eHealth Ontario

Standards Selection Guide

Ontario
eHealth Ontario

Contents

Introduction

Introduction

eHealth Ontario's Standards Selection Guide provides assistance to implementors of electronic health record (EHR) projects in choosing appropriate interoperability standards.

Topics featured include specific criteria and rationale for selecting interoperability standards and descriptions on how to apply evaluation principles to different types of standards – especially in regards to terminology, messaging, and content standards.

The guide also includes a high-level review of the processes involved – from the initial screening to final selection. Detailed criteria and rationale are found in the appendices.

Background

eHealth Ontario is enabling physicians and health care providers to establish and maintain an EHR for Ontario's 13 million residents. To make this happen, the systems involved in the EHR must accomplish many things, including: identifying clients and providers, protecting personal health information and the privacy of Ontarians – in addition to providing the "glue" that allows the systems to talk to each other.

The eHealth Standards Program is responsible for the interoperability standards used in the various EHR solutions. EHR interoperability standards are loosely defined as the messaging, content and terminology standards that support the exchange of data between point of service systems and the registries, repositories and applications that comprise an EHR. The following are examples of standards that fall into these three main categories:

1. Messaging Standards such as HL7 v2 and v3, DICOM, and SOAP
2. Content Standards such HL7 Clinical Document Architecture (CDA), RESTful approaches, and DICOM
3. Terminology Standards such as SNOMED CT, LOINC, pCLOCD, ICD, and CCI

The challenge for implementors is that numerous interoperability standards exist to facilitate data exchange between health care applications. Selecting the right one is complicated. An incorrect standard can lead to issues ranging from increased costs to maintain the standard, to an inability to adopt and sustain the use of the standard to support effective health services to patients.

Further complicating matters is the fact that there are different approaches to extending and constraining the baseline standards for particular implementations. For example, HL7 CDA – used to define the structure and content of clinical documents – may be selected as the baseline standard for an electronic hospital discharge summary document, but there are many different implementation approaches that could be selected for re-use in Ontario. Evaluating the different implementation approaches also requires criteria and supporting methodologies. The standards selection criteria and supporting methodologies require consideration and involvement of information from various sources that impact how the standards can be implemented, and maintained, including the assessment of existing and emerging technology and standards, health information policy and legislation requirements, current and future business requirements, and other interrelated standards.

Which is where a standards analyst comes in. Using best-practice tools and methodologies, a standards analyst works directly with clients to help them select the most effective interoperability standards. The analyst's work however,

doesn't stop there – they continue to collaborate with clients during subsequent phases to either constrain or extend the standards to tailor them to specific implementations.

Selecting a Standard

Selection Process Overview

Prior to selecting an interoperability standard, certain preconditions should be met. These include: a project team has been established; all business requirements have been defined; and you are working with a standards analyst.

Once these preconditions have been met, the next step is determining which of the available interoperability standards is most suitable for the project. Potential standards can be assessed against initial screening criteria consisting of three overarching categories: fit for purpose, stewardship, and standard quality.

By assessing potential standards against these criteria, the most appropriate messaging, content, or terminology standard can be determined. At this point, the standard can be further analyzed by:

A) Assessing the standard through the three categories of criteria once again or;

B) Assessing the standard through the standard specific criteria.

Tables containing detailed descriptions of the initial screening criteria and the standard specific criteria with rationale are included in the appendices. These tables support detailed examination of several aspects relating to the standard's usage and content. They can be easily converted to evaluation forms by adding additional columns to allow for the comparison of standards being considered.

After the appropriate standard has been selected, the next step is determining which implementation guide and localization to select. For example, if HL7 v3 is selected for a pharmacy-related project, Canadian Electronic Drug (CeRx) or Maintenance Release (MR) 2009 may be potential implementation guides. In order to select which one is more suitable, they may have to be assessed against the initial screening criteria or the messaging specific criteria.

Once the standard selection process is complete, there are certain post-conditions that should be met. These may include: informing stakeholders of the selection decision; determining where the selection documents need to be stored; and possibly closing out the project or service request.

Figure 1 provides an overview of the standards selection process and highlights the key stages involved.

