

eHealth Ontario

EHR Interoperability Plan

Version 1.1

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Introduction

The vision of the electronic health record (EHR) is to allow all of a patient's health information to be accessible at the point of care. Interoperability between the information systems that collect a patient's data will enable all the disparate data to be represented in one place. From a technological perspective, the Institute of Electrical and Electronics Engineers (IEEE) defines interoperability as "the ability of two or more systems or components to exchange information and to use the information that has been exchanged." From a health care provider's perspective, Dr. John Halamka defines it as having "access to the data you need to coordinate care when you need it without a lot of effort or cost."¹

Interoperability is facilitated by a common model and 'language' of communication between the sending and receiving systems. As in other industries, interoperability standards have been developed to exchange various types of clinical data in the healthcare industry. Standards development organizations gather business requirements, 'lessons learned' and collective experience to create standards that will support data sharing scenarios within the health care system. The key benefit of utilizing standards is that they are widely adopted, lending the knowledge and experience of a broad stakeholder group to Ontario solutions, providing opportunities to share EHR components between Ontario and other jurisdictions and better opportunities for return on investments made by commercial partners.

eHealth Ontario recently drafted an interoperability whitepaper² which made the case for interoperability in Ontario in the context of the Ministry of Health and Long Term Care (MOHLTC)'s Patients First approach and the emerging Digital Health strategy. The whitepaper looks at the current and future state of interoperability in the province, highlights economic and clinical benefits, and examines short and long-term opportunities for interoperability. The Interoperability Direction section of eHealth Ontario's Enhancing Architecture & Standards document examines the current state of interoperability in the province and offers a framework for developing the necessary direction to achieve the EHR vision that underpins eHealth Ontario's current priorities and projects across the province. These two documents discuss the vision and business objectives of interoperability, and offer a broad range of opportunities for achieving the vision of interoperability.

The purpose of an EHR Interoperability Plan is to summarize the current state of EHR interoperability, anticipate where and when further EHR interoperability must be enabled, and mitigate interoperability issues that arise from a lack of coordination between projects. It is a companion document to the EHR Connectivity Strategy, which illustrates the high-level current and future state of connectivity between point of service (POS) systems and EHR assets. The strategy uses Provincial Integration Model (PIM) views to visually represent the complexity of EHR systems integration. In these views, a single line represents the connection between the HIAL and the relevant EHR assets. If each line is magnified, it would be comprised of multiple, distinct standards-based 'interface strands' that interconnect each asset to multiple systems. For example, the Provincial Client Registry (PCR) is connected to the Client Health and Related Information System (CHRIS) bi-directionally, using HL7 v3: whereas hospital information systems (HIS) are updating PCR with HL7 v2, as well as querying using HL7 v2-based Integrating the Healthcare Enterprise (IHE) PIX/PDQ. This PCR 'line' will change with the introduction of a PCR Fast Healthcare Interoperability Resources (FHIR)- based query 'interface strand'. In this way, the Interoperability Plan will assist decision makers in understanding the degree of interoperability already in place and the interoperability decisions and activities necessary to realize the Connectivity Strategy.

The Interoperability Plan identifies the existing and future integrations between each of the systems listed in the [EHR Asset Inventory](#) and the provincial EHR assets. Utilizing the same format as the Connectivity Strategy, an interoperability profile has been created for each of the EHR registries, repositories and integration assets. It describes the current state and future state of integration, transitions activities that will need to occur, whether

¹ https://files.ontario.ca/17_john_halamka.pdf

² Interoperability – Enabling a Healthy Ontario. Please contact Architecture@ehealthontario.on.ca to receive a copy.

terminology services will be required and key milestones that have been identified. These will be inputs into decisions regarding standards selection, project sequencing, and timing.

The timelines and standards selected for future state integrations are only provided here when sufficient information and EHR stakeholder commitment is available. When information is not available, considerations include:

- *Standards selection decisions:* each selection should be preceded by an analysis of the business and technological context and requirements of each system and the relevant standards to arrive at the best fit standard selection. This is facilitated by eHealth Ontario’s Standards Selection Guide
- *Standards’ deprecation:* Deprecation of interfaces already supporting production system integrations should be a business decision that should be made in consultation with stakeholders
- *Timelines and sequencing of system integrations:* these will be dependent on eHealth Ontario and stakeholders’ decisions on the priority and ability to establish these integrations. These milestones will be added to the Interoperability Plan once agreements have been established;
- *Terminology services:* The priority and capability to create specific value sets is dependent on clinical input and resource availability and will be progressively elaborated in future updates to this document.

The focus of the Interoperability Plan is on the interoperability required to contribute and consume data to provide and coordinate care. It does not explicitly include interoperability for the purpose of secondary use (e.g. making data available to an analytics repository or external partner). In some cases, the same interoperability standards may be used to transfer large data sets for analysis, but there may be other more effective ways to transfer data that should be explored. Interoperability for secondary use will be included in future releases of this document.

Audience

The target audience for this document is provincial and regional EHR planners and health IT decision makers. The document will assist them by identifying the development work that is required to further integrate EHR assets with point-of-service systems and with each other. As well it will provide information about future plans for interfaces that they have already deployed and those that are planning to be deployed that can serve as an input into local technology planning.

Assumptions

- From an EHR stakeholder perspective, it is preferable that each EHR asset can offer contribution and consumption services through different standards (“multiple dialects”). This provides flexibility for POS systems to build interfaces using standards that are most familiar to them. At the same time, it is assumed that eHealth Ontario will offer the minimum number of dialects to meet the needs of the majority of POS systems.
- It is assumed that the EHR will employ Service-Oriented Architecture (SOA)³ and Resource-Oriented Architecture principles. Services and/or resources will be exposed from the connected backbone (HIAL) to enable provincial assets. Therefore all data contribution and consumption should be brokered via the HIAL rather than point-to-point.
- Interfaces will be built in a manner that adopts existing international and Pan-Canadian / jurisdictional profiles to the greatest degree possible so as to minimize the need for customization specifically for Ontario. Conversely, where an Ontario need arises, efforts will be made to influence the international standards to reflect these needs under the assumption that they will be beneficial to future implementers in other jurisdictions.

³ <https://www.ehealthontario.on.ca/en/standards/view/service-oriented-architecture-policies-and-principles>

Interoperability Plan

Overview

The Connectivity Strategy describes conceptually the EHR assets and how connectivity will be achieved (as illustrated in Figure 1 below). The EHR Interoperability Plan is a companion document to the Connectivity Strategy. It identifies the existing and future integrations between the main EHR registries, repositories and integration assets and the Connectivity Strategy's EHR Asset Inventory⁴.

