means of the maintenance of—
   a. an accurate record in respect of each service user which shall include appropriate information and documents in relation to the care and treatment provided to each service user; and
   b. such other records as are appropriate in relation to—
      i. persons employed for the purposes of carrying on the regulated activity, and
      ii. the management of the regulated activity
2. The registered person must ensure that the records referred to in paragraph (1) (which may be in paper or electronic form) are—
   a. kept securely and can be located promptly when required;
   b. retained for an appropriate period of time; and
   c. securely destroyed when it is appropriate to do so.

Regulation 20 of the Health and Social Care Act 2008 (Regulated Activities) Regulations 2010

Guidance for compliance with the standards includes:
- the service has procedures for the maintenance of personal and medical records for service users
- service user records about care, treatment and support are updated as soon as practical
- verbal communications about care, treatment and support are documented as soon as practical
- records about care, treatment and support are clear, factual and up do date
- record of current interaction with a service user is linked with any previous record for that person.

Each NHS Trust must supply accurate, good quality and comprehensive data within specified timeframes to the Care Quality Commission (CQC) for routine and special data collections. It is the responsibility of each trust to ensure that the data supplied is of good quality and to apply quality checks to ensure that the data is of good quality. The CQC may also apply quality checks and may penalise organisations for poor quality data including for late submission. The CQC use the IG Toolkit self-assessments submitted by organisations as a component of compliance monitoring.

3.2.7 The Audit Commission

The Audit Commission is an independent body that aims to drive improvements in economy, efficiency and effectiveness of public services across the United Kingdom[41]. The remit of the Audit Commission includes local authorities, police authorities, fire services and the NHS. Their objectives are to improve financial management, encourage quality improvement, promote high standards of governance and stimulate improvements in data quality and the use information.

Standards for better quality data

The Audit Commission has developed a set of standards[20] to support public bodies improve information used for decision-making. The standards set out management arrangements for public bodies to voluntarily put in place that reassure both the organisation and stakeholders that data used for management and reporting purposes is of good quality. The standards are presented using five themes:

- governance and leadership – public bodies need to demonstrate clear corporate leadership that includes a strategic approach to data quality
- policies – public bodies should have policies that clearly specify how data is recorded and reported
- systems and processes – the collection, recording and reporting of data should be incorporated into the business planning and management processes of the organisation. Systems and processes should be in place to ensure that data is collected right first time, is collected only once, and reused for different purposes.
- people and skills – staff have the necessary skills and knowledge to fulfil their roles in relation to data quality and are accountable for data quality
- data use and reporting – public bodies must use data locally for decision-making purposes rather than see it as an administrative requirement.

The standards are voluntary and public bodies are not obliged to adopt them, but any assessment of data quality is likely to incorporate the principles contained in the standards. The Audit Commission state that public bodies are themselves responsible for the quality of data and that the risks associated with poor quality data are wasted resources, flawed decisions, failure to identify opportunities for improvement and failure to identify good performance[20].

Payment by Results Data Assurance framework

Payment by Results (PbR) is a process whereby NHS Trusts are reimbursed for the provision of acute care. Each service user that attends or is admitted to hospital is categorised into a healthcare resource group (HRG) according to their treatment and condition. A fixed payment is then made to the Trust based on the national average cost of treatment in English NHS trusts for that HRG. It is based on the premise that each member of a HRG will consume the same amount of resources for the diagnosis and treatment of their condition. NHS Trusts submit data based on CDS to SUS containing details of all the care they have provided, including that covered by the PbR.

The PbR Data Assurance framework[42] is a rolling programme of audits carried out by the Audit Commission on NHS Trusts to determine the accuracy of data submitted for PbR. The commission hosts an online National Benchmarker portal that facilitates the comparison of acute hospital activity data with other organisations. The portal provides access to a report library that contains benchmark and audit reports on data quality for each trust.

The commission also publishes an annual report highlighting any data quality issues that have been identified and whether there have been overpayments or underpayments based on the data submitted. Recommendations in the 2010 annual report[43] include that:

- trusts should carry out internal audits on clinical coding
- clinical coders are well trained and follow national standards
- clinicians are involved in improving the quality of inpatient and outpatient data
- policies and procedures for data quality and capture are up-to-date
- clinical care records are of good quality and are readily accessible to those inputting data.

The report states that the accuracy of clinical coding has improved since the audits commenced with a reduction in errors from an average of 16.5% to 11.2% over the last three years. The report also states that there are continuing problems with the quality of clinical records and training and development of clinical coders, each of which contribute to poor quality data.

3.3   Summary

The NHS in England provides a significant amount of support and guidance to organisations to support the collection of high quality data. The guidance and support is specific to various aspects of data quality and often very detailed. The following initiatives have been identified to support data quality in England:
- the NHS are upgrading their IT infrastructure to facilitate the sharing and communication of information based on national information standards
- the NHS CfH have a number of initiatives to support data quality including the NHS Terminology Service, NHS Classification Service, NHS data Model and Dictionary service, Standards Consulting Group and IQAP
- NHS organisations can self-assess data quality practices through the Information Governance Toolkit
- the NHS Information Centre is in the process of establishing a Data Quality Service to support improvements in data quality in health and social care
- the SUS supports organisations with the publication of protocols for data collection and submission and providing feedback on the quality of data submitted through data quality KPI reports and data quality dashboards

- the Care Quality Commission apply quality checks to data submitted by organisations and may penalise organisations for poor quality data
- the Audit Commission have published standards for better quality data that provide a framework for organisations to put in place to support data and information quality
- the Audit Commission carry out a rolling programme of audits on the quality of data submitted by NHS Trust for PbR and facilitate benchmarking against other organisations. The commission also publishes an annual report on the quality of data submitted nationally for PbR.

