

eHealth Ontario

Provincial eReferral Strategy

Conceptual & Information Architecture Report

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1.0 Executive Summary

1.1 Purpose of This Report

This architectural vision lays the groundwork to build a foundational infrastructure that all organizations can contribute and participate in – an infrastructure that connects vendor systems with other clinical systems and with provincial assets, building an end-to-end, integrated information systems business network across the Province that enables clinicians to refer patients to the care they need, anywhere in Ontario.

Along with the referral conceptual architecture, this report provides a high-level business framework to set the context that the eReferral conceptual architecture will operate within. Business processes maps are provided for five sample referral pathways that represent near-term candidates for provincial eReferral implementation, along with the PanLHIN Referral Management Working Group Guiding Principles that illustrate the high-level business requirements this conceptual architecture was based upon.

The report will be of specific interest to the Pan LHIN Referral Management Working Group Referral Management (RM) Working Group (WG) and MOHTLC to inform the feasibility of the broader Provincial Electronic Referral (eReferral) strategy. It will also be of interest to stakeholders with roles in the planning and delivery of eReferral services within Ontario (e.g. vendors, innovators, IT planners, and provincial/regional delivery partners/LHINs). Finally, Ontario citizens and advocacy groups may be interested in understanding the proposed direction for achieving an Ontario eReferral ecosystem.

In fall 2018, eHealth Ontario introduced the ONE Access Strategy in support the Agency's role as the provincial Integration and Technology Service Provider. The ONE Access Strategy will leverage existing investments and will help to increase adoption by offering easy access to the digital health information health providers want, when they want it and how they want it.

It should be noted that a significant part of this updated conceptual architecture now supports many types of e* initiatives including eConsult, ePrescribe and others. This report will continue to focus on eReferral but the reader should note that any e* service can be accommodated by this architecture.

This architecture also lays the foundation for adoption of a Blockchain based service in the future (See Section 9). While Blockchain technology presents a compelling avenue for e* solutions, additional work is required to validate and gain additional experience before committing to its use.

1.2 Business Drivers

Clinicians need to be able to refer patients to the care they need, anywhere in the Province in a fair and consistent manner. Current paper-based referrals and disconnected electronic systems are a significant barrier to this. The conceptual architecture solves this problem by:

- Establishing a formal standard mechanism for referral systems to communicate
- Establish industry standard messaging and vocabulary standards (HL7-FHIR) that requires all vendors to comply with in order to support interoperability
- Ensure that all participants have access to a complete transaction history of referral events and status information
- Ensures that participants can evolve and innovate without undue constraints on the architecture.
- Ensures the ability for easier integration with EHR Assets by leverage the agencies ONE Access Strategy.

Health care IT planners, from across multiple organizations who are responsible for putting in-place the enabling electronic systems to support patient referrals, currently do not have a roadmap as to how to do this in a coordinated manner – a manner that advances the Province, as a whole, and enables referrals to flow across Ontario. A Provincial eReferral Strategy is needed. The Conceptual Architecture provides the technical approach in support of that goal.

1.3 Working Groups

As a result of the above-noted need for strategic direction, the Referral Management Working Group submitted a Statement of Work that was endorsed by all 14 LHIN CEOs (August 2017) and by the MOHLTC (funding flow in March 2018) to develop a Provincial Electronic Referral (eReferral) Strategy. PanLHIN Referral Management Working Group Guiding Principles were developed (Section **Error! Reference source not found.**) to communicate the vision and guide various stakeholders in the development of the strategy.

***Note:** MOHTLC will utilize the strategy, along with other ongoing initiatives, to inform future investments in a provincial eReferral program and other e* initiatives.*

To advance this work, a Provincial eReferral Strategy – Architecture Working Group was formed, consisting of 17 members from a cross-section of key digital health partner organizations from across the Province including: LHINs, the eHealth Centre of Excellence (ECE) that manages the System Coordinated Access (SCA) program in Waterloo Wellington LHIN, eHealth Ontario, OntarioMD (OMD), Ontario Telemedicine Network (OTN), and Health Shared Services Ontario (HSSO). These organizations came together and collaboratively worked to develop the architectural vision, contained herein, based on the Guiding Principles.