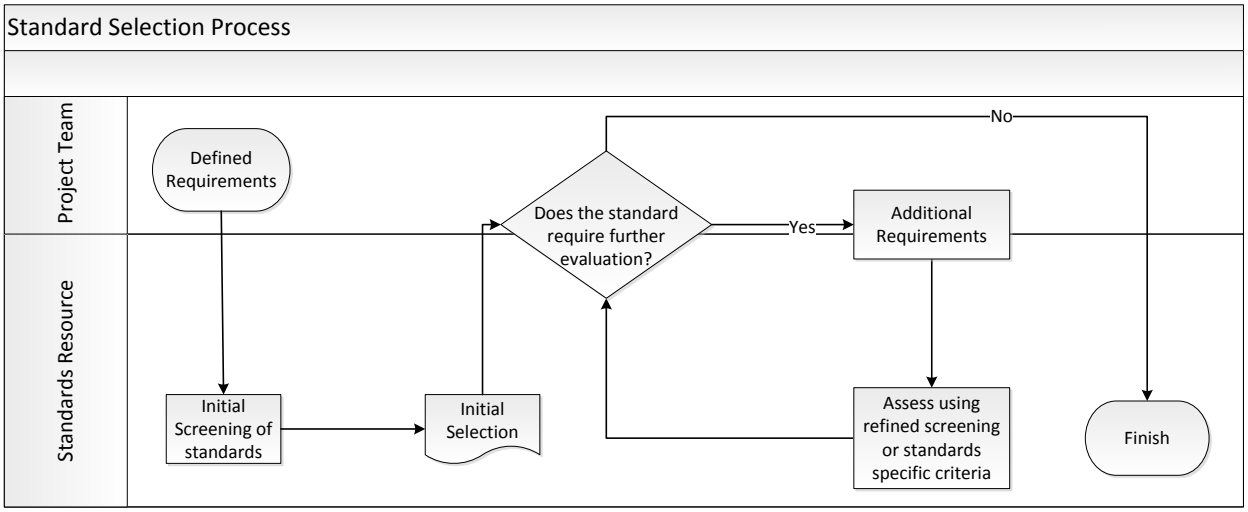

Figure 1 – Standard Selection Process

Interoperability Standards – Initial Screening

The initial screening framework outlines standard selection criteria and associated guidelines that should be considered when selecting one or more standards for the intended use in the EHR. It should be noted that only the applicable criteria to the standard in question should be considered. Additionally, some standards selection decisions may require more work to determine which standards have been previously implemented in existing systems, and to develop and evaluate options for resolving differences in the implemented standards.

For your initial selection consideration, standards must embody criteria from the following three categories:

Fit for Purpose

Fit for purpose criteria evaluate the appropriateness of the standard for the intended business, clinical and technical context. It includes the following considerations: aligns to Ontario's eHealth Blueprint; constrained/extended from existing interoperability standards; supports business requirements; supports technical requirements; is likely to be adopted; and supports coded versus free text. It is also important to take into consideration that fit for purpose today may be different in the future, and when the purpose and business requirements change, the standards may require a re-evaluation. Details and the rationale are listed in 4.2.1 in the appendices.

The key criteria to assess in this category is that the standard aligns to Ontario's eHealth Blueprint and supports business requirements.

Stewardship Criteria

Stewardship criteria facilitate comparison of the standard's stewards in terms of governance structure, licensing and intellectual property rights, and defined maintenance process. Criteria also provide insight into the sustainability of the standard. Details and rationale are discussed in section 4.2.2 in the appendices.

The key criteria to assess in this category include: cost of implementation and defined maintenance process.

Standard Quality Criteria

Standard quality criteria evaluate the overall calibre of the standard and are not related to the standard content itself. They must enable interoperability, be adaptable, and stable. Additional implementation resources must exist, such as training, implementation guides, and software to support development, conformance testing, and maintenance of the standard. Details and rationale are outlined in 4.2.3 in the appendices.

The key criteria to assess here are that the standard provides support and is adaptable and customizable.