4. Wales

4.1 Introduction

In Wales the National Health Service (NHS Wales) comprises seven Health Boards that are responsible for delivering primary, community and continuing healthcare in their respective regions. There are also three NHS Trusts, each of which provides services on a national rather than regional basis. The Velindre NHS Trust provides a range of specialist services including cancer care, the Welsh Blood Service and the NHS Wales Informatics Service. The Welsh Ambulance Services Trust is responsible for emergency services and the Public Health Wales Trust provides public health advice and services to the population of Wales.

4.2 Initiatives to support data quality

A review of data quality initiatives in Wales identified a number of programmes to support organisations monitor and improve the quality of their data. Many of these programmes are either Welsh Assembly Government initiatives or NHS Wales' initiatives. Support initiatives for data quality in Wales include:

- Informing Healthcare
- Corporate Health Information Programme
- Health Solutions Wales
- Standards for Health Services in Wales.

4.2.1 Informing Healthcare

Informing Healthcare (IHC) is a programme that was developed by the Welsh Assembly Government (WAG) to improve the accessibility, use and storage of health information. This will be achieved through the incremental upgrade of the technical infrastructure and information systems used by NHS Wales. The aim of IHC is to make health information available to clinicians and patients for the purpose of providing high quality care and to securely share information between the NHS and social care. The programme contributes to data quality though supporting the correct identification of patients which will reduce the incidence of duplicate records and enabling better access to accurate and reliable patient information. The programme also supports data quality through its Information Governance programme called "Caldicott: Principles into Practice"[44].

IHC projects include:

- Individual Health Record[45] – based on the premise that GPs hold the most complete record of a patient's care. The Individual Health Record allows urgent out of hours and unscheduled care facilities to view an individual's health record. It is "view only" and can only be viewed by authorised individuals with the patient's consent

- Better Care and Services[46] – uses ICT to coordinate care for chronic conditions, cancer care and diagnostics
- Welsh Clinical Portal[47] – is a secure healthspace that provides access for healthcare professionals to patient information from different computer systems at one site. The portal unites information from pathology, radiology, cancer and primary care information systems and makes it available on one screen
- Map of Medicine[48] – provides evidence-based clinical care pathways to healthcare professionals via web-based interface
- Master Patient Index[49] – is a system to support the correct identification of patients and decrease the likelihood of duplicate records
- Caldicott: Principles into Practice (C-PIP)[50] – supports organisations put procedures in place to ensure that their information is of high quality and protected from unwarranted and inappropriate disclosure. Organisations must self assess against 41 standards that require them to put in place procedures for the reconciliation of duplicate records and procedures for correctly identifying patients using their NHS number.

4.2.2 Corporate Health Information Programme

The Corporate Health Information Programme (CHIP) is a programme developed by the Welsh Assembly Government which aims to improve the quality of data by working with providers and users of healthcare data. CHIP is responsible for managing the Data Quality Improvement Programme (DQIP), which commenced in March 2007. Its principal aim is to work with providers and users of healthcare data to raise the profile of data quality. As part of this programme, the DQIP project manager visited all Welsh Trusts in 2007/08 to discuss and investigate the local governance arrangements and operational processes in place to promote the quality of data collected[51]. The visits proved invaluable in identifying areas of best practice, as well as highlighting areas of concern that needed to be addressed. Based on the best practice identified within Welsh healthcare organisations, a range of recommendations were made as part of the review, which primarily related to local governance, operational and communication processes that Trusts should have in place to enhance data quality[51].

The recommendations made following the site review are as follows[51]:
- Trusts should ensure an executive level focus on data quality, encouraging an organisation wide approach to its management.
- Data quality performance should be a feature of all Trusts performance reports.
- Trust boards should sign off on data quality performance of their organisation on an annual basis.
- Trusts should have a data quality policy that acknowledges the responsibilities of the organisation with respect to data quality. This policy should outline local accountability for data quality (Executive lead for overall accountability and Senior Manager for operational responsibility).

- There should be a forum where data quality can be discussed regularly. The forum should include management level staff that have the authority to commit resources and implement changes in working practice
- Trusts should ensure regular communications with data entry staff on data quality issues
- Data quality should be a feature of staff induction
- Regular local data quality audits should be carried out
- Patient Administration System refresher training should be carried out on a regular basis
- Data quality should be incorporated into Knowledge and Skills Framework outlines and job descriptions of appropriate staff.

The WAG Minister for Health and Social Services wrote to the Chairs of all NHS trusts and local health boards informing them that they must review and action the recommendations of the site review report[52]. The Minister also stated that compliance with the recommendations will be monitored through the NHS Standards for Health Services in Wales[53].

4.2.3 Local policies

A number of trusts have data quality policies in place but the CHIP data quality review discovered that less than half of Wales NHS Trusts had these in place[51]. The review found that the policies that were in place only covered a high-level organisational approach to managing data quality and only one detailed specific data quality processes.