1.4 Value

The Provincial eReferral vision will benefit multiple stakeholders across Ontario's healthcare system:

- **Patients** benefit from more efficient access to specialized care and support services as well as enhanced safety and quality of care as they transition through the care continuum;
- **Health service providers** benefit from improved communication and a more streamlined referral process and access to eReferral content and status
- **Health system planners** benefit by having access to consistent and accurate referral data to inform their planning.
- **Health Technology Providers** benefit from a consistent broad range approach to managing interoperability among a variety of vendor clinical solutions and EHR assets.

The value that an eReferral solution brings to the end-to-end referral process increases when it can interoperate with many other systems to expand the number and type of service providers that can be referred to, leverage existing clinical data, reduce duplication and streamline workflow.

The future-state vision documented in this report, and graphically shown in Section 6.5, facilitates realization of this value. It enables a broad range of health care clinicians, as well as patients themselves to initiate eReferrals to an equally broad range of service delivery providers, and have access to up-to-date referral information such as the status of the referral (e.g., specialist has accepted the referral) and appointment information (Section **Error! Reference source not found.**, Guiding Principle #4.). The fact that a referral may traverse multiple systems from the original Referral Requestor to the Referral Recipient is transparent to people using the system, as the high-level design ensures a consistent experience for users – i.e., they don't have to log into and traverse multiple systems (Section **Error! Reference source not found.**, Guiding Principles #3).

1.5 Proposed Architecture

1.5.1 Distributed Referral Management Systems

The architecture proposed fulfills the PanLHIN Referral Management Working Group Guiding Principles while enabling flexibility for eReferral systems to plug and play in an eReferral (and e*) ecosystem, while maintaining innovation and flexibility for LHINs to respond to changing business drivers/needs and facilitating competitive pricing by vendors – versus employing a one-system monopoly.

Providers within each LHIN will access an RMS (Referral management system) that facilitates the following pivotal functions:

- Serve as the point of entry into the eReferral ecosystem for Point of Service (POS) systems and/or used by providers without a POS system to directly initiate an eReferral;
- Contains an internal Service Directory (with authoritative health care provider data from the PSD) to ensure patient needs can be efficiently matched to the most appropriate and timely care, and provide patients with a choice of Referral Recipients, including those that provide their services: on evenings or weekends, through telemedicine, in a specific language, etc. (Section **Error! Reference source not found.**, Guiding Principles #8 and #9);
- Matches and connects referrals to non-local RMS-based end-point consultants and service information via the Provincial Service Directory
- Contain data related to all referrals that are initiated or received within that system. Authoritative referral content is not duplicated by available from the source that created it
- Each RMS will have the ability to interact with ONE ID, PSD, PPR, PCR and other EHR Assets to enable value added services and capabilities.

1.5.2 Benefits

There are several benefits to this decentralize/distributed model discussed above:

- **Leverages LHIN investments:** This model respects the existing investments that LHINs have made into RRSs. It is strategic, highly scalable, reusable and sustainable. It utilizes standardized interfaces and data to connect systems, does not build in duplication, and does not require LHINs to rip and replace existing systems with a new system (Section **Error! Reference source not found.**, Guiding Principles #1, #2, #5, #6).¹
- **Leverages eHealth Ontario investments:** eHealth Ontario will provide services to allow vendors access to PPR, PCR, and ONE ID using standard FHIR interfaces through the ONE Access Gateway, as well as provide an API to record the transactional activity for both internally managed referrals as well as those transacted between multiple vendors. The Transactional Activity will allow vendor and portal implementation to determine the activity of a particular patient regardless of where the referral originated or terminated. It also contains sufficient information for authorized users to obtain the original content.
- **Leverages provincial investments:** such as the OTN Directory which is linked to the provincial Provider Registry and additionally contains related telemedicine service profiles and community data. The OTN Directory is the critical linking component to over 800K telemedicine consults each year and is being deployed by the TCLHIN as a key access to e-care services for primary care practitioners.
- **Levels the playing field:** A distributed model allows for innovation by allowing new vendors to participate by providing value added services in the eReferral ecosystem in an incremental fashion. In recognition of these stakeholders, as well as services that already have investments in a custom eReferral service, the architecture supports multiple Referral Management Systems (RMSs) sending/receiving referrals to/from each other (called inter-system referrals). RMSs are also used by Referral Requestors to initiate referrals to Referral Recipients that use the same system (called intra-system referrals). In both of these scenarios, eReferral data is shared with the each LHIN's RRS (including out-of-province referral data) to capture all of the referral activity within the region, enabling LHINs to have end-to-end visibility, reporting, and analytics throughout the life-cycle of a referral to inform ongoing, system-wide improvements (Section **Error! Reference source not found.**, Guiding Principles #10, #11, #12).
- **Enables flexibility:** The distributed model offers the flexibility to scale and incorporate new eReferral vendors and pathways into the ecosystem, enabling the Province to implement eReferrals in a manageable manner, which relies on an effective governance structure being put in place as part of the overall strategy (Section **Error! Reference source not found.**, Guiding Principle #7). See example below.

¹ Currently, all LHINs, except one, are in a position to select an RRS for their region. The definition, criteria, and maturity model of what a RRS is, is part of the scope of the strategy.

Example of Flexibility

The following five methods are available to process a referral, depending on the Referral Recipient's electronic readiness:

1. **Provincial Standard Referral Pathways:** Standard datasets between electronic systems (bi-directional communication).*
2. **Bi-directional Generic Referral Pathways:** Minimum Data Set (MDS) exchanged between electronic systems (bi-directional communication).
3. **One-way Generic or Standard Referral Pathways:** MDS one-way communication from RRS to a paper-based or non-integrated electronic receiving system (e.g. generic or provincial standard referral forms with MDS being faxed/auto-faxed out to Referral Recipients).
4. **One-way Pathway Hyperlink:** Navigate from RRS to non-integrated external electronic system or a website providing a downloadable and/or fillable acrobat referral form that a provider uses.
5. **Pop-up RRS Target window (viewlet) within RRS Source** (within Referral Source (RS) window if from POS) using the ONE Access Viewlet standard which will ensure all vendors and consumers of these services can fully participate.

*Point #1 (above) references provincial referral standard pathways between two electronic systems. Since these pathways are standardized [i.e., the four provincial referral standard pathways: "Acute" to 1) Home and Community Care for in-home services; 2) Long-Term Care; 3) Rehabilitation; or 4) Complex Continuing Care], if a referral is being sent from "Acute" for "Rehabilitation" and the receiver is not using an electronic system, this would result in #3.

1.5.3 Conceptual Information Model

This report includes an information architecture section derived from the provincial [Conceptual Information Model](#) (CIM). It explains the data concepts that are relevant to the design of a Provincially accessible Service Directory and eReferral repository. This lays the foundation for detailed data design aligned with the other Ontario digital assets that comprise the electronic health record (EHR).