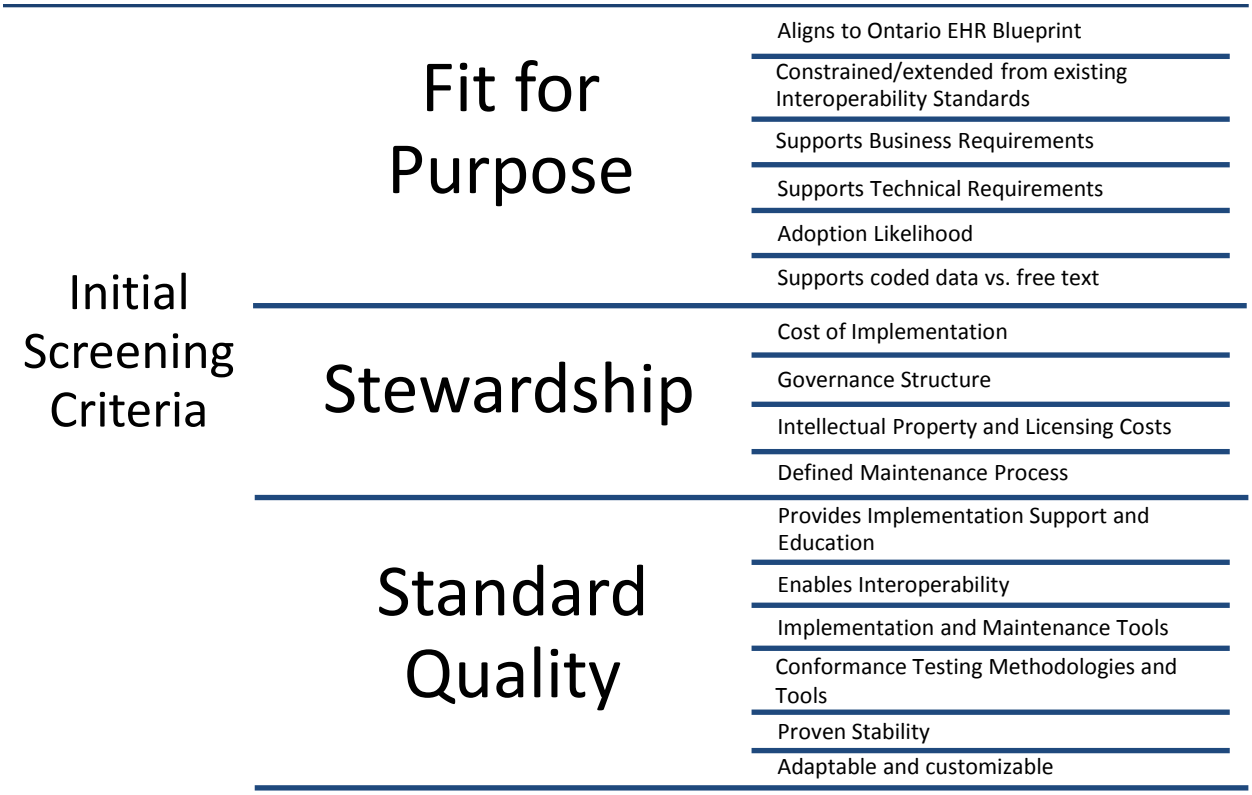

Figure 2 – Summary of Initial Screening Criteria

You may want to perform additional analysis to complement the Standards Selection Guide to ensure the overall process is more suitable for your purposes, such as:

- Adding in additional stakeholder specific criteria that are not in scope for this document;
- Including a mathematical scoring system to reflect the relative importance of specific criteria and associated guideline(s). For additional information on scoring, please refer to "An evaluation and selection framework for interoperability standards" (Mykkanen & Tuomainen, 2008).

Standard Specific Selection Criteria

Once the initial assessment is completed, a deeper analysis of the potential standards may be required. This section outlines specific criteria to be assessed in each of three main types of standards: messaging, terminology, and content standards. Tables containing detailed descriptions and rationales for the criteria are listed in the appendices.

Terminology Standards

Once the initial screening is completed, standards can be evaluated using the terminology specific criteria outlined in the appendices. When selecting a terminology standard, there are certain essential technical criteria the standard must meet: concept orientation, concept permanence, unambiguous concept meanings, and explicit version identifiers. Other desirable, but not essential technical criteria, include: meaningless identifiers, multi-hierarchies,

source information/terminology model, use of synonyms, and level of granularity. For more details, see 4.3 in the appendices.

Messaging Standards

Once the initial screening of standards is completed, standards specific to messaging can be evaluated using the messaging specific criteria in the appendices. When selecting a messaging standard, the following criteria should be considered: implementation completeness, flexibility, and market trend. For more details, see 4.4 in the appendices.

Content Standards

Once the initial screening has been completed, content standards can be evaluated using content specific criteria outlined in the appendices. Content standards include document standards such as HL7 CDA and DICOM for imaging. When selecting a content standard, the following criteria should be considered: implementation completeness, flexibility, and market trend. For more details, see 4.4 in the appendices.

Use Case Examples

NOTE TO READERS: The use cases below are loosely based on experiences of the eHealth Ontario Standards Program. They are provided as high-level, illustrative examples and are not intended to be precise reflections of real life events.

Use Case – Selecting a Diagnostic Imaging Common Service Messaging Standard

Problem: Selecting a baseline messaging standard for the exchange of diagnostic imaging (DI) reports between regional DI repositories.

Methodology: The project team establishes business and technical requirements for the Diagnostic Imaging Common Services (DI/CS) in collaboration with a variety of stakeholders. During the stakeholder consultations, it is determined that the majority of the DI repositories currently support the IHE XDS profiles – used for sharing documents – which use SOAP messages with HL7 CDA)

eHealth Ontario's standards analyst compares the IHE XDS profiles against the "fit for purpose" and "standard quality" criteria in the standards selection guide (e.g. support for detailed business and technical requirements, adoption likelihood, re-usable implementation and maintenance tools, etc.). The "stewardship" criteria are already known for the IHE profiles and the underlying standards (i.e. SOAP and CDA) do not need to be re-assessed. Our standards analyst identifies the need for a sizeable terminology stakeholder engagement process if CDA Level 2, which requires coded section headings, is selected for the initial release.

Outcome: The IHE XDS approach with CDA Level 2 is chosen. The standards analyst works with the project team and implementers to specify various components of the CDA document, such as the message header and Level 2 sections, described in the DI/CS implementation guide.

1.1 Use Case – Selecting a Diagnostic Imaging Common Service Terminology Standard

Problem: Selecting a common terminology standard for diagnostic imaging (DI) procedures to assist the sharing of DI reports amongst regional DI repositories by allowing them to map their local DI procedure codes to a single provincial list.

Methodology: eHealth Ontario's standards analyst works with the project team to speak to the implementers of the regional DI repositories to see what terminologies they have already selected. The analysis identifies that a variety of terminologies are currently used, such as RADLEX, SNOMED CT, and the CCI. The standards analyst uses the business and technical requirements and identifies a need to have a granular list of codes which narrows the options down to two standards from three – RADLEX and SNOMED CT. The standards analyst then applies the remaining criteria in the standards selection guide, as well as the terminology specific criteria.

Outcome: The standards analyst recommends that the project team select SNOMED CT for codifying diagnostic imaging procedures.