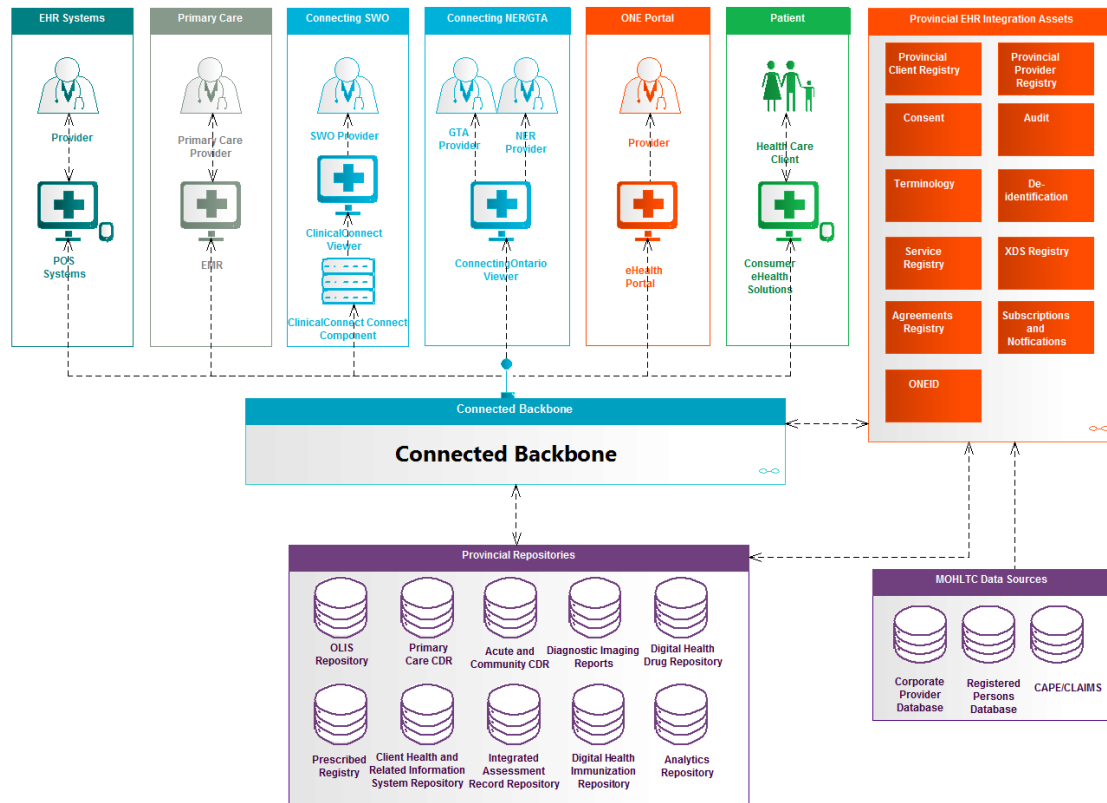


Figure 1 - Provincial Integration Model for EHR Connectivity

Current State of Ontario EHR Interoperability

Most Ontario EHR assets have been built and progress is being made to deploy them for clinical use. Table 1 shows the standards-based interfaces that exist for contributing and/or consuming each asset. Many of these have undergone a provincial open review and been approved by the provincial eHealth Architecture and Standards Governance Committee (this is indicated by a checkmark in the right-hand column).

It is important to note that there is variety amongst the standards used across assets, and that several assets offer multiple interfaces. This variety is related to business needs, the availability of standards for different domains, and the time in which the standards were selected. For instance, eHealth Ontario adopted HL7 version 3 pan-Canadian standards for several of its assets to align with the Canada Health Infoway objective of simplifying the ability of

⁴ <https://www.ehealthontario.on.ca/en/asset-inventory/>

linking jurisdictional EHRs⁵. Wherever possible, established patterns for constraining standards, such as Integrating the Healthcare Enterprise (IHE) profiles, are selected and then constrained and/or extended, where required.

Provincial Asset	Base Standard(s) Supported By Asset (I = Data Contribution, O = Data Consumption)	Source of Standard (Open Review Process)		
		Int'l	pan- Canadian	ON
Provincial Client Registry (PCR)	HL7 v2 (I/O) HL7 v3 (I/O)	✓	✓	✓
Provincial Provider Registry (PPR)	HL7 v3 (O)	✓	✓	✓
Ontario Laboratories Information System (OLIS)	HL7 v2 (I/O) LOINC - Test Results (I/O) PCLOCD - Display Names (O) SNOMED CT - Microorganisms (I/O)	✓	✓	✓
Digital Imaging (DI CS)	IHE XDS (I/O) HL7 CDA R2 (I/O)	✓	✓	✓
Medications (DHDR)	FHIR (O)	✓		
Acute and Community Clinical Data Repository (acCCR)	HL7 v2 (I) HL7 v3 (O) LOINC - Report Names (O)	✓	✓	✓ Input only
Primary Care Clinical Data Repository (pcCCR)	IHE XDS (I/O) HL7 CDA R2 (I/O)	✓	✓	
Consent Management	HL7 v3 (I/O)	✓	✓	✓
Audit	IHE ATNA, HL7 PASS	✓	✓	✓
Single Sign On / Single Sign Off	SAML	✓	N/A	✓
Immunizations (DHIR)	FHIR (I/O)	✓		

Table 1- The Current State of Ontario's EHR Assets Standards-Based Connectivity

Since 2013, eHealth Ontario has performed conceptual standards assessments for each interoperability project to describe the relative merit of the candidate standards. The selection criteria (listed in Figure 2 below) consider multiple stakeholder perspectives and the sustainability of using the standard over the lifecycle of the solution⁶. This provides a consistent framework for assessing options based on criteria that have been found to be critical success factors in the long-term success of enabling broad system connectivity.

⁵ https://files.ontario.ca/8_mohawk_college.pdf

⁶ http://www.ehealthontario.on.ca/images/uploads/pages/documents/eHealth_Standards_Selection_Framework_en.pdf

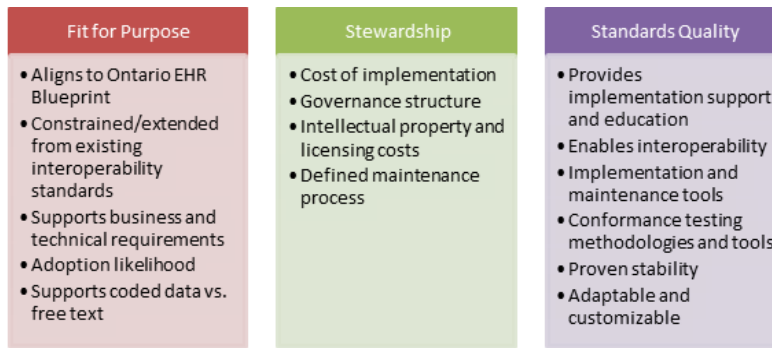


Figure 2 - Standards Selection Criteria

Interpreting the Interoperability Profiles

An interoperability profile has been created for each of the main EHR domains and integration assets that are discussed in the Connectivity Strategy (the reader is referred to the Connectivity Strategy for a description of the purpose and capabilities of the systems supporting each of these services). Each profile includes:

- *Current state:* The types of standards-based and proprietary interfaces currently supported, which systems are utilizing each of these interfaces, and in what manner (contribution and/or consumption)
- *Future state:* The types of standards-based and proprietary interfaces that will be supported, the complete list of EHR assets that should be integrated with them, and how (contribution and/or consumption)
- *Transitions:* Key activities and decisions that need to occur for interface development, updating, migration, and retirement to transition from current to future state
- *Terminology Services:* Utilization of the provincial terminology services for inbound or outbound terminology mapping
- *EHR Roadmap Milestones:* Relevant commitments and associated target delivery periods

It is important to guide the reader in the interpretation of the summaries. Each specifies whether contribution **from** an external asset to the asset of focus is required, or if a data consumption request (query) is submitted to the asset of focus **by** another asset. If asset A is contributing data **to** asset B, this will be represented in the interoperability profile for asset B, but not in the profile for asset A. For example, PCR, PPR, Diagnostic Imaging (DI) Common Service, Subscription Management Services, and eConsult will all ‘contribute’ an audit event to the provincial EHR event monitoring and logging service, Monitoring and Control Technology Assets (MCTA), so these will all appear in the Summary of Audit Connectivity. However, MCTA will not appear in the summary for any of these assets because neither contribution nor consumption will occur **from** MCTA to any of these assets.