1.6 Deployment Priorities

Upon approval and final planning for the Provincial eReferral Strategy, five high-level deployment priorities will accelerate the realization of this conceptual architecture into reality:

- **Select** the first five referrals pathways that will be prioritized for provincial standardization and proceed with the extensive work required to achieve business standardization that will precede pathway digitization. **Note:** the CIA is agnostic of specific pathways.
- **Define** the key performance indicators and related data concepts that are needed for system and resource management and specify a common terminology for these that must be supported by all eReferral ecosystem stakeholders.
- **Clarify** with stakeholders the role(s) each of their systems will have in the ecosystem (i.e., which systems are the LHIN RRS, which systems will be RMSs, provincial and/or regional patient portals) and the minimum capabilities required to demonstrate in order to integrate into the eReferral ecosystem.
- **Build** and Establish the participants in the Service Directory. The eReferral Provincial repository is now decentralized allowing this capability to be immediately realized without significant investment, time and resources.
- **Develop** the full set of interoperability guidance (data exchange and terminology standards) for all exchanges between systems and release rigorous, open conformance testing capabilities and services to ensure that all eReferral ecosystems stakeholders have implemented the standards fully and correctly.

2.0 Overview

2.1 About Referrals

Successful transitions in care are critical to achieving an optimal patient experience, effective care delivery, and enhanced system efficiency. The providers joining the health care client's² care team needs timely, relevant, accurate and up-to-date information to effectively deliver care services. The focus of this report is on referrals (defined as 'the practice of requesting a service, care, support, and/or advice for a health care client from a health care provider³'), which are one of the most common forms of transition in care.

Examples of referrals from across the healthcare system include:

- A parent requesting school-based speech language therapy services for his/her child;
- A family member requesting meal delivery and friendly visits for an elderly person living in the community;
- A Primary Care Provider (PCP) seeking advice or an in-person assessment from a specialist;
- An Emergency Medical Services (EMS) Responder request for Local Health Integrated Network (LHIN) - coordinated services for patients repeatedly contacting EMS;
- A hospital-based discharge planner assisting the transition of a patient to a complex-care facility or home with the support of needed home-care services;
- A PCP seeking palliative care services for an end-of-life health care client.

2.2 eReferral Technology Solutions

Note: In this document, “eReferrals” refers to the automation of one or more activities involved in initiating, negotiating and closing the referral process.

As with other areas of healthcare, care providers are at various stages of introducing technology to mediate referrals. Potential benefits that can be realized through utilization of technology in the referral space include secured delivery of referrals, comprehensive Ontario view of referral flows and status, improvements in the efficiency, access, quality, and continuity of care, better quality of documentation and communication, and reduced cost⁴.

Ontario stakeholders have made solid progress in implementing eReferral technology for specific referral pathways. LHINs have built and purchased eReferral systems to optimize priority pathways within their regions. Vendors have attracted physicians and community service organizations to use their platforms to improve the efficiency of referring and booking services. Specialty networks, such as [the Hospital for Sick Children](#) and the [Ontario Bariatric Network](#), offer an eReferral central intake service while OTN delivers a Health Services Directory to match and connect telemedicine and specialist eConsult services. Customized integrations are established and used to connect some of the eReferral products in the Province.

² The terms “patient”, “consumer”, and “health care client” are used interchangeably in this report.

³ eHealth Ontario. (2012). *eReferral Standard Implementation Guide*. eHealth Ontario.

⁴ Gu Y, Warren J, Orr M. (2014). The potentials and challenges of electronic referrals in transforming healthcare. *New Zealand Medical Journal*. 127(1398):111-8.

2.3 Provincial Strategic Direction

2.3.1 Approach

Two important direction-setting initiatives have laid the foundation for a Provincial eReferral strategy:

- LHIN eHealth leaders have recognized that a coordinated approach is necessary to leverage the eReferral knowledge and experience of individual LHINs. Coordination maximizes the reuse and spread of existing pathways, as well as minimizing duplicate spending. To this end, the Ontario PanLHIN Referral Management Working Group, with representation from all 14 LHINs, was created to share information and coordinate activities regarding standardized referral forms and the approach to expanding eReferral offerings.
- The Ministry of Health and Long-Term Care (MOHTLC) has funded the implementation of the *Ocean eReferral Network* in Waterloo Wellington (WW) LHIN, and the expansion of up to seven other LHINs⁵. While this will accelerate the adoption of eReferrals within each LHIN (intra-LHIN), eReferrals between LHINs (inter-LHIN), and/or between eReferral systems (inter-system), integration will be required to enable the flow of eReferrals across the Province.