4.2.4 Health Solutions Wales

Health Solutions Wales (HSW) is a NHS Wales organisation that manages a number of databases on behalf of NHS Wales, including Patient Episode Database for Wales (PEDW), the National Community Child Health Database (NCCHD) and the NHS Administrative Register (NHSAR). HSW also receive birth and death registration extracts from the Office for National Statistics (ONS). HSW support organisations improve data quality through a number of services that are available to organisations, including:

- Clinical Coding Service – provides training and support to clinical coders throughout Wales. Clinical coders use two classifications for the collection of clinical data; the International Statistical Classification of Diseases and Health Related Problems, Tenth revision (ICD-10) and Office of Population Censuses and Surveys Classification of Surgical Operation and Procedures, Fourth revision consolidated version 1990 (OPCS 4.2). The clinical coding service also provides a help line to answer coding related queries
- Data Standards Service – maintains and revises the data dictionary used in the NHS Wales. The service provides a help line to answer queries in relation to data standards and definitions. The service monitors data standards and definitions used

in other UK countries and notifies organisations of any changes. The service also works with organisations to improve the quality of the data submitted to national databases by assisting in establishing the underlying cause of problems and helping to resolve problems

- HSW also assists organisations by carrying out quality checks on incoming data and producing data quality reports.

4.2.5 Standards for Health Services in Wales

The Welsh Assembly Government have developed healthcare standards for Wales, "Doing Well, Doing Better"[53]. The standards are intended to be used as a basis for continuous improvement in the quality and experience of services and care of service users. Organisations are encouraged to use the standards for self-assessment purposes, benchmarking against other organisations and as a basis for quality improvement. The DQIP was involved in the development of these new standards which came into operation on 1st April 2010. There are a total of 26 standards and standard 19 specifically focuses on information management and data quality.

Standard 19: Information Management and Communications Technology[53]

Organisations and services support and facilitate patient care and service delivery by:
  a) developing and using safe and secure information systems in accordance with legislation and within a robust governance framework;
  b) having processes to operate and manage information and data effectively and to maintain business continuity;
  c) ensuring data quality is robust and timely;
  d) using information to review, assess and improve services; and
  e) sharing information with relevant partners using protocols when necessary.

These are new standards and no formal assessment has yet taken place against them but they will be used by Health Inspectorate Wales (HIW) as part of their public assurance role. A guidance document[54] has been issued to accompany the standards to advise organisations about compliance. The guidance details what each standard is about, who it is for, what needs to be done to meet the standards and contains links to legislation, guidance and good practice.. The guidance document supporting Standard 19 deals with such issues as information governance, information security, data quality, and design and development of information services. The recommendations contained in the CHIP data quality review also form part of the guidance for compliance with this standard.

4.3   Summary

The following are the data quality initiatives that have been identified in Wales:

- NHS Wales is in the process of upgrading their IT infrastructure and information systems that will support the availability of accurate and reliable information for decision-makers
- a review of data quality in NHS Wales organisations by CHIP has resulted in a list of recommendations for organisations to implement that identify a supportive organisational framework for data quality
- organisations are supported by HSW through their clinical coding service, data standards service and producing data quality reports
- the standards for health services in Wales include a standard for data and information quality with supporting documentation to assist with compliance.

5. Canada

5.1   Introduction

In Canada healthcare is publicly funded and predominantly free at the point of care through the national health insurance program, often referred to as Medicare. Provincial and territorial governments fund and are responsible for the administration and provision of healthcare and social services in their respective areas. The provincial and territorial governments also receive federal funding that is dependent on compliance with certain conditions laid out in the Canada Health Act (CHA).

5.2   Initiatives to support data quality

This review identified a number of national and regional organisations in Canada that provide support to healthcare organisations improve data quality. The organisations are primarily responsible for national data collections and for supporting the development of Electronic Health Records (EHRs) in Canada.

National organisations discussed in this review include the Canadian Institute for Health Information (CIHI) and Canada Health Infoway. In order to identify data quality initiatives at a regional level the Newfoundland and Labrador Centre for Health Information (NLCHI) is also discussed.

5.2.1   The Canadian Institute for Health Information

The Canadian Institute for Health Information (CIHI) is an independent, not-for-profit organisation that provides data and analysis of the Canadian health system and the health of Canadians[8]. CIHI's stated goal is to provide accurate, timely and comparable information and this is done through the publication of reports on topics such as healthcare services, health spending, health human resources and population health. CIHI is responsible for a number of databases and registries that capture information about care provided. Data is supplied to CIHI by hospitals, regional health authorities, medical practitioners and territorial governments. The databases and registries held by CIHI include[55]:

- Canadian Joint Replacement Registry (CJRR) - captures information on hip and knee joint replacements performed in Canada and follows joint replacement patients over time
- Canadian Organ Replacement Register (CORR) - records information on the level of activity and outcomes of vital organ transplantation and renal dialysis activities in Canada
- Continuing Care Reporting System (CCRS) - contains demographic, administrative and clinical data for residents in facility-based continuing care in Canada

- Discharge Abstract Database (DAD) - contains demographic, administrative and clinical data for hospital discharges (inpatient acute, chronic, rehabilitation) and day surgeries in Canada
- Home Care Reporting System (HCRS) - contains demographic, administrative and clinical data for clients receiving home care services in Canada
- Hospital Mental Health Database (HMHDB) - contains demographic and medical diagnosis information for inpatient hospital stays for mental health disorders in Canada
- Hospital Morbidity Database (HMDB) - contains a count of cases separated (discharge or death) from a hospital, by primary diagnoses, for all provinces and territories
- National Ambulatory Care Reporting System (NACRS) - includes data for all hospital-based and community-based ambulatory care: day surgery, outpatient clinics and emergency departments. Currently contains Ontario emergency data only
- National Rehabilitation Reporting System (NRS) - A national health information system for adult inpatient rehabilitation services
- National System for Incident Reporting (NSIR) - a new reporting system to capture and share medication incident data from Canadian hospitals.