The Health Information Access Layer (HIAL) (the Connected Backbone)

The HIAL acts as a mediation layer between EHR assets and EHR contributors and consumers, facilitating the exchange of information between them. It provides security by preventing direct access to the EHR assets and encourages a standardized approach to integration. It is ‘fluent’ in the interoperability standards that are attributed to the EHR assets, and requires none of its own. Connection to the HIAL is established by implementing the [HIAL message and transport specification](#).

Another role that the HIAL plays is as an orchestration (or workflow) engine. It follows a pattern of steps that are required to complete a complex business transaction. For example, the HIAL receives a data contribution from a POS system that is intended for deposition in the Diagnostic Imaging Repository (DI-r). It ‘checks’ the PCR to confirm that the person that the image and/or imaging report is associated with is a provincial healthcare client, and only then will

the content be deposited in the repository. In this scenario, the HIAL is consuming the PCR for the end purpose of the DI-r, but not on behalf of it. It is for this reason that the DI-r is not listed in the PCR interoperability profile. For HIAL orchestrations, which are 'behind the scenes', the HIAL may not use an eHealth interoperability standard (such as HL7, IHE Cross-Enterprise Document Sharing (XDS)) to contribute or consume EHR assets; instead it will extract and transform the data it receives from POS systems into the format required to interact with EHR assets for the purposes of the orchestration. HIAL orchestrations that need to be developed are identified in the transition sections of the interoperability profiles.

Provincial Repositories

Provincial Client Registry (PCR)

Summary of Provincial Client Registry Connectivity

Current State	Future State
<ul style="list-style-type: none"> Primary Care Clinical Data Repository (pcCCR) proof of concept is contributing to PCR via the HIAL deriving the patient information from the XDS message Digital Health Drug Repository (DHDR) utilizes PCR's web services behind the HIAL to validate patient information. Acute and Community Clinical Data Repository (acCCR) is integrated with PCR to support searches for clients that return up-to-date, accurate and trustworthy health care client identity information and deliver more exact patient search results <p>Standards-based interfaces supported:</p> <ul style="list-style-type: none"> HL7 v2 data contribution: over 60 data sources, covering over 170 hospital settings, are contributing data using HL7 v2 Admit, Discharge, and Transfer (ADT) Update standard HL7 v2 data consumption: 2 hospitals have implemented the IHE PIX/PDQ interfaces to query the PCR HL7 v3 data consumption: DI Common Service is using HL7 v3 interfaces to query for client identifier resolution via the HIAL The eHealth Ontario Innovation lab offers web services and test harness for HL v2 PIX/PDQ and HL v3 query FHIR DSTU 2 data consumption: under development with an expected completion in 2017/18. This will first be used with other provincial EHR assets and will then be deployed for external stakeholder consumption 	<ul style="list-style-type: none"> The PCR will continue to support HL7 v2, v3 and FHIR interfaces for data contribution and consumption until stakeholders indicate that there is a readiness to consolidate onto a single standard <p>Bidirectional integration with:</p> <ul style="list-style-type: none"> Point of Service Systems (e.g. hospital information systems such as NEON, North West Health Alliance, eReferral systems) (1) The Client Health and Related Information System (CHRIS) <p>Data contribution from:</p> <ul style="list-style-type: none"> Registered Persons Data Base (RPDB) Wait Times Information System (WTIS) <p>Data consumption by:</p> <ul style="list-style-type: none"> Better Outcomes Registry and Network (BORN) (2) Client Details Portlet Client Selector Portlet ClinicalConnect™ Viewer (1) CMTA acCCR (4) ConnectingOntario Clinical Data Viewer (3) Digital Health Drug Repository (DHDR) (3) DI Common Service (4) OntarioMD/Ontario Telemedicine Network (OTN) eConsult (2) Emergency Neuro Image Transfer System (ENITS) (2) Health Partner Gateway (HPG) – CHRIS viewer (2) Health Report Manager (HRM) (2) MCTA New Drug Funding Program (NDFP) eClaims (2) Ontario Lab Information System (OLIS) (1) Patient Monitoring Management Systems (PMMS) (2) Patient Selector Portlet Scheduling Application (2) South East Health Integrated Information Portal (SHIP) (1) Consumer portals (e.g. MyChart) (2)
<p style="text-align: center;">Transition</p> <ul style="list-style-type: none"> Release HL7 FHIR IHE PIXm and EMPI Patient Match query services for consumption For (1) items, assess the best-fit standard for outstanding integrations 	

- For (2) items, determine if integration with PCR is required
- For (3) items, a direct connection to the PCR using web services will be created; no standard will be used
- For (4) items, a HIAL orchestration will validate that a patient exists in PCR prior to depositing data in the repository. This orchestration will use web services.
- Assess if FHIR-based data contribution is necessary
- Offer test harness and web service testing of all interfaces in the eHealth Ontario Innovation Lab
- Develop the provincial ADT data contribution format within the HIAL and assist POS systems to update their CDR data contribution interfaces to this format so that it can be used to replace multiple interfaces
- HIAL orchestration services calling PCR may be upgraded to leverage newest PCR interfaces when appropriate.
- Assess whether FHIR based interfaces require updating to align with the normative version of the standard

Terminology Services

- Not required

Provincial Provider Registry (PPR)

Summary of Provincial Provider Registry Connectivity	
Current State	Future State
<ul style="list-style-type: none"> 13 data sources, representing 92% of regulated health care provider persons, are submitting data in proprietary formats: <ol style="list-style-type: none"> College of Physicians and Surgeons of Ontario (via Corporate Provider Database [CPDB]) College of Nurses of Ontario (CNO) College of Dieticians of Ontario (CDIO) Ontario College of Pharmacists (OCP) College of Midwives of Ontario (CMO) Royal College of Dental Surgeons (RCDSO) College of Psychologists of Ontario (CPO) College of Audiologists and Speech-Language Pathologists (CASLPO) College of Denturists (CDO) College of Medical Radiation Technologists of Ontario (CMRTO) College of Massage Therapists of Ontario (CMTO) College of Respiratory Therapists College of Dental Hygienists of Ontario The CPDB data contribution also includes billing organizations <p>Standards-based interfaces supported:</p> <ul style="list-style-type: none"> HL7 v3 data consumption: 6 sites are querying PPR using the HL7 v3 standard. This standard is also used by ONE Portal, the User Registry, ONE ID, and CMTA HL7 v2 data consumption: 2 provincial assets (Panorama, MCTA) are receiving HL7 v2 batch files FHIR DSTU 2 data consumption: a FHIR query is under development with an expected completion in 2018/19. This will first be used with other provincial EHR assets and will then be deployed for external stakeholder consumption 	<ul style="list-style-type: none"> Increase the number of regulated and un-regulated professions contributing to PPR. Multiple formats accepted for trusted organization submission of authoritative provider data Data contributors are able to add and/or revise provider information using a FHIR interface FHIR used exclusively for data consumption Existing HL7 v3 consumers supported for data consumption there is a readiness to consolidate onto the FHIR interface <p>Bidirectional integration with:</p> <ul style="list-style-type: none"> OntarioMD/OTN eConsult POS systems (e.g. hospital information systems, electronic medical records (EMRs), eReferral systems) <p>Data contribution from:</p> <ul style="list-style-type: none"> CPDB College of Physicians and Surgeons of Ontario (CPSO) Source systems College/Association information systems, human resources information systems (2, 3)) <p>Data consumption by:</p> <ul style="list-style-type: none"> Agreements Registry (1) ConnectingOntario Clinical Data Viewer (1) ClinicalConnect™ Viewer (CCV) (1) Consent Management Technology Assets (CMTA) – Consent DHDR NDFP eClaims (1) ENITS (1) Cancer Care Ontario’s ICS/InScreen (1) ONE ID OLIS (1) Ontario MD - Health Report Manager (HRM) (1) Panorama/DHIR PrescribeIT PMMS (1) Provider Directory Portlet Provider Service Directory Scheduling Application (1) BORN (1) SHIIP (1) Consumer portals (e.g., MyChart) (1)
<p>Transition</p> <ul style="list-style-type: none"> Migrate all current consumers from the legacy PR to PPR Release HL7 FHIR PPR query services for consumption Determine if the HL7 v3 interfaces should be deprecated and migrate consumers to the FHIR interface For (1) items, determine if integration with PPR will be using the HL7 v3 or FHIR For (2) items, assess if a non-standard interface is required to submit data to PPR 	