Appendices

1.2 Initial Screening Criteria

1.2.1 Fit for Purpose

Table 1 – Fit for Purpose Criteria

Criteria	Description	Rationale
Aligns to Ontario's eHealth Blueprint*	The purpose of this criterion is to assess whether the standard supports the exchange of information between two or more components of the Ontario EHR. The standard should also be intended to be used in a federated approach to EHR architecture where multiple organizations are expected to build, operate and/or host the various applications.	The standard supports eHealth Ontario's mandate in providing a single, harmonized, coherent province-wide EHR.
Constrained/extended from existing Interoperability Standards	This criterion assesses whether the standard is adopted/adapted from existing standards, and whether it is intended for international, pan-Canadian, or use in Ontario.	Re-use of existing standards allows implementers to re-use code (i.e. in point of service /Health Information Access Layer (HIAL) applications, conformance testing environments, etc.). It also allows reuse of existing tools/skills/knowledge sets to establish the standard.
Supports Business Requirements*	This criterion assesses whether the standard expresses all information required by the business/clinical domain. While the exact business requirements are project specific, example questions may include: • Does the messaging standard have all the messages to support the required functions for data exchange? • Do the messages have the appropriate fields to express the information required for the business functions? • Does the document standard have all the sections to express the	To ensure that the standard addresses the health care business requirements. The standard should be health care delivery setting independent to enable use across multiple health care delivery settings.

Criteria	Description	Rationale
	required business information? • Does the terminology contain all of the concepts that need to be captured? • If bi-lingual information needs to be exchanged, does the standard allow for English and French terms to be mapped to common codes? • Are there user interface data collection/display requirements that should be considered when choosing the interoperability standard?	
Supports Technical Requirements	This criterion assesses the degree to which the standard is feasible to adopt and implement according to the technical requirements of the project. While the exact technical requirements are project specific, example questions may include: • Can the standard be implemented in the proposed architecture? • Does the conceptual architecture make any assumptions about synchronous or asynchronous communication? • Does the architecture support HTTP and/or MLLP? • Are there any interdependencies with other aspects of the architecture that would make it difficult to implement the standard (e.g. there are no places to express SAML bindings in HTTP without SOAP, making it difficult to integrate RESTful interfaces with the existing security system and therefore difficult to implement HL7 FHIR)?	To enable successful implementation of the standard.
Adoption Likelihood	This criterion assesses the likelihood that the selected standard will be adopted and maintained by vendors and other implementors. Some questions that may be asked when	To ensure success of the implementation. If the standard is not widely implemented or supported by vendors, it will result in

Criteria	Description	Rationale
	assessing the likelihood for adoption, include: • Have vendors already implemented this? If they haven't, will they get a return on investment if they do? • Do vendors have the necessary expertise to implement the standard? If not, is it realistic that they can gain that expertise in time to implement? • Will vendors provide support for sustained use and maintenance?	increased time, cost, and effort.
Supports coded data versus free text	This criterion assesses the degree to which coded data is required. Some questions to ask when assessing whether there is a need for coded data versus free text, may include: • Does the project implementing the standard expect to support automated processing such as decision support or data analytics? • Do clinicians require assistance to exchange data/information for human readability? • Are there other forms of non-textual data/information (i.e. audio, video, images) that need to be exchanged? • Are there privacy concerns with exchanging free text?	Different standards support different levels of data granularity and coding. However, there can be trade-offs to application developers and users to provide granular and coded data. At one extreme, end users may reject using the application because it forces them to enter data in too many fields, increasing their time/effort to do so. At the other extreme, just capturing free text can cause privacy breaches and be a barrier to implementing decision support.

*Key criteria to assess

1.2.2 Stewardship

Table 2 – Stewardship Criteria

Criteria	Description	Rationale
Costs and Benefits of Implementation*	This criterion assesses whether the cost of implementation and disruption to current business is affordable given the benefits. It is important to consider not only the initial cost but the on-going cost for maintenance as	To take into consideration any cost constraints when adopting a standard, as well as initial implementation and longer-term maintenance costs.

Criteria	Description	Rationale
	well. Cost is not only measured in currency, but can be in time or effort as well. Some sample questions to ask when assessing the costs and benefits of implementation, include: • What is the return on investment for the vendor? • What is the cost of tools required? • Will the implementation timelines be increased due to the complexity of the standard? • What is the number of people required for implementation? • Is there any existing commercial off the shelf software vs. custom software? • If properly implemented, would the standard provide system or societal benefits such as improved decision support or clinical research?	
Governance Structure	The purpose of this criterion is to assess whether or not the standard is governed appropriately. When assessing if a governance structure is in place, it is important to consider whether there are: • Defined processes in place for making decisions about the standard. • Processes for adding and removing members on the governance committees.	To ensure proper processes are in place for the voting, maintenance and changing of the standard amongst its various stakeholders; as well as certification and other capabilities of the standards development or maintenance organization.
Intellectual Property and Licensing Costs	This criterion assesses whether the intellectual property and licensing terms for the standard allows the wide use of the standard. Example questions may include: • Does the standard have licensing costs that are so expensive that the costs prohibits uptake of the standard? • Is it likely the standard licensing costs will increase over time? • If a standard is currently free, are there other hidden conditions? • Does the standard have licensing restrictions that prevent it from	To ensure that the standard is vendor neutral and allows for the wide use of the standard. Openness and intellectual property policies affect the status, uptake and implementability of specifications, especially in the long term.