CIHI also publishes information on health indicators including measures such as life expectancy and expenditure to monitor and compare performance. CIHI coordinates health information standards to ensure that measurements are comparable and that data collected are of good quality.

CIHI have a number of initiatives that aim to continuously improve data and information quality including the Data Quality Framework, Infostructure Standards and Data Quality in Action.

Data Quality Framework
CIHI have developed a Data Quality Framework[24] to provide an objective approach to continuous quality improvement in CIHI data quality. The framework identifies three main components:

- a data quality work cycle
- a data quality assessment tool
- documentation about data quality.

The Data Quality Work Cycle
The data quality work cycle consists of three types of activities, namely planning, implementing and assessing. Planning for data quality involves ensuring data is of good quality before it is entered into a database including designing any changes to the data set. Implementing involves developing processes for data collection, monitoring incoming data and releasing reports. Finally assessing involves evaluating the quality of

the database to determine if the processes for collecting and monitoring incoming data result in good quality data or are changes required to improve the quality of the database.

The data quality assessment tool
The CIHI have developed an assessment tool that examines five dimensions of data quality:

- accuracy
- timeliness
- comparability
- usability
- relevance

Each of these dimensions is further broken down into a number of characteristics and each characteristic is described using a number of criteria (see Appendix 1). Each of the criteria are posed as questions about different aspects of data quality and when answered will identify if there are any data quality issues. Each criterion is assessed using a rating of met, not met, unknown or not applicable.

Documentation about data quality
The CIHI informs users about CIHI data quality through three publications:

- the Data Quality Assessment Report – is primarily an internal report for CIHI staff and reports the results of data quality assessment and identifies strengths and weaknesses of a data holding
- the Data Quality Documentation for Users – is for data users to give them an understanding of any limitations associated with the data. They can then decide if the data is of sufficient quality for their intended purpose
- Metadata Documentation – provides detail about the data holding and includes details such as a detailed description of the data holding, population of interest and sample selection, procedures for data collection and capture, how it is processed, how it is analysed and dissemination activities.

Infostructure standards
Health infostructure standards are published by CIHI and contain technical specifications to facilitate the interoperability of communication and information technology to improve the quality and safety of healthcare delivery. They contribute to data quality through having a standardised approach to the collection and sharing of information.

They include:

- Discharge Abstract Database (DAD) - contains demographic, administrative and clinical data for hospital discharges and day surgeries

- National Ambulatory Care Reporting System (NACRS) - includes data for all hospital-based and community-based ambulatory care including day surgery, outpatient clinics and emergency departments
- Canadian Conceptual Health Data Model (CHDM) - is a reference tool for organising, viewing and defining high-level health information
- CIHI Data Dictionary – is a pan-Canadian collection of standardised data elements, definitions and values for elements captured in the CIHI databases
- National Public Key Infrastructure (PKI) Framework for Health - a national framework for the secure communication of health information
- Unique Identifiers Development – to uniquely specify and link the health information of individuals, facilities and service providers.

Data quality in action

CIHI routinely carries out a range of data quality activities, including:

- providing education to data providers
- providing a Coding Query service for users of ICD-10-CA/CCI
- publishing coding standards for ICD-10-CA/CCI
- publishing standards for financial reporting
- publishing edit specifications for vendors' abstracting software
- participating in provincial/territorial data quality committees
- providing annual reports on the status of data quality in each of the provinces/territories

5.2.2 Canada Health Infoway

Canada Health Infoway (Infoway) is a not-for-profit organisation funded by the Canadian government that supports provinces and territories develop electronic health record (EHR) systems that comply with pan-Canadian functionality, privacy, security, interoperability and management standards.

Infoway coordinates the development of EHR systems through the provision of funding for projects that meet established criteria with the aim of having a pan-Canadian EHR. EHRs facilitate healthcare professional have access to accurate and reliable information to support decision making.

Standards Collaborative

The Standards Collaborative is part of the infoway organisation and is a collaboration between CIHI and infoway to support and sustain health information standards nationally. The collaborative facilitates the timely, effective and secure exchange of health information between regions and healthcare organisations.

To date, a number of standards have been developed including Diagnostic Imaging Standards, Laboratory Standards, Public Health Surveillance Standards, iEHR Clinical Messaging Standards, and Privacy and Security Standards. The standards facilitate the

communication of accurate health information and performance monitoring through the comparison of comparable data.