- For (3) item, determine whether an update interface should be offered directly to providers to update their information in PPR. Alternatively, this service may be provided by OTN's provider directory.
- Offer test harness and web service testing of all interfaces in the eHealth Ontario Innovation Lab

Terminology Services

- Not required

Consent Management

Summary of Consent Management Connectivity	
Current State	Future State
<ul style="list-style-type: none"> Consent directives are submitted to eHealth Ontario through mail, fax or OneMail for DI Common Service, and acCDR; the forms are available for downloading from eHealth Ontario's official website; eHealth Ontario's privacy office staff is available via phone and email for assistance to complete the form The patient contacts the Health Information Custodian's privacy office if s/he wants to block access to his/her PHI records Provincial DI Common Service is the first EHR service to use CMTA to manage individual's consent directives in a fully integrated manner, using a proprietary interface. The primary care CDR (pcCDR) proof of concept that is underway is also using this interface DHDR is using CMTA's PubSub queue to obtain a list of consent directives for local use The ConnectingOntario solution has a local consent management service that is integrated with the viewer using the pan-Canadian HL7 v3 consent management standard 	<ul style="list-style-type: none"> When a patient is selected within any of the portals or viewers in the list below, it will trigger a HIAL orchestration to query CMTA to search for a consent directive. This will determine whether clinical data may be displayed. Each of these portals/viewers will need to have the capability to submit a HL7 FHIR consent override to CMTA <p>Consent override service used by :</p> <ul style="list-style-type: none"> CCT ConnectingOntario Clinical Data Viewer ClinicalConnect™ Viewer DI Viewer DHDR Emergency Neuro Image Transfer System (ENITS) Ontario Laboratories Information System (OLIS) Point of Service Systems (e.g. such as hospital information systems, primary care EMRs) CHRIS Wait Time Information System (WTIS) SHIIP
Transition	
<ul style="list-style-type: none"> Develop FHIR-based consent validation and override services Create a HIAL orchestration that will query CMTA when patient information is submitted by a viewing system (this will not utilize the standard as it is 'behind the HIAL') Pub/sub web services will be used to integrate with assets behind the HIAL integrations, such as OLIS, rather than the standards-based interface Point of service consent management systems are synchronized with CMTA through a standards-based subscription and notification mechanism Determine whether a standards-based API should be published to enable patients to self-manage consent policies via an app Offer test harness and web service testing of all interfaces in the eHealth Ontario Innovation Lab 	
Terminology Services	
<ul style="list-style-type: none"> Not required 	

Laboratory

Summary of Laboratory Connectivity	
Current State	Future State
<p>Standards-based interfaces supported:</p> <ul style="list-style-type: none"> HL7 v2 data contribution: OLIS has been connected to all major community and public health labs, most hospital labs, and continues to grow using the HL7 v2 standard HL7 v2 data consumption: OLIS data is accessible from the ConnectingOntario Clinical Data Viewer, ClinicalConnect™ Viewer and eCHN, as well as the Patient Lab Results (OLIS) Portlet. As well, in partnership with OntarioMD, eHealth Ontario certified 11 electronic medical record (EMR) vendors for access to OLIS data for clinical use. Over 10,000 clinicians are successfully connected to OLIS through an EMR. Finally, the first hospital HIS direct integration with OLIS has been implemented in 2017 Terminology services: also utilizes the pan-Canadian LOINC Observation Code Database (pCLOCD) terminology standards to normalize the test names and results and SNOMED CT for microorganisms OLIS uses its own client and provider registries and security and privacy controls Innovation lab offers web services and test harness for HL v2 OLIS submit and query. A FHIR-based practitioner query is also being released in the near future 	<ul style="list-style-type: none"> Expand contribution of lab reports from hospital, community, and public labs that are sent to OLIS using the HL7 v2 standard. All lab reports from hospital, community, and public labs stored in OLIS are available to providers and patients through various channels via HL7 v2. FHIR-based query services are being added OLIS will be integrated with PCR, PPR and CMTA via the HIAL <p>Bidirectional integration with:</p> <ul style="list-style-type: none"> Point of Service Systems (e.g. hospitals and private laboratories, EMRs) (1) <p>Data consumption by:</p> <ul style="list-style-type: none"> ConnectingOntario Clinical Data Viewer ClinicalConnect™ Viewer Cancer Care Ontario's Integrated Cancer Screening (ICS)/InScreen (1) Patient Lab Results (OLIS) Portlet Consumer portals (e.g. MyChart) (1) SHIIP (1) Consumer mobile applications (e.g. No Evidence of Disease (NED), Medly)
<p>Transition</p> <ul style="list-style-type: none"> For data consumption by (1) systems, determine if stakeholders prefer HL7 v2 or FHIR to consume OLIS data Develop FHIR interface for OLIS query and data retrieval based on stakeholder demand) Perform re-conformance testing for labs already contributing to OLIS to ensure that only those results that were agreed to contractually will be exclude from the repository Connect OLIS' local client, provider and consent registries to the provincial assets Offer test harness and web service testing of all interfaces in the eHealth Ontario Innovation Lab 	
<p>Terminology Services</p> <ul style="list-style-type: none"> Test requests names Test results Microorganisms Test-Result and matching pairs 	

Medication

Summary of Medication Connectivity	
Current State	Future State
<ul style="list-style-type: none"> DHDR currently contains Ontario Drug Benefit (ODB), Narcotics Monitoring System (NMS) and pharmacy service data representing approximately 70% of all dispensed medications in Ontario Medication information is currently available at 146 care delivery sites through the ConnectingOntario Clinical Data Viewer and 75 via the ClinicalConnect™ viewer As well, 245 care delivery sites (including community health centres) access medication information through ONE Portal's Drug Profile Viewer (DPV). A proprietary approach is used by DPV for retrieving the data <p>Standards-based interfaces supported:</p> <ul style="list-style-type: none"> HL7 v3 data contribution: Electronic claims are submitted by several regional cancer centres to Cancer Care Ontario's New Drug Funding Program (NDFP) using the HL7 v3 NeCST pan-Canadian standard FHIR STU 3 data consumption: ConnectingOntario Clinical Data Viewer and ClinicalConnect™ Viewer access DHDR via a FHIR query that is based on the FHIR STU 3 May2016 	<ul style="list-style-type: none"> Medication claim information (all people, all drugs) is available for consumption through HL7 FHIR services Primary care providers send prescriptions electronically to pharmacies (e.g. via Canada Health Infoway's PrescribeIT) and to DHDR using HL7 FHIR <p>Bidirectional integration with:</p> <ul style="list-style-type: none"> Point of Service Systems (e.g. EMRs, pharmacy systems, medication reconciliation applications) <p>Data contribution from;</p> <ul style="list-style-type: none"> Health Network System (HNS) Narcotics Monitoring System (NMS) NDFP eClaims Pharmacy Acquirer Host Solutions <p>Data consumption by:</p> <ul style="list-style-type: none"> ConnectingOntario Clinical Data Viewer ClinicalConnect™ Viewer Consumer portals (e.g. MyChart) SHIIP CHRIS
<p>Transition</p> <ul style="list-style-type: none"> Create a FHIR-based interface (aligned to Canada Health Infoway's PrescribeIT initiative) for submitting prescriptions to DHDR Include insured medications records for all eligible Ontarians 24 years old and under to support government legislation change Investigate direct consumption of DHDR by HIS' and EMRs Create a FHIR-based interface for the submission of approved NDFP claims to the DHDR Offer test harness and web service testing of all interfaces in the eHealth Ontario Innovation Lab 	
<p>Terminology Services</p> <ul style="list-style-type: none"> Translate Ontario-specific Drug Information Number (DIN-PIN) (outbound) into recognized drug names 	