The PanLHIN Referral Management Working Group engaged eHealth Ontario and other provincial digital health partners to develop this architecture in support of a provincial eReferral strategy. Using the PanLHIN-approved Guiding Principles and the business processes of several referral pathways as high-level business requirements, the objective is to create a blueprint for implementing a provincial eReferral ecosystem.

eHealth Ontario has significant subject matter expertise in designing system architecture and integration, as well as experience in various Ontario-based eReferral initiatives. The Ontario *eReferral Provincial Reference Model (PRM)*, published by eHealth Ontario in 2015, provides architectural and standards guidance to regional initiatives. eHealth Ontario subject matter experts have contributed to the planning and/or implementation of:

- The Ocean eReferral Network in Waterloo Wellington LHIN;
- OntarioMD's eReferral Business Case;
- EMR integration with Ontario Telehealth Network's eConsult service (recently renamed the "Ontario eConsult Program").

eHealth Ontario has recently established an updated strategy referred to as the ONE Access Strategy that leverages and modernizes its existing assets and capabilities. This strategy has garnered considerable support from various agencies and the Ministry. The eReferral conceptual architecture leverages ONE Access which has led to a number of improvements and efficiencies that will make realization of the eReferral strategy more practical.

- Large complex development of central repositories are not required, consent content is maintained at its source.
- Future integration with BLOCKCHAIN technology is enabled to provide further cost savings, services for eReferral and other e* solutions.
- Current proof of concepts and implementations can proceed without waiting for a central hub solution
- Vendors can continue to innovate without impeding progress negotiating changes to an exclusively central solution
- Vendors can access to provincial assets where required (they are available now or are imminent) through a standards based API Gateway
- More incremental approach toward a full implementation, reduce costs, complexity and effort.
- Reduces potential costs of implementation by reducing duplication and taking advantage of ONE Access capabilities and features.
- Provide a central repository of all e* transactions and the capability to use these transactions to find, and retrieve the content (directly and via viewlets) for a variety of purposes.

⁵ <https://news.ontario.ca/mohltc/en/2017/8/new-wait-times-data-now-available-for-surgeries-and-procedures-across-ontario.html>

2.3.2 Governance

The Ontario EHR Architecture and Standards governance committees, consisting of the Strategic Committee and the Business and Technical Committee, have provided tangible benefits for the Province since their formation in 2012 under the guidance of the MOHLTC's Action Plan for Health initiative. They provide both advisory and approval bodies for provincial architecture and standards products, services, policies, and processes, and provide strategic direction for how EHR connections are established. The committees consist of representatives from 22 different organizations across Ontario and the country.

These groups have been consulted regarding the proposed conceptual architecture, and have agreed to oversee a provincial review process for this report. The review process includes a public consultation period (between August and October 2018) that cumulates with a decision for endorsement in November 2018.

2.3.3 Benefits of a Decentralized Provincial Solution

A provincial conceptual solution architecture is required to guide how individual eReferral solutions interoperate with each other within Ontario's eReferral ecosystem and with EHR assets. Integration across products offers the following benefits:

- **Choice:** Providers can use the eReferral system to find services inside and outside of their LHINs. This expands their options, which translates into service selection that is better suited for the patient (e.g. shorter wait times, closer to home, languages spoken);
- **Efficiency:** eReferrals will securely and reliably flow between systems that the LHINs have invested in so that existing clinical data can be leveraged. This reduces data duplication and improves providers' workflow;
- **Insight:** End-to-end referral lifecycle visibility can assist the LHINs in regional resource and service management and planning (e.g., how many referrals were sent by which health service providers within a LHIN and to whom they were sent).