5.2.3 Newfoundland and Labrador Centre for Health Information

The Newfoundland and Labrador Centre for Health Information (NLCHI) aims to develop a confidential and secure health information network as a foundation for a provincial EHR. The NLCHI holds health and social care databases for the province of Newfoundland and Labrador (NL) including:

- Clinical Database Management System (CDMS) – contains data submitted to the DAD database in CIHI for patients that received inpatient and surgical day case care in NL acute care facilities
- NLCHI Live Birth System – contains demographic, administrative and clinical data related to all live births that occur in the province, both resident and non-resident
- NLCHI Mortality System – contains demographic, administrative and clinical data related to deaths that occur in the province.

The NLCHI receives data directly from organisations and this is then passed on the CIHI where appropriate or alternatively NLCHI receives data from CIHI, relevant to NL, which has been submitted to that organisation directly. The NLCHI has adopted the CIHI data quality framework for application to databases that it holds for data quality improvement purposes.

NLCHI supports organisations improve the quality of data through ensuring health data from different sources is consistent in definition, measurement, collection, and interpretation and providing feedback on data quality issues to various committees[56]. Representatives will then feedback to their respective organisations to address data quality problems that have been highlighted.

5.3   Summary

The following are the data quality initiatives that have been identified in Canada:
- CIHI have developed a data quality framework to objectively assess the quality of data submitted for inclusion in its databases
- CIHI provide regional data quality reports on the status of data quality in each of the provinces/territories
- CIHI participate in provincial/territorial data quality committees to update provinces/territories on data quality
- CIHI provide education and ongoing support to organisations
- Canada Health Infoway collaborates with CIHI through the development of standards that facilitate the sharing of information
- NLCHI support organisations in Newfoundland and Labrador with data quality through feedback to various committees that have a remit for data quality.

6. New Zealand

6.1 Introduction

In New Zealand, the Ministry of Health (Ministry) has overall responsibility for health and disability and provides advice to the Minister of Health and in turn the government of New Zealand on policy issues.

For administrative purposes New Zealand is divided into 21 District Health Boards (DHBs) that either provide or fund health and disability services for the population in each of the DHBs[57]. Primary health care, including GP services, are contracted by DHBs to primary health care organisations (PHOs) who either directly provide the services or indirectly through member providers.

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

6.2 Initiatives to support data quality

The review identified a number of national organisations that contribute to data quality primarily through providing supporting documentation for national data collections. Some regional initiatives were also identified.

6.2.1 National Health Board

The National Health Board[58] (NHB) was established in November 2009 as a Business Unit of the Ministry of Health to improve the quality, safety and sustainability of healthcare in New Zealand. The NHB is responsible for ensuring that the health and disability sector is capable of meeting the evolving needs of the sector predominantly through planning activities.

The Ministry and DHBs sign an Operational Policy Framework (OPF) each year which sets out the accountabilities of DHBs in relation to the provision of services and includes DHBs responsibilities in relation to national health information management and reporting requirements[59]. The NHB receives data from the various DHBs that has been collected when service users interact with the healthcare system and then stores it in a number of national collections. Examples of national collections include:

- General Medical Subsidy Collection (GMS) - contains data on the fee-for-service payments made to doctors for patient visits.
- Health Practitioner Index (HPI) - uniquely identifies health practitioners, practitioner organisations (employers) and facilities (the physical address where the health care takes place) in three separate indexes

- Laboratory Claims Collection (Labs) - contains claim and payment information for community laboratory tests
- Maternity and Newborn Collection (MNIS) - contains information relating to the maternity and newborn services that are provided up to nine months before and three months after a birth
- Medical Warning System (MWS) - is an alert service linked to National Health Index numbers. It warns healthcare providers of known risk factors that could be important when making clinical decisions about patient care
- Mental Health Information Collection (MHDW) - is a high-level national database that allows the Ministry of Health to manipulate and report data to monitor the implementation of the national mental health strategy
- Mortality Collection (MORT) - classifies the underlying cause of death for all deaths registered in New Zealand, and all registerable stillbirths (foetal deaths)
- National Booking Reporting System (NBRS) - contains information by health specialty and booking status on how many patients are waiting for elective surgery, and how long they have had to wait before receiving it

Data quality is supported through the provision of regional education programmes by the clinical coding section of the Ministry. The programme provides education to clinical coders based on identified needs and feedback from clinical coders. The Ministry also hosts a coding query service and maintains an online historical database of queries and associated responses. The Ministry also publishes a large number of technical documents to support DHBs and service providers return data in an agreed format. The technical documents include various data dictionaries by speciality, information on ICD-10-AM coding, information about diagnosis-related groupings, procedures for the collection of ethnicity data and specifications on file formats for returning data.

Data submitted to national collections is subjected to data quality checks and data that contain errors is returned to providers for correction and resubmission. The OPF places the responsibility on service providers to ensure data is included in national collections and therefore they must have processes in place to deal with errors and resubmissions. There are data analysts within the NHB who work with service providers to ensure they understand reporting requirements and to provide education to data providers and data users. This facilitates ongoing feedback to data providers to support improvements in data quality.

6.2.2 The National Health IT Board

The National Health IT Board is established as a sub-committee of, and reports to, the National Health Board (NHB). The NHITB provides strategic advice to the Minister for Health, National Health Board and Ministry of Health and also provides strategic leadership on information systems across the health and disability sector. The NHITB also administers a primary healthcare IT grants fund and target particular areas to deliver key aspects of a national health IT plan. The NHITB is supported by a number of

advisory groups including the Health Information Standards Organisation (HISO (2010)).