Immunization

Summary of Immunization Connectivity	
Current State	Future State
<ul style="list-style-type: none"> Immunization information for Ontarians is housed in the provincial Digital Health Immunization Repository (DHIR). Public Health Units (PHUs) are the health information custodians of the data in the DHIR and access the DHIR through Panorama⁷. Immunization records are also stored in the digital systems of healthcare providers who administer vaccines (e.g., primary care providers, pharmacists), some Public Health Units' EMRs, and on paper Yellow Cards. PHUs may receive immunization records electronically from external sources. PHUs validate these immunization records in Public Health Information Exchange (PHIX) before adding them to DHIR. A limited production release of the Immunization Connect ONtario (ICON) web interface enables Ontario residents to electronically submit and retrieve their immunization records to and from the centralized DHIR through HL7 FHIR services. ICON is currently available to residents of Grey Bruce, Northwestern, Hamilton, and Kingston PHUs. <p>Standards-based interfaces supported:</p> <ul style="list-style-type: none"> FHIR data contribution: FHIR (STU 3 Candidate May 2016 version) for immunization records submission. FHIR data consumption: FHIR (STU 3 Candidate May 2016 version) for immunization records and immunization forecasts/recommendation retrieval (virtual yellow card). 	<ul style="list-style-type: none"> A provincial immunization system where individuals, health care providers, and public health all have real-time access to the same immunization information, including clinical decision support in interpreting the provincial immunization schedule. Rollout of the DHIR service for electronic submission and retrieval of immunization records by the public users through HL7 FHIR R3 services to all PHUs in Ontario. Creation of a DHIR service for health care providers to electronically submit and retrieve immunization records using ICON or directly from their EMR systems through HL7 FHIR R3 services. <p>Bidirectional integration with:</p> <ul style="list-style-type: none"> Point of Service Systems (e.g., Primary care EMRs) Consumer mobile applications (e.g., CANImmunize) BORN ICON <p>Data contribution from:</p> <ul style="list-style-type: none"> PHU EMRs and Portals Pharmacy management systems DHDR <p>Data consumption by:</p> <ul style="list-style-type: none"> ConnectingOntario Clinical Data Viewer ClinicalConnect™ Viewer Consumer portals (e.g. MyChart)
<p>Transition</p> <ul style="list-style-type: none"> Update the FHIR-based interface to meet new business requirements and to align to HL7 FHIR R3 for retrieving and submitting immunizations to/from DHIR Investigate direct integration of DHIR with PCR, PPR, CMTA Work with PHAC (Public Health Agency of Canada) to create Canadian Vaccine Catalogue, replacing old VIDS (Vaccine Identification Database) system Offer test harness and web service testing of all interfaces in the eHealth Ontario Innovation Lab 	
<p>Terminology Services</p>	

⁷ Panorama is the 36 Public Health Units' (PHUs) interface to the provincial Digital Health Immunization Repository (DHIR), the centralized repository of immunization records of Ontario residents. Panorama is used by PHUs to manage vaccine inventories and to support the delivery of immunization coverage assessment and delivery programs. Panorama's immunization forecaster provides clinical decision support by encoding the complex logic of the provincial immunization schedule and applying it to records in the DHIR. Panorama is licensed from IBM and includes a series of Ontario customizations. New applications have been created by the ministry to augment the features of Panorama, namely PHIX (Public Health Information Exchange), Student Information Exchange (STIX), Ontario Integration Adaptor (OIA), Immunization Reconciliation Tool (IRT), Immunization Connect Ontario (ICON), and the Mobile Immunizations (m-IMMS) IOS application.

- Use Canada Health Infoway's (CHI) Terminology Gateway FHIR API to manage vaccine names, immunizing agents, trade names and routes of immunization FHIR value sets based on SNOMED CT subsets.
- Canadian Vaccine Catalogue (will include SNOMED CT to GTIN mapping, enabling vaccine barcoding)
- The DHIR is not currently part of the EHR as defined by O.Reg. 329/04 under the Personal Health Information Protection Act (PHIPA). MOHLTC is currently examining options for including the DHIR in the EHR.
- Milestones will be available from the DHIR project roadmap

Diagnostic Imaging

Summary of Diagnostic Imaging Connectivity	
<p>Current State</p> <p>The IHE XDS-I profile is the standards-based method that enables:</p> <ul style="list-style-type: none"> • DI reports and image manifests are published to the provincial XDS repository (DI Common Service) from all four DI-rs • Access to provincial DI reports is available via ONE Portal; onboarding of providers is ongoing <p>Access to regional DI reports and images is available through regional connecting project viewers (ClinicalConnect™, ConnectingOntario Clinical Data Viewer) and DI-r provided viewers using proprietary methods</p> <ul style="list-style-type: none"> • Regional foreign exam management (FEM) capability is available for a limited subset of hospitals • Hospitals send head scans to ENITS where they are accessed by on-call neurosurgeons 	<p>Future State</p> <p>Provincial DI reports and images are available to providers and clients through multiple access channels including ONE Portal and the regional connecting project viewers using IHE XDS-I. FHIR-based Mobile Access to Health Documents (MHD) profile will be added if there is a stakeholder demand for it.</p> <p>Bidirectional integration (including foreign exam management [FEM]) with:</p> <ul style="list-style-type: none"> • Point of Service Systems (e.g. Independent Health Facilities, hospital-based radiology Picture Archiving And Communications System (PACS) systems, EMRs) (1) <p>Data contribution from;</p> <ul style="list-style-type: none"> • Regional Diagnostic Imaging Repositories (DI-rs) <p>Data consumption by:</p> <ul style="list-style-type: none"> • ConnectingOntario Clinical Data Viewer (1) • ClinicalConnect™ Viewer • Cancer Care Ontario's Integrated Cancer Screening (ICS)/InScreen (1) • DI Viewer • Consumer portals (e.g. MyChart) (1) • SHIIP (1)
<p>Transition</p> <ul style="list-style-type: none"> • For (1) items, determine whether they will prefer to consume XDS-I or FHIR based query interfaces • FHIR-based XDS contribution and consumption of DI reports. Investigate if this will be enabled by the DI Repository product natively (e.g. through product enhancements and/or upgrades) • Offer test harness and web service testing of all interfaces in the eHealth Ontario Innovation Lab 	
<p>Terminology Services</p> <ul style="list-style-type: none"> • Normalize local DI procedure terminology (outbound) to provincial standardized terminology to facilitate consistent data representation • Include terminology for the specialty reports (such as cardiology, ophthalmology) to be made available via the DI repository 	