Criteria	Description	Rationale
	being implemented by anyone? • What standards are being implemented in neighbouring regions/countries due to differing licensing costs? Will these impact expectations in our country?	
Defined Maintenance Process*	This criterion assesses whether or not the standard custodian has processes in place to accept requests for change to address errors or new needs in the standard. When assessing if a maintenance process is in place, it is important to consider the following: • There are defined processes in place for changes to the standard • The change processes are responsive to eHealth Ontario's needs. • The frequency of updates should be sufficiently short to accommodate new codes and repairs quickly, as well as extensions or temporary ("hot") fixes to resolve immediate needs in between full updates. • Is the maintenance body responsive to requests for assistance, maintenance, etc.?	Business requirements and technology change over time, as such, standards need to evolve to meet changing needs. It is therefore important to ensure the selected standard has defined maintenance processes in order to evolve.

*Key criteria to assess

1.2.3 Standard Quality

Table 3 – Standard Quality Criteria

Criteria	Description	Rationale
Provides Implementation Support and Education*	To assess the degree to which resources are able to assist with appropriate use and implementation of the standard. Some key questions to consider when assessing this criteria are: • Does the standards development/maintenance organization (e.g. HL7, IHE, Infoway,	If there are organizations available to provide supporting services to help implement, it will help increase the number of adopters and decrease the costs for specific implementers who would otherwise have to provide those services.

Criteria	Description	Rationale
	etc.) provide support for implementation? • Is it easy to obtain education and/or training on the standard and supporting tools? • Is the education or training offered in multiple formats (online training modules, books, in person, etc.)?	
Enables Interoperability	The purpose of this criterion is to assess whether the standard is complementary to or strategically positioned to work with existing interoperability standards implementations. When assessing this criterion, the following should be considered: • Is the standard backwards compatible? (E.g. can implementers of previous versions keep their applications in tact in order to be compatible with a newer version?) • Does the standard have the ability to map to other terminology and classification standards? • Does the standard facilitate information exchange?	To enable existing and new clinical solutions and provide the capability of exchanging information in a seamless manner. To ensure that previous data and legacy systems are compatible with the standard and can be upgraded if necessary.
Implementation and Maintenance Tools	This criterion assesses the availability of tools, code libraries, and/or COTS products to support implementation and maintenance of the standard. The following are questions that may be asked: • Are there any existing code libraries available or would it be necessary to write the base level code from scratch? • Are there standard design tools that help implementers to extend or constrain the standard? • Are the standard design tools stable? • Do the tools run on different operating systems? • Are there tools that help implementers compare 2 or more versions of the standard or localization? • Are there any application program	The existence of tools that are easily accessible decreases the effort and cost to implement and maintain a particular standard.

Criteria	Description	Rationale
	interfaces or development 'sandboxes' for implementers?	
Conformance Testing Methodologies and Tools	This criterion assesses if the standard has well defined conformance testing processes and supporting tools. Examples questions may include: • Are there conformance testing tools that first time implementers can easily access? • Can implementers re-use their conformance testing environments and processes?	In order to test whether a standard has been implemented correctly, a set of conformance criteria and profiles against which a standard can be measured is important. Ideally, a process to measure conformance should be in place to publicly notify those vendors that are certified (meet testing criteria).
Proven Stability	This criterion assesses the stability and level of adoption of the standard. Some key questions to consider are: • Has the standard been implemented and tested previously? • Is the standard already implemented by the project's implementers? • Is the standard stable or still in draft?	If a standard is stable and widely implemented it is more attractive for other implementers to adopt it. If a standard is still in inception, it is more volatile and fragile, which will likely lead to increased risks (e.g. increased implementation costs and timeline delays) for initial implementers.
Adaptable and customizable*	This criterion assesses the extent to which the standard allows implementers to make modifications to meet local requirements. Example questions may include: • Is the standard highly flexible with lots of optionality and minimal cardinality constraints? • Is the standard very strict with little to no optionality and strict cardinality constraints? • Does the standard custodian have defined processes and tools for registering local extensions?	For every interoperability standard, it is essential to describe how tightly the aspects defined in the standard constrain the options for the implementation, and which aspects are left for the implementation-specific or customer-specific conventions.

*Key criteria to assess

1.3 Criteria for Selecting Terminology Standards

Table 4 – Terminology Standard Criteria

Criteria	Description	Rationale
Concept Orientation*	This criterion assesses whether terminology elements are coded concepts (e.g. heart attack code# 103405), with	To eliminate any possible ambiguity that may exist historically. Concept orientation ensures that terms must