Health Information Standards Organisation

HISO (2010) is an advisory group that supports and promotes the development, understanding and use of fit-for-purpose health information standards to improve the New Zealand health system. HISO (2010) supports data quality by facilitating the exchange of information electronically without loss of meaning, otherwise known as semantic interoperability. Prior to 2003 Health Information standards were developed by Standards New Zealand, which was the main standards body in New Zealand. Following a review of information infrastructure the Health Information Standards Organisation (HISO) was created to lead the development and implementation of Health Information standards in New Zealand with the aim of improving health outcomes and safety through a coordinated and consistent approach. Subsequent restructuring recently resulted in a new standards advisory group with new reporting arrangements to be known as HISO (2010) to differentiate it from the previous organisation. HISO (2010) is an independent body, accountable to National Health IT Board of the National Health Board in relation to health information standards development in New Zealand. HISO (2010) is responsible for approving standards for use in the New Zealand health and social care system and also commission the development of standards based on identified priorities.

6.2.3 Other data quality initiatives

A minority of DHBs have data quality teams that meet periodically to discuss the capture and processing of data and to address data quality issues[5]. Membership varies but membership of one team included information system team members, clinical coding manager, medical records manager, finance department staff, booking system coordinator, mental health staff, training coordinator and quality assurance team member. There are a number of other committees throughout DHBs that address data quality issues but this is only one element of their role and is not routinely on their agenda[5].

6.3   Summary

The following are the data quality initiatives that have been identified in New Zealand:
- data quality is supported through the provision of regional education programmes to clinical coders
- the Ministry hosts a coding query service and maintains an online historical database of queries and associated responses
- the Ministry supports data quality through the publication of technical documents to support organisations return data in an agreed format. The technical documents include information on ICD-10-AM coding and data dictionaries
- data quality checks are applied to data submitted to national collections and providers must have processes to correct errors and resubmit data

- data quality analysts liaise with providers and provide feedback to data collectors and data users in relation to data quality
- HISO (2010) is responsible for the approval and commissioning of health information standards for use in the health and social care sector
- some DHBs have data quality teams that address data quality issues as they arise
- data quality is addressed through different processes across the health and social care sector in New Zealand.

7. Conclusion

The aim of this document was to explore international practice in relation to data quality in healthcare. The review is the first step in the process of developing standards for data quality for the health and social care sector in Ireland. The countries reviewed were England, Wales, Canada and New Zealand and the process for monitoring and improving data quality varies considerably in each jurisdiction.

7.1   Findings

While there was evidence of data quality initiatives in each of the countries reviewed, particularly in relation to national collections, it was apparent from the review that some countries, such as England, have more advanced structures and processes than others.

For example there was evidence of significant interaction between organisations responsible for national data collections and data providers in England through the provision of education, guidance and feedback on the results of data quality assessment. The review did not find a similar level of interaction in New Zealand.

Support for organisations in relation to data quality appears to be fragmented with guidance being provided by a number of sources in each country. There was also evidence of cooperation between the various sources such as between the Canadian Institute for Health Information (CIHI) and Canada Health Infoway (Infoway) in Canada. Through a programme called Standards Collaborative, CIHI and Infoway support the development and maintenance of health information standards facilitating pan-Canadian exchange of health information.

The following are some of the main findings of this international review of data quality:

7.1.1 Data quality standards

Standards for data quality identify arrangements that organisations should have in place to promote data quality. For example, organisations should have an education and training programme that enables staff fulfill their obligations in relation to data quality.

Examples of standards in England include:
- the Audit Commission has published standards for data quality as a resource for all public bodies to drive improvements in data quality. These standards however are voluntary and organisations are not assessed against them.
- CQC include a standard for records management in their Essential Standards for Quality and Safety and organisations must declare their level of compliance with this standard.

Examples of standards in Wales include:

- The standards published by the Audit Commission in England have been endorsed by the Wales Audit Office and are therefore intended as a resource for all Welsh public bodies.
- The NHS Wales Informatics Service through CHIP has published a list of recommendations based on a review of data quality carried out in NHS Trusts throughout Wales in late 2007. The recommendations identify structures and processes that create a supportive environment for data quality and organisations have been directed to implement them. It is proposed that compliance with the recommendations will be monitored through the information management and communications technology standard contained in the NHS Standards for Health Services in Wales.

- Canada and New Zealand have many initiatives that support data quality but this review did not identify national standards for data quality.

7.1.2 Data quality guidance

For the purpose of this review guidance are defined as resources that promote data quality by identifying how data should be collected, processed and analysed.

- Examples of guidance resources in England include:
  - clinical coding manuals and the NHS Data Model and Dictionary Service provided by NHS CfH
  - NHS CfH also publishes guidance that identifies how organisations can meet the requirements of the IG toolkit
  - The NHS IC hosts a searchable web library, the Data Quality Lexicon, facilitating access to numerous data quality resources such as data quality tools, data quality reports and standards and best practice guidance.

- Examples of guidance resources in Wales include:
  - HSW hosts a data dictionary used throughout NHS Wales to support the consistent collection of data throughout Wales
  - HSW also hosts a helpline service for data standards, data definitions and for coding related queries
  - NHS Standards for Health Services in Wales are standards set out by the Welsh Assembly Government for all healthcare settings to provide effective, timely and quality care. The standards are supported by guidance documents and the guidance for the information management and communications technology standard includes data standards and the CHIP recommendations.