Clinical Data Repositories

Summary of Clinical Data Repositories					
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Provincial EHR Integration Assets

Audit

Summary of Audit	
<p>Current State</p> <ul style="list-style-type: none"> A full privacy audit solution known as monitoring and control technology assets (MCTA) is in place which uses the IHE Audit Node and Authentication (ATNA) profile for submission of events to the audit log. MCTA currently provides monitoring, alerting and reporting capability for DI Common Service, OLIS and CMTA. MCTA has been integrated with PCR using a proprietary web service to ensure accuracy in identification of a patient 	<p>Future State (Proposed)</p> <ul style="list-style-type: none"> Additional line of business will be integrated with MCTA for privacy auditing utilizing the IHE ATNA profile <p>Data contribution from;</p> <ul style="list-style-type: none"> acCDR Client Details Portlet Client Selector Portlet ConnectingOntario Clinical Data Viewer ClinicalConnect™ Viewer DHDR CMTA DI Common Service Emergency Neuro Image Transfer System (ENITS) HPG - CHRIS Viewer ONE ID OLIS OntarioMD/ OTN eConsult Patient Lab Results (OLIS) Portlet Patient Selector Portlet pcCDR PCR Point of Service Systems (e.g. eReferral platforms) Provider Directory Portlet PPR DI-rs Subscription Management Service CHRIS WTIS BORN Consumer portals (e.g., MyChart) SHIIP
<p>Transition</p> <ul style="list-style-type: none"> Enhance the current IHE ATNA profile to support all systems and events to be logged Update or deprecate the Healthcare Audit Event specification currently published as a Ontario eHealth interoperability specification 	
<p>Terminology Services</p> <ul style="list-style-type: none"> Not required 	

Subscription and Publication/Notification

Summary of Publication and Subscription	
Current State	Future State
<p>Three Pub/Sub solutions at eHealth Ontario are used for different system-to-system integrations:</p> <ul style="list-style-type: none"> • PCR Pub/Sub System is used internally to broadcast changes to a client's demographic information using the pan-Canadian HL7 v3 standard • PR Pub/Sub is HL7v2-based system and used to facilitate communicating data changes in PR to external subscribing systems such as Panorama • OLIS Pub/Sub system is used externally to exchange laboratory information 	<p>A consolidated Pub/Sub solution with a standard set of web services will be exposed out of HIAL and available to EHR consumers and contributors:</p> <ul style="list-style-type: none"> • acCDR • DHDR • Cancer Care Ontario's Integrated Cancer Screening (ICS)/InScreen • OLIS • Ontario MD HRM • OntarioMD/OTN eConsult • Panorama/DHIR • Point of Service Systems (e.g. hospital information systems, EMRs, eReferral systems) • PCR • pcCDR • PPR • Terminology Services • CHRIS • BORN
Transition	
<ul style="list-style-type: none"> • Determine the HIAL-based subscription and notification (pub/sub-standard(s)) that will be supported • Develop and publish the web services for Pub/Sub • PCR and PR Pub/Sub capability, as well as OLIS data broker functionality will be replaced with the HIAL-based subscription and notification 	
Terminology Services	
<ul style="list-style-type: none"> • Not required 	

ONE ID

Summary of ONE ID	
Current State	Future State
<ul style="list-style-type: none"> ONE ID systems and processes are approved for protection and access of PHI and it currently provides inclusive security services for OTN, Cancer Care Ontario (CCO), ONE Portal, DPV, OLIS, Panorama and others Single Sign On (SSO)/Patient Context Sharing Standard v1.5 is the most recent approved version (March 2017). The HIAL currently supports 5 versions of the interface (v1.3, 1.4, 1.42, 1.46, 1.5) Health care client context management between POS systems and EHR viewers occurs at EHR viewer launch only 	<ul style="list-style-type: none"> ONE ID is an identity federation operator and routes distributed authentication traffic for the province Participating viewers and POS systems are able to set, acquire and release health care client and provider context, enabling health care client context to be continually maintained between a provider's POS system and EHR viewer using either SAML or OAuth 2.0 <p>Identity data authorization and context management from:</p> <ul style="list-style-type: none"> Agreements Registry ConnectingOntario Clinical Data Viewer ClinicalConnect™ Viewer (CCV) DHDR Drug Profile Viewer (DPV) eCHN Emergency Neuro Image Transfer System (ENITS) HPG - CHRIS Viewer ONE Portal OntarioMD/OTN eConsult PMMS Point of Service Systems (e.g. EMRs, eReferral platforms) SHIIP Consumer portals (e.g., MyChart) CHRIS
<p>Transition</p> <ul style="list-style-type: none"> Approve and publish SSO and Context Management standard to enable dynamic context management between ONE-ID enabled applications Approve and publish Single-Sign-Off standard Implement native OAuth 2.0 support on the HIAL infrastructure Approve and publish a authentication and OAuth 2.0 authorization standard leveraging OpenID Connect Offer Open ID Connect Offer test harness and web service testing of all interfaces in the eHealth Ontario Innovation Lab 	
<p>Terminology Services</p> <ul style="list-style-type: none"> Not required 	

Terminology Services

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Portals and Viewers

For the foreseeable future, it will be necessary to rely upon EHR portals and viewers to ensure all providers have access to provincial EHR information. In addition to the ConnectingOntario Clinical Data Viewer and ClinicalConnect™, other portals and special focus web applications target specific audiences and work flows for creating or modifying health care client data. Examples include Integrated Assessment Record (IAR), Care Coordination Tool (CCT), CHRIS, DHIR/Panorama and eCHN. They will continue to exist as standalone applications until the content and consumption channels are rationalized.

Evolving Needs and Emerging Opportunities

Data Exchange Standards Modernization

In the [Current State of Ontario EHR Interoperability](#) section it is noted that the current suite of standards that are supported by EHR assets have been chosen based on clinical, business and technical standards selection decision criteria and/or alignment with pan-Canadian standards. The interoperability profiles in the previous sections identified which interoperability standards are supported by each asset, as well as the stakeholders that are gaining value from implementing these standards when contributing or consuming data. In some cases, multiple interoperability standards are offered.

The Health IT community has gained significant experience in large-scale interoperability in North America over the past decade. HL7 International and the international health IT community have decided that, while there are many valuable building blocks from the development of HL7 v3, it will not lead to large-scale interoperability due to its complexity and message density⁸. The community has therefore thrown its support behind the development of FHIR as a modern, web-based, intuitive, lightweight alternative. While the scope of FHIR does not include a security protocol, the OAuth security and OpenID Connect authentication standards, which are used by Internet-based eCommerce service providers, are the favoured approaches. Many projects and products, including several Ontario EHR assets, are already offering interoperability application program interfaces (APIs) that leverage these standards.

Health information exchanges in the US that already offer interoperability standards are planning how to support FHIR. Health information exchanges are continuing to promote their existing interoperability standards while preparing for FHIR^{9,10}. This is due to the extent of existing investment in and experience with existing standards. Similarly, Ontario stakeholders are considering when to adopt FHIR within the context of the existing set of skills and system interfaces.