Criteria	Description	Rationale
	possible multiple synonymous text and relationships to other concepts such as diagnoses or procedures. Example questions may include: • Does the standard contain redundant, ambiguous, or vague concepts?	correspond to at least one meaning and no more than one meaning, and that meanings correspond to no more than one term.
Concept permanence*	The purpose of this criterion is to assess whether the meaning of each coded concept in a terminology remains forever unchanged. If the meaning of a concept needs to be changed or refined, a new coded concept should be introduced. No retired codes are deleted or reused.	This is important, for example, when data coded under an older version of the vocabulary needs to be interpreted in view of a current conceptual framework.
Unambiguous concept meanings*	This criterion ensures that concepts must have exactly one meaning. When a common term has two or more associated meanings, it must be separated into distinct concepts.	To ensure each concept is unambiguous and does not have any duplicate meanings.
Explicit version identifiers*	This criterion assesses whether each version of the terminology is designated by a unique identifier, such that parties exchanging data can readily determine whether they are using the same set of terms.	To prevent the misuse of concepts and identifiers within a standard.
Meaningless identifiers	The purpose of this criterion is to assess whether unique identifiers attached to concepts are not tied to hierarchical position or other contexts, and do not carry any meaning.	Meaningless identifiers (where, for instance, a hospital site identifier bears no relationship to a hospital organization) allow for an individual concept to remain constant even if changes are made to future relationships.
Multi-Hierarchical	This criterion assesses whether the standard fully supports multiple classifications with concepts accessible through all reasonable hierarchical relationships. For example: the concept of the influenza virus may have two different parents, one for pathogens and the other for vaccines.	To support the needs of multiple stakeholders with varying degrees of hierarchical relationships within a controlled vocabulary.
Source Information/Terminology Model	This criterion assesses whether all content in the standard is derived from a single information and/or terminology model.	To ensure that terminology has a consistent model applied to all terms, making maintenance and updates easier. Models also help to express the relationships between hierarchies that

Criteria	Description	Rationale
		the concepts belong to, which in turn help people to understand the meaning of specific concepts and allow them to implement the standard correctly.
Use of Synonyms	The purpose of this criterion is to assess whether each concept may have multiple synonymous terms, but the relationship of the terms to the concept must be explicitly represented.	The terms or "labels" for a concept needs to be precise. However, the precise term (sometimes called the Fully Specified Name) may not be commonly used. Furthermore, different people may prefer to use slightly different terms (i.e. synonyms) for the same concept which are frequently used in their implementation. Allowing synonyms to be linked to a single concept allows implementers to use different or "preferred" terms to describe the same concept while maintaining the precise semantics. For example, heart attack, infarction of heart and cardiac infarction are all synonyms of the concept myocardial infarction.
Level of Granularity	This criterion assesses the degree to which the standard provides structured, granular, coded data to support: • advancements in provision of care such as decision support and alerts; and • various levels of data masking for health system use of de-identified EHR data Example questions may include: • Does the standard need to support both clinical decision making and secondary analysis? • Does the system need to have the flexibility to allow users to enter post-coordinated terms?	To support the needs of various stakeholders who may require different levels of granularity. Different levels of granularity are needed for defining concepts, navigation, decision support, and reporting. For example, a manager may only need to know that a patient has a broken leg; the finance department that it is a fractured tibia; but the clinician needs to know that it is a spiral fracture of the shaft of the right tibia.

*Key criteria to assess

1.4 Criteria for Selecting Messaging and Content Standards

Table 5 – Messaging and Content Standards Criteria

Criteria	Description	Rationale

Implementation Completeness	This criterion assesses the ease of implementation by the existence of artefacts and tools. Some examples of questions include: • Do schemas and implementation guides exist? • Does the localization/implementation documentation have all the standards artefacts (e.g. well written implementation guide, terminology specification, XML schemas and message instances, Visio diagrams, Model Interchange Format (MIF) 1 and 2 files, etc.)? • Are there existing code libraries and off the shelf products that support this? • How much custom code is required?	If a standard has all the implementation artefacts and tools, it saves time and effort by not having to create them. Provides better guidance and less work intensive activities around implementation of the standard
Flexibility	This criterion assesses whether or not integration with other standards is possible. Some example questions may be: • Does the standard support different formats? • Does the standard work well in terms of plug and play, or is it tied to some other part of architecture? • Can any security scheme be layered or is the security format and policy dictated? • Can any terminology standard be used with the standard or is it limited to one specific standard?	Supports ease of adoption and seamless integration with existing or pre-adopted standards and platforms
Market Trend	This criterion assesses the implementation and usage of the standard in a wider context. Example questions may be: • How widely is the standard implemented? • How many vendors currently support the standard?	To ensure vendor support and adoption of the standard is readily available

1.5 Glossary

Term	Definition
Canadian Classification of Health Interventions	CCI is the national standard for classifying health care procedures. It is a classification system for describing a broad spectrum of health interventions from various types of providers across the continuum of health care. (Source: http://www.cihi.ca/CIHI-ext-portal/internet/en/document/standards+and+data+submission/standards/classification+and+codi