- Examples of guidance resources in Canada include:
  - CIHI provides guidance through the publication of annual reports for each province/territory on the quality of data submitted to national collections
  - CIHI hosts a coding query service for users of ICD-10-CA
  - CIHI publish edit specifications to support vendors develop abstracting software
  - Standards Collaborative is a joint project between CIHI and Canada Health Infoway (Infoway) that facilitates the communication of accurate health information and performance monitoring by supporting and sustaining health information standards across Canada
  - NLCHI provides guidance through the provision of feedback to organisations within the province of Newfoundland and Labrador on the quality of data submitted to them.

- Examples of guidance resources in New Zealand include:
  - the Ministry provides guidance through the publication of a number of technical documents that support organisations to collect good quality, comparable data such as data dictionaries, guidance on ICD-10-AM coding, procedures for the collection of ethnicity data and specifications on file formats for returning data.

7.1.3 Data quality support and education

This review found that service providers are usually supported through the provision of education, primarily by organisations responsible for national data collection holdings and predominantly on the topic of coding.

Examples of support and education for data quality in England include:
- NHS Classification Service has developed a training and accreditation strategy to ensure that clinical coders receive core training and to support continuous professional development of NHS clinical coders
- NHS IC supports organisations improve data quality by hosting the Data Quality Guild which is a network of data quality champions and practitioners. Members of the guild can become members of an online community called "Guildspace" that provides access to various data quality tools and expertise from fellow guild members.

Examples of support and education for data quality in Wales include:
- HSW employs a clinical coding tutor to provide training to clinical coders throughout Wales on topics such as medical terminology, anatomy and physiology and the use of ICD.

Examples of support and education for data quality in Canada include:
- CIHI provides support for data quality improvement through participation in regional data quality committees and the provision of education sessions to data providers on data collection and submission requirements.

Examples of support and education for data quality in New Zealand include:
- regional education programmes provided by the clinical coding section of the Ministry for clinical coders
- the provision of a coding query service and maintenance of an online historical database of queries and associated responses
- some DHBs have data quality teams that address data quality issues as they arise
- data analysts within the NHB provide education to data providers and data users to ensure they understand reporting requirements.

7.1.4   Data quality assessment

This review found that the assessment of data quality is commonly carried out by organisations responsible for regional or national collections. Healthcare provider organisations submit data to regional or national organisations that are mandated to collect the data. They then apply quality checks and provide feedback to the data providers on the quality of the data submitted. Feedback can be in the format of data quality annual reports, data quality KPI reports or data quality dashboards. Healthcare providers are then expected to institute data quality improvements based on these reports and in some cases can be penalised financially for poor quality data.

Examples of data quality assessment in England include:
- NHS organisations self-assess data quality through the IG toolkit under clinical information assurance and secondary use assurance and while organisations may be audited against the self-assessment there is no evidence that this happens in practice
- the Secondary Uses Service (SUS) assesses the quality of data submitted by NHS funded organisations and provides feedback through data quality KPI reports and data quality dashboards
- the CQC applies quality checks to data submitted for performance reporting purposes
- the Audit Commission carry out a rolling programme of audits on the quality of data submitted by NHS Trust for Payment by Results (PbR) and facilitate benchmarking against other organisations. The commission also publishes an annual report on the quality of data submitted nationally for the PbR programme.

Examples of data quality assessment in Wales include:

- NHS organisations assess the quality of data against the standards contained in Caldicott: Principles into Practice (C-PIP) that includes issues such as reconciliation of duplicate records and the use of NHS numbers to correctly identify service user records.

Examples of data quality assessment in Canada include:

- CIHI have developed the data quality framework that includes a data quality assessment tool (Appendix 1) for assessing the quality of data against a number of data quality dimensions, characteristics and criteria and provides feedback in the form of annual reports
- NLCHI has adopted the CIHI framework to assess the quality of data submitted to the regional databases that it holds.

Examples of data quality assessment in New Zealand include:

- data submitted to national collections is subjected to data quality checks and data that contain errors is returned to providers for correction and resubmission
- data analysts within the NHB monitor the quality of data submitted and provide feedback to data providers.

7.2   Next steps

Data quality is one component of a suite of information governance standards and supporting guidance that are being developed by the Authority. This international review will be used to inform the Authority of international practice in relation to data quality. The next step will be to develop the standards and guidance for data quality in Ireland to support the delivery of better safer care using the international review as a resource. These standards will be developed in conjunction with key stakeholders.

The Authority will continue to develop and publish additional documents to support improvements in information governance and health information to support the delivery of better safer care for health and social care service users.