It is of the utmost importance that the EHR offer modernized interoperability standards¹¹. Innovative applications and new vendors are aligned to the REST architectural paradigm underlying FHIR; it is easier for implementers to learn, and mobile device performance is improved by it. The United States' Office of the National Coordinator for Health Information Technology continues to expand its efforts to identify interoperability standards. This will influence vendors within the North American health IT market, which is a primary source of health IT products in Ontario for most health care settings. Therefore, the EHR interoperability standards should align to these where possible. The EMRs in use in primary care and some community health settings continue to have systems originating in Canada, and some vendors are monitoring the trend with FHIR to determine how use of FHIR may improve the potential for their systems beyond the borders of Canada. Recently, the Ontario Telehealth Network (OTN) has taken on a mobile application (app) evaluation role, and there are more apps coming to fruition through app challenges, innovation labs, and through [SMART on FHIR](#) in the US.

The US Office of the National Coordinator has been proactively promoting interoperability challenges and included FHIR in its [Interoperability Standards Advisory](#) for 2017. As of March 21, 2017, HL7 FHIR Standard for Trial Use (STU) 3 is the official published version, and FHIR is expected to be an approved HL7 standard in 2018. eHealth Ontario's recently launched Trial for Use section in the Ontario EHR Interoperability Standards on the website provides a platform for sharing emerging specifications using FHIR. Work is in progress to collaborate with Canada Health Infoway and other jurisdictions to share, learn, and advance the international standards, and identify the necessary pan-Canadian supports for shared use of FHIR in Canada, such as a URI Registry. eHealth Ontario will

⁸ https://files.ontario.ca/8_mohawk_college.pdf

⁹ <http://healthitinteroperability.com/news/directtrust-seeks-potus-support-of-ehr-interoperability-hie>

¹⁰ <http://sequoiaproject.org/carequality-blog/carequality-commonwell-connectivity-faqs/>

¹¹ <https://www.ontario.ca/page/value-and-opportunities-created-ontarios-digital-health-assets>

continue to monitor the standards ecosystem, standards supporting structures (e.g. FHIR development, publication and conformance tools, URI registries, and FHIR servers). Ontario's EHR is expected to evolve along with the diverse standards landscape, so eHealth Standards will continue to work with many partners to harmonize and align in the best interests of interoperability in the EHR for Ontario.

The interoperability profiles in the previous sections identify where transition activities are being planned to offer modernized EHR services. These will be augmented to align with Ontario's digital health strategy and the broader market direction. The existing interoperability standards will continue to be supported until EHR implementers indicate that these are no longer desired and/or there is a business rationale to deprecate them.

Interface/API Management

EHR interoperability standards evolve over time due to maintenance, new requirements and changes to the base standards. For instance, three versions of the ConnectingOntario input standard have been released. It is expected that as FHIR evolves, interfaces built upon previous releases will need to be updated. While efforts are made to maintain backwards compatibility between versions, this is not always possible or desirable.

A tactical plan should be developed to establish guidelines regarding EHR interface/API management, which can be informed from a growing knowledge base from other industries that have already made extensive progress in API management. It should provide guidelines regarding:

- Anticipated scheduled releases and events resulting in unscheduled releases
- The number of versions of an interface/API that will be supported at a time
- The strategy for migrating contributors/consumers in a cost-effective manner

Achieving Semantic Interoperability

Semantic interoperability means that two or more computers are able to interpret the meaning of data in the same way. It takes advantage of both the structuring of the data exchange and the codification of the data, including vocabulary, so that the receiving IT systems can interpret them. This enables the receiver to have the same understanding of content, context and intent of the data as it was collected, so that it can be used "to coordinate care when you need it without a lot of effort or cost".¹² The current set of EHR interoperability standards support semantic interoperability for a small set of data elements that were identified by stakeholders, primarily for the purpose of direct care delivery and coordination. As well, there is a high value to structured data for secondary use, such as population health, analytics, health system planning and research.

Achieving semantic interoperability is a complex socio-technical challenge. Providers use different terms to refer to the same concept; conversely, there may be overlap between concepts that share similar terms (e.g. s for two different concepts may be the same). Even if there is agreement amongst all human actors to use specific terms to refer to specific concepts, there must be willingness amongst providers to document terms in a manner that may be less familiar and require additional time. Competing priorities, time pressures and perceived incentive and/or value may undermine this effort. Finally, typographical errors and intentional variants (e.g. acronyms) can be introduced during data entry. The technology challenge stems from the fact that different information systems' data models constrain how data is collected (e.g. free text, drop down pre-defined list, the ability to select multiple terms within a value set) and stored (highly normalized or 'blobs' of co-mingled concept attributes)¹³. Many considerations must therefore be factored into planning an approach to enabling semantically interoperable data exchange and secondary use.

¹² https://files.ontario.ca/17_john_halamka.pdf

¹³ http://www.auditor.on.ca/en/content/annualreports/arreports/en16/v1_303en16.pdf

While there are no convenient solutions to enabling semantic interoperability, three approaches can be applied to achieve it incrementally:

- At source – collaboration between care providers to identify core data of interest and the means of capturing it in a format that can be supported by all information systems (for data storage and transmission). From a semantic perspective, this is the optimal approach in that that data being shared is the same data that was collected by the provider; there is no transformation or mapping applied. This yields the highest level of data quality and integrity. Clinical document improvement initiatives, such as developing templates for commonly shared documents (e.g. referrals, discharge summaries), can be used to facilitate this approach. Another option is for providers to map the local data to a common terminology prior to data transmission. This is less desirable because it is extra work for the providers, is outside their area of expertise, and must occur each time data is shared.
- Transformation – this approach utilizes a semantic mediation layer (e.g. an interface engine) or a terminology services asset to transform data using predetermined value set mappings. This approach is sensible where it is too costly to modify the POS systems to collect data in a standardized manner but the type of values that the data point of interest can be bounded. This is the approach used for [OLIS](#), the [acCDR](#) and [Diagnostic Imaging](#). The more subjective or contextual the datapoint of interest is, the less likely it is that a mapping can be applied after the fact that will reliably represent the provider’s intent.
- Computer assisted – this approach utilizes pattern recognition techniques such as optical character recognition and natural language processing to generate structured data from less structured content. As well as the success factors for transformation, success with this approach is highly dependent on the level of pre-existing structure in the underlying data (e.g. data entered into a template but stored in a flat file format such as PDF).

The International Health Terminology Standards Development Organization (IHTSDO) has created a business case describing the clinical and non-clinical benefits of enabling semantic interoperability through a standard such as SNOMED-CT¹⁴. Three success factors for achieving semantic interoperability are highlighted below:

- Aligning benefits – the value of semantic interoperability is gained by the receiver of the data in that they can use it immediately and reliably for clinical and non-clinical purposes rather than have to re-collect, confirm or transform it first. Conceptually, in a large health care system, everyone will be both a data collector and receiver but the burden of data collection will be borne by some more than others. For these stakeholders, the immediate burden of standardized data collection can outweigh the less frequent or less valuable return value of receiving standardized data from others. For instance, although there is a symbiotic relationship between the documentation shared between emergency physicians and primary care physicians, they burden of standardized data collection may be greater on one role than the other. As such, it is important that due attention be paid to align the tangible return on investment with the time and effort expected from each stakeholder group
- Focus on high value data – efforts to improve semantic interoperability should be focused on the data domains that correlate with high cause of errors / costs and/or where there is already a regulatory / policy requirement to submit the data (e.g. billing data). Amongst these, further filtering can be applied to select well-understood data concepts. For example, the United States’ Office of the National Coordinator for Health Information Technology has identified a list of priority data domains in its Interoperability Roadmap Final version 1.0 Figure 7).
- Market capability – stakeholder engagement is critical to assess the capability of the existing installations of POS systems to accommodate the collection and/or transmission of priority data domains in a standardized format to enable semantic interoperability. This will serve as an additional filter to short-listing the data domains that should be attempted in the short term and which will require longer-term planning to achieve.