Term	Definition
(CCI)	ng/codingclass_cci)
Commercial Off The Shelf (COTS)	Commercial Off-The-Shelf is a term for goods available in the commercial marketplace that can be bought and used under government contract. COTS purchases are alternatives to in-house developments or one-off government-funded developments. (Source: http://en.wikipedia.org/wiki/Commercial_off-the-shelf)
Digital Imaging and Communication in Medicine (DICOM)	Standard for handling, storing, printing, and transmitting information in medical imaging. It includes a file format definition and a network communications protocol. The communication protocol is an application protocol using TCP/IP to communicate between systems. DICOM files can be exchanged between two entities capable of receiving image and patient data in DICOM format. (Source: http://medical.nema.org/Dicom/about-DICOM.html)
Electronic Health Record (EHR)	Provides each individual in Canada with a secure and private lifetime record of their key health history and care within the health system. The record is available electronically to authorized health care providers and the individual anywhere, anytime in support of high quality care. (Source: https://www.infoway-inforoute.ca/index.php/resources/technical-documents/architecture/doc_download/283-ehrs-blueprint-v2-summary; Page.32)
Health Information Access Layer (HIAL)	An interface specification for the EHR infostructure that defines service components, service roles, information model and messaging standards required for the exchange of EHR data and execution of interoperability profiles between EHR services. . (Source: https://www.infoway-inforoute.ca/index.php/resources/technical-documents/architecture/doc_download/283-ehrs-blueprint-v2-summary; Page.33)
Health Level 7 (HL7)	Founded in 1987, HL7 is a not-for-profit standards developing organization dedicated to providing a comprehensive framework and related standards for the exchange, integration, sharing, and retrieval of electronic health information that supports clinical practice and the management, delivery and evaluation of health services. (Source: http://www.hl7.org/about/index.cfm?ref=nav)
Health Level 7 Clinical Document Architecture (HL7 CDA)	The HL7 CDA is a document markup standard that specifies the structure and semantics of "clinical documents" for the purpose of exchange between health care providers and patients. It defines a clinical document as having the following six characteristics: 1) Persistence, 2) Stewardship, 3) Potential for authentication, 4) Context, 5) Wholeness and 6) Human readability. (Source: http://www.hl7.org/implement/standards/product_brief.cfm?product_id=7h)
Health Level 7 version 2 (HL7 v2)	Standard supporting hospital workflows. Created in 1987, it defines electronic messages to support administrative, logistical, financial and clinical processes. (Source: http://www.hl7.org/implement/standards/product_brief.cfm?product_id=185)
Health Level 7 version 3	Standard supporting health care workflows. Development started in 1995, resulting in an initial standard publication in 2005. HL7 v3 is based on a formal methodology (the HDF – HL7

Term	Definition
(HL7 v3)	Development Framework) and object oriented principles. (Source: http://www.hl7.org/implement/standards/product_brief.cfm?product_id=186)
HL7 Fast Healthcare Interoperability Resources (FHIR)	Expected to be a next generation standards framework created by HL7. FHIR combines the best features of HL7's Version 2, Version 3 and product lines while leveraging the latest web standards and applying a tight focus on implementability (Source: http://www.hl7.org/implement/standards/fhir/)
Hypertext Transfer Protocol (HTTP)	HTTP is a protocol with the lightness and speed necessary for a distributed collaborative hypermedia information system. It is a generic stateless object-oriented protocol, which may be used for many similar tasks such as name servers, and distributed object-oriented systems, by extending the commands, or methods used. A feature of HTTP is the negotiation of data representation, allowing systems to be built independently of the development of new advanced representations. (Source: http://www.hl7.org/documentcenter/public_temp_B48207D3-1C23-BA17-0CD09DA0F7B11184/calendarofevents/FirstTime/Glossary%20of%20terms.pdf)
Integrating the Healthcare Enterprise (IHE) - Cross Enterprise Document Sharing (XDS)	IHE XDS is focused on providing a standards-based specification for managing the sharing of documents between any health care enterprise, ranging from a private physician office to a clinic to an acute care in-patient facility and personal health record systems. This is managed through federated document repositories and a document registry to create a longitudinal record of information about a patient within a given clinical affinity domain. (Source: http://wiki.ihe.net/index.php?title=Cross-Enterprise_Document_Sharing). It's worth noting that there are spcializations of the IHE XDS profile, such as IHE XDS-I, which provides a solution for publishing, finding and retrieving imaging documents across a group of affiliated enterprises. (Source: http://wiki.ihe.net/index.php?title=Cross-enterprise_Document_Sharing_for_Imaging)
International Classification of Diseases (ICD)	ICD is the standard diagnostic tool for epidemiology, health management and clinical purposes. It is used to monitor the incidence and prevalence of diseases and other health problems. It is used to classify diseases and other health problems recorded on many types of health and vital records including death certificates and health records.(Source: http://www.who.int/classifications/icd/en/)
Interoperability Standards	Documented rules and guidelines that describe data structure, format and exchange mechanism between two or more software applications. (Source: http://www.himss.org/library/interoperability-standards/what-is?navItemNumber=17333)
Logical Observation Identifiers Names and Codes	A universal code system for identifying laboratory and clinical observations. The purpose of the database is to facilitate the exchange and pooling of results for clinical care, outcomes management, and research. (Source: http://loinc.org/background)