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Glossary

In the context of this international review the following definitions apply:

Accessibility
Refers to how easily data can be accessed, the awareness of data users of what data is being collected and knowing where it is located

Accuracy
Refers to how closely data correctly captures what it was designed to capture

Comparability
Refers to the extent to which data is consistent between organisations and over time allowing comparisons to be made

Completeness
Refers to the extent to which the data collected matches the data set that was developed to describe a specific entity. Monitoring for incomplete lists of eligible records or missing data items will identify data quality problems

Data
Data are numbers, symbols, words, images, graphics that have yet to be organised or analysed

Data quality
Refers to data that is accurate, valid, reliable, relevant, legible, timely and complete

Health Information
Health information is defined as information, recorded in any form or medium, which is created or communicated by an organisation or individual relating to the past, present or future, physical or mental health or social care of an individual or cohort

Information
Information is data that has been processed or analysed to produce something useful

Information Governance
A strategic framework that brings coherence and transparency to information initiatives and which is responsive to the spectrum of issues and concerns of those involved. Issues such as information sharing, health surveillance, quality assurance, confidentiality, privacy, records management, freedom of information and data protection are all included

Minimum Data Set
The minimum set of data elements that are required to be collected for a specific purpose

Relevance
Refers to the extent to which the data meets the needs of users

Reliability
Refers to the extent to which data is collected consistently over time and by different organisations either manually or electronically

Timeliness
Refers to the extent to which data is collected within a reasonable time period from the activity or event and is available within a reasonable timeframe to be used for whatever purpose it is intended. Data should be made available at whatever frequency and within whatever timeframe is needed to support decision making

Validity
Refers to the extent to which data that has been collected in accordance with any rules or definitions that are applicable for that data. This will enable benchmarking between organisations and over time

Appendices

Appendix: 1 The CIHI Data Quality Framework

Accuracy	Coverage	1a. The population of reference is explicitly stated in all releases.
		1b. Efforts are being made to close the gap between the population of reference and the population of interest.
		2. Known sources of under- or over-coverage have been documented.
		3. The frame has been validated by comparison with external and independent sources
		4. The rate of under- or over-coverage falls into one of the predefined categories
	Capture and Collection	5a. CIHI practices that minimize response burden are documented.
		5b. CIHI has documentation of data-provider practices that minimize response burden.
		6. Practices exist that encourage cooperation for data submission.
		7. Practices exist that give support to data providers.
		8. Standard data-submission procedures exist and are followed by data providers.
		9. Data-capture quality control measures exist and are implemented by data providers.
	Unit Non-Response	10. The magnitude of unit non-response is mentioned in the data quality documentation.
		11. The number of records for responding units is monitored to detect unusual values.
		12. The magnitude of unit non-response falls into one of the predetermined categories.
	Item (partial) Non-Response	13. Item non-response is identified.
		14. The magnitude of item non-response falls into one of the predetermined categories.
	Measurement error	15. The level of measurement error falls into one of the predetermined categories.
		16. The level of bias is not significant.
		17. The degree of problems with consistency falls into one of the predetermined categories.
	Edit and Imputation	18. Validity checks are done for each data element and any invalid data is flagged.
		19. Edit rules and imputation are logical and applied consistently.
		20. Edit reports for users are easy to use and understand.
		21. The imputation process is automated and consistent with the edit rules.
	Processing and Estimation	22. Documentation for all data processing activities is maintained.
		23. Technical specifications for the data holding are maintained.
		24. Changes to a data holding's underlying structure or processing or estimation programs have been tested.
		25. Raw data, according to the CIHI policy for data retention, is saved in a secure location.
		26a. Aggregated statistics from a data holding have been compared, where possible, to similar statistics from another CIHI data holding or external source.

		26b. The variance of the estimate, compared to the estimate itself, is at an acceptable level.
Timeliness	Data Currency at the Time of Release	27. The difference between the actual date of data release and the end of the reference period is reasonably brief.
		28. The official date of data release was announced before the release.
		29. The official date of data release was met.
		30. Data processing activities are regularly reviewed to improve timeliness.
	Documentation Currency	31. The recommended data quality documentation was available at the time of data or report release.
		32. Major reports were released on schedule.
Comparability	Data Dictionary Standards	33. All data elements are evaluated to determine their inclusion within the CIHI Data Dictionary
		34. Data elements from a data holding that are contained within the CIHI Data Dictionary must conform to dictionary standards.
	Standardization	35. Data is collected at the finest level of detail practical.
		36. For any derived data element, the original data element remains accessible.
	Linkage	37. Geographical data is collected using the Standard Geographical Classification (SGC).
		38. Data is collected using a consistent time frame, especially between and within jurisdictions.
		39. Identifiers are used to differentiate facilities or organizations uniquely for historical linkage.
		40. Identifiers are used to differentiate persons or machines uniquely for historical linkage.
	Equivalency	41. Methodology and limitations for crosswalks and/or conversions are documented.
		42. The magnitude of issues related to crosswalks and conversions falls into one of the predetermined categories.
	Historical Comparability	43. Documentation on historical changes to the data holding exists and is easily accessible
		44. Trend analysis is used to examine changes in core data elements over time.
		45. The magnitude of issues associated with comparing data over time falls into one of the predetermined categories.
Usability	Accessibility	46. A final data set is made available per planned release.
		47. Standard tables and analyses using standard format and content are produced per planned release or upon request.
		48. Products are defined, catalogued and/or publicized.
	Documentation	49. Current data quality documentation for users exists.
		50. Current metadata documentation exists.
		51. A caveat accompanies any preliminary release.
	Interpretability	52. A mechanism is in place whereby key users can provide feedback to, and receive notice from, the data holding program area.
		53. Revision guidelines are available and applied per release.

Relevance	Adaptability	54. Mechanisms are in place to keep stakeholders informed of developments in the field
		55. The data holding is developed so that future system modifications can be made easily
	Value	56. The mandate of the data holding fills a health information gap.
		57. The level of usage of the data holding is monitored.
		58 User satisfaction is periodically assessed.