¹⁴ <http://www.snomed.org/snomed-ct/why-should-i-get-snomed-ct/business-case>

Governance to Achieve the Interoperability Plan

Broad stakeholder representation in the governance of this Interoperability Plan is critical to guide its elaboration and implementation. The transition sections in the interoperability profiles identify many areas that will require input and discussion to make informed decisions. For instance:

- Selection of standards for contribution and consumption of EHR assets by various POS systems based on business needs and technology capabilities that are in place currently and in the future
- How to balance the achievement of Ontario-specific interoperability needs with the objective of minimizing the development of ‘made-in-Ontario’ standards that deviate from North American and international standards selections
- Which interoperability standards (or older versions of a standard) should be deprecated, the timing for phasing them out and how to support stakeholders to transition to newer standards
- Advising on the areas of focus for achieving semantic interoperability that weigh the cost and effort against the return on investment
- Providing input and feedback regarding existing standards compliance, return on investment and opportunities for improvement to maximize the value that can be realized by the health care system through interoperability

Ontario already has an EHR Architecture and Standards Governance Committee structure in place with broad stakeholder representation. Several opportunities for enhancing this structure are under consideration in light of the need to enhance interoperability. The Ontario Health Informatics Standards Council (OHISC) is also contributing to the enablement of semantic interoperability.

Information Management

Standards-based interoperability is a means to achieving the goal of enabling access to data for multiple purposes. These purposes include: informing care coordination and delivery, enabling patient self-management, administrative, financial, and legal requirements, quality improvement, and a broad range of research and secondary use purposes (e.g. health intervention assessments, clinical trials, health systems, population health, predictive and prescriptive analytics). Decisions regarding the selection of data content and structure standards should therefore be guided by a clear understanding of how the data is intended to be collected, stored, utilized, retained, assessed for quality, presented to consumers, protected, and disposed of. A comprehensive information management perspective will unveil opportunities, constraints, trade-offs and solutions that can influence standards selection decisions. Many projects do not have the opportunity to fully assess the information management aspect in great detail before design and implementation begin. In most cases, it is very difficult and costly to introduce modifications once implementation is complete.

The knowledge domain of digital information management has matured and there are many IT practitioners with health care specific-experiences. New initiatives should draw upon this body of knowledge to perform upfront assessments. Even where comprehensive assessments cannot be completed due to constraints, experienced practitioners can identify opportunities, considerations and risks that can enhance project planning, stakeholder engagement and potential benefits.

Improving Implementation through Standards Conformance

Using internationally recognized interoperability standards to achieve provincial EHR connectivity positively influences the overall implementation. These standards have a greater likelihood of being enabled in vendor products, are ‘road-tested’, and are familiar to implementers. This can result in lower overall costs and timelines.

Ontario can consider enhancing the reliability of compliance to required EHR interoperability standards through conformance testing and certification. Conformance testing is conducted by evaluating whether a system is able to send and/or receive the correct, complete messages for a given use case. eHealth Ontario's Innovation Lab could serve as an ideal facility for offering self-assessment as well as validated conformance testing.

Certification denotes a formal recognition that a product has successfully passed conformance testing by a recognized testing body. An EHR certification service enables vendors to demonstrate that they have met the privacy, security, and interoperability standards established by eHealth Ontario. Stakeholders would then be able to specify EHR certification as a procurement requirement, which would be advantageous to the many stakeholders that are seeking to replace existing systems (as part of the HIS Renewal Advisory Panel recommendations¹⁵).

¹⁵ <https://www.ontario.ca/page/value-and-opportunities-created-ontarios-digital-health-assets>

Appendix A: Glossary/Acronyms

ACRONYM	DEFINITION
acCDR	Acute Care Clinical Data Repository (may contain documents and/or data)
ADT	Admit, Discharge, and Transfer
BORN	Ontario's Pregnancy, Birth and Childhood Registry and Network
CCO	Cancer Care Ontario
CCT	Care Coordination Tool
CDA	Clinical Document Architecture
CDR	Clinical Data Repository (may contain documents and/or data)
CHRIS	Client Health and Related Information System
CMTA	Consent Management Technology Assets
CMTF	Consent Management Technology Program
CPDB	Corporate Provider Database
DHDR	Digital Health Drug Repository
DHIR	Digital Health Immunization Repository
DI, DI CS	Diagnostic Imaging, Diagnostic Imaging Common Service
DI-r	Diagnostic Imaging Repository
DPV	Drug Profile Viewer
DSTU	Draft Standard for Trial Use
eCHN	Electronic Child Health Network
EHR	Electronic Health Records
EMPI	Enterprise Master Patient Index
EMR	Electronic Medical Record
ENITS	Emergency Neuro Image Transfer System
FEM	Foreign Exam Management

ACRONYM	DEFINITION
FHIR R3	Fast Healthcare Interoperability Resources, Release 3
GTA	Greater Toronto Area
HDIRS	Hospital Diagnostic Imaging Repository Services
HIAL	Health Information Access Layer
HIS	Hospital Information System: a comprehensive, integrated information system designed to manage the administrative, financial and clinical aspects of a hospital.
HNS	Health Network System
HPG	Health Partner Gateway
HRM	Health Report Manager (formerly known as Hospital Report Manager)
IAR	Integrated Assessment Record
ICON	Immunization Connect Ontario
IHE	Integrating the Healthcare Enterprise
IHF	Independent Health Facility: privately run facility providing clinical services
LOINC	Logical Observation Identifiers Names and Codes
MCTA	Monitoring and Control Technology Assets
MCTP	Monitoring and Control Technology Program
MHD	Mobile Access to Health Documents
MOHLTC	Ministry of Health and Long Term Care
NDFP	New Drug Funding Program
NMS	Narcotic Monitoring System
OACCAC	Ontario Association of Community Care Centres
OBD	Ontario Drug Benefit Program
OLIS	Ontario Lab Information System
ONE	Ontario Network for eHealth
OTN	Ontario Telemedicine Network
PACS	Picture Archiving And Communications System: supports the storage and flow of medical imaging studies, including advanced imaging display workstations that provide dedicated and specialized

ACRONYM	DEFINITION
	functionality for the interpretation of imaging studies.
pcCDR	Primary Care Clinical Data Repository (may contain documents and/or data)
pCLOCD	pan-Canadian LOINC Observation Code Database
PCR	Provincial Client Registry
PHU	Public Health Unit
PIM	Provincial Integration Model
PMMS	Patient Monitoring Management Systems
POS	Point of Service system: any application used by health care providers to manage health care clients, such as: <ul style="list-style-type: none"> • Physician EMRs • Hospital information systems • Human Resources (HR) information systems • Dentist EMRs • Oncology Patient Information System (OPIS), used by Cancer Care Ontario
PPR	Provincial Provider Registry
REST	Representational state transfer. RESTful web services are a way of providing interoperability between computer systems on the Internet
RPDB	Registered Persons Data Base
SHIIP	South East Health Integrated Information Portal
SOA	Service Oriented Architecture
SSO	Single Sign On
SWO	South West Ontario
SWODIN DI	Southwestern Ontario Diagnostic Imaging Network , Southwestern Ontario Diagnostic Imaging
WTIS	Wait Times Information System
XDS	Cross-Enterprise Document Sharing