Term	Definition
(LOINC)	
Message Interchange Format (MIF)	MIF is a set of XML formats used to support the storage and exchange of HL7 version 3 artefacts as part of the HL7 Development Framework. It is the pre-publication format of HL7 v3 artefacts used by tooling. The formats are defined by a set of inter-related schemas. (Source: http://wiki.hl7.org/index.php?title=Model_Interchange_Format)
Minimal Lower Layer Protocol (MLLP)	The MLLP protocol is a minimalistic OSI -session layer framing protocol. It is assumed that the MLLP protocol will be used only in a network environment. Most of the details of error detect ion and correct ion are handled by the lower levels of any reasonable network protocol (e.g. TCP/ IP, SNA) and do not require any supplementation (Source: http://www.hl7.org/documentcenter/public_temp_B48207D3-1C23-BA17-0CD09DA0F7B11184/calendarofevents/FirstTime/Glossary%20of%20terms.pdf)
Pan-Canadian Lab Observations Codes Database (pCLOCD)	Nomenclature standard that allow access, management and storage of patient laboratory orders and results across the continuum of care through a jurisdictional Laboratory Information System. (Source: https://www.infoway-inforoute.ca/index.php/programs-services/standards-collaborative/pan-canadian-standards/pan-canadian-loinc-observation-code-database-pclocd-nomenclature-standard)
Radiology Lexicon (RADLEX)	A comprehensive lexicon—a unified language of radiology terms—for standardized indexing and retrieval of radiology information resources. (Source: https://www.rsna.org/RadLex.aspx)
Representational State Transfer (REST)	Architectural style consisting of clients and servers. Clients initiate requests to servers; servers process requests and return appropriate responses. Requests and responses are built around the transfer of representations of resources. A resource can be essentially any coherent and meaningful concept addressed. A representation of a resource is typically a document capturing the current or intended state of a resource. (Source: http://www.ics.uci.edu/~taylor/documents/2002-REST-TOIT.pdf)
Security Assertion Markup Language (SAML)	An XML-based open standard data format for exchanging authentication and authorization data between parties, in particular, between an identity provider and a service provider. (Source: http://en.wikipedia.org/wiki/Security_Assertion_Markup_Language)

Term	Definition
Simple Object Access Protocol (SOAP)	Lightweight protocol intended for exchanging structured information in a decentralized, distributed environment. It uses XML technologies to define an extensible messaging framework providing a message construct that can be exchanged over a variety of underlying protocols. The framework has been designed to be independent of any particular programming model and other implementation specific semantics. (Source: http://www.w3.org/TR/2000/NOTE-SOAP-20000508/)
Standards Analyst	A generic role title used to describe a person with expertise in one or more standards (e.g. SNOMED-CT, HL7 CDA, etc.) who is typically responsible for reviewing, comparing, constraining or extending standards documentation to help inform IT system or software design and implementation. (Source: COACH HIP® Role Profiles. Page 77. https://ams.coachorg.com/inventory/PurchaseDetails.aspx?Id=529927ef-0e5d-4f0e-81e2-5b2968501fd9)
Standard Development Organization (SDO)	Organization responsible to develop, support and maintain Standards (sometimes called Specifications, Products or Protocols) for a particular domain such as messaging (such Health Level 7), terminology (such as International Health Terminology Standards Development Organization for SNOMED CT) or technology (such as XML). (Source: http://en.wikipedia.org/wiki/Standards_organization#Standards_developing_organizations_.28SDOs.29)
Systemized Nomenclature of Medicine Clinical Terms (SNOMED CT)	SNOMED CT is the most comprehensive, multilingual clinical health care terminology in the world. It is an internationally recognized terminology standard to capture, retrieve, aggregate and share relevant clinical information across health care settings and providers in a consisten, safe, and reliable manner. It contains more than 300, 000 active components with unique meanings, ranging from diagnoses and therapies, to medications, results and orders. (Source: https://www.infoway-inforoute.ca/index.php/programs-services/standards-collaborative/pan-canadian-standards/systematized-nomenclature-of-medicine-clinical-terms-snomed-ct)
XML	eXtensible Markup Language (XML) is markup language that defines a set of rules for encoding documents in a format that is both human-readable and machine-readable (Source: http://www.w3.org/XML/)
XML Schema	An XML schema describes a set of rules to which an XML document must conform in order to be considered 'valid'. (Source http://www.w3.org/XML/Schema)

1.6 Referenced Documents

Table 6 - Reference Documents

#	Document Name	Version	Comments
DOC01	Canada Health Infoway Pan-Canadian Terminology Selection Guide	Version 1.0, September 23, 2010	https://www.infoway-inforoute.ca/index.php/component/docman/doc_download/194-pan-canadian-terminology-selection-guide The Pan-Canadian Terminology Selection Guide was used in the development of the Standards Selection Guide. Since the Pan-Canadian Terminology Selection Guide focuses primarily on terminology standards, this paper is intended to supplement that Guide and is broader, with a focus on terminology, messaging and content standards.
DOC02	Conceptual Standards Assessment	A.1.ST.01	
DOC03	Mykkänen, J. A., & Tuomainen, M. P. (2008). An evaluation and selection framework for interoperability standards. Information and Software Technology, 50(3), 176-197.	N/A	http://journals2.scholarsportal.info.myaccess.library.utoronto.ca/tmp/1768740773477909954 3.pdf
DOC04	Cimino, J. (1998).Desiderata for Controlled Medical Vocabularies in the Twenty-First Century. Methods of Information in Medicine, 37 (1). 4-5		http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3415631/
DOC05	Infoway SC pan-Canadian Standards Decision Making Process	Version 2.0 Release 2.2 January 11, 2012	https://forums.infoway-inforoute.ca/index.php/en/forum/scg-procedure-and-policy/331-pan-canadian-standard-decision-making-process-definition-and-listing

DOC06	OHISC Evaluation Checklist		

Acknowledgements

The Pan-Canadian Terminology Selection Guide was used in the development of the Standards Selection Guide. Since the Pan-Canadian Terminology Selection Guide focuses primarily on terminology standards, this Guide is intended to be broader, with a focus on terminology, messaging and content standards.