2.4 Scope of This Report

2.4.1 In Scope

This report corresponds to the "Design of Architecture and Interoperability Guidelines" section of the overall Provincial eReferral Strategy Statement of Work, which articulates the work to be delivered by the overall strategy. The August 2017 Statement of Work proposal defined the scope as guidelines that would:

support [the] design of EMR eReferral integration and integration of Regional Referral Systems with each other so they can share referral information – enabling referrals to be sent across the Province. [It] includes design of integration/interoperability across key regional and provincial components (such as EMRs, regional eReferral systems, hospital information system (HIS) hubs), in order to facilitate flow of referral information across the various systems, as appropriate.

Areas of consideration include:

- A conceptual architecture that is designed to support, first and foremost, the provincially standardized referral pathways, such as the musculoskeletal (MSK) central intake and four post-acute referral pathways;
- A conceptual information model (CIM) to assist in identifying the data concepts required for exchange between eReferral systems. This covers the activities beginning with referral initiation, and ending with a decision by the selected service provider (accept or decline);
- Specific opportunities for leveraging provincial digital assets and eHealth Ontario's roadmap;
- Cost-effectiveness, implementations time-frames and practicality
- Lastly, the report concludes with high-level deployment priorities.

2.4.2 Out of Scope

Items that are deemed out of scope for this report include:

- Consideration of an architectural design that assumed a single, centralized eReferral solution for the Province (as per the direction given by MOHTLC);
- Defining the internal fulfilment and task-management capabilities of Referral Management System (RMS).
- Conducting a technology capability assessment of systems that are in the provincial eReferral ecosystem with regards to the conceptual architecture;
- Discussion of how to optimize resource matching during the service discovery phase (e.g. matching algorithms);
- Identifying requirements to support development of specifications to enable point of service (POS) and/or EMR integration with Referral Management Systems (this is the scope of another report within the Provincial eReferral strategy);
- Addressing the integration of the Ontario eConsult Program into the conceptual architecture. While the eConsult Program was not incorporated directly, it was deemed appropriate to ensure the architecture could accommodate multiple solutions.

2.5 Assumptions

The following assumptions are employed in developing the eReferral conceptual architecture:

- The PanLHIN Referral Management Working Group Guiding Principles (Section **Error! Reference source not found.**) represent the high-level business requirements to which the conceptual architecture must be guided by;
- Every LHIN has designated a RRS to serve as a referral hub within the LHIN; the architecture supports a LHIN ability to designate one or more RRS as it so chooses.
- Every service is associated with a geographic location or set of boundaries that are defined; The architecture does not require specific boundary conditions and therefore supports this requirement and more.
- Provincial digital services, such as client resolution, consent management, and terminology mapping can contribute value to the eReferral ecosystem;
- The contributors to the Provincial Service Directory (PSD) are motivated and have the ability to vet that service information they publish to the PSD to ensure its validity;
- Appropriate methods will be put in place to ensure the quality of the information available in the PSD; Note that eHealth Ontario cannot be responsible for the quality of data outside of its mandate.
- eReferral systems that operate beyond the Province are also able to use the PSD to share their service information and obtain information within Ontario.

3.0 Stakeholder Engagement

3.1 Approach

From April to June 2018, consultations were conducted to vet the conceptual architecture, and to ensure as many stakeholder groups had an opportunity to review and contribute to the final draft. Early on, it was decided that the vendor community would need to be more directly engaged at all levels of development to ensure that the conceptual architecture would support existing systems and infrastructure, as well as existing Regional Referral Systems. The referral and HIS vendors with expressed interest in cross-system eReferral interoperability were encouraged to participate in the consultation sessions.

3.2 Targeted Engagements

3.2.1 Webinar

A webinar was hosted with 176 participants on April 23, 2018 to walk through the proposed high-level integration design of the provincial eReferral ecosystem. The audience⁶ for the webinar included public and private solution delivery providers that offer eReferral capabilities (sending or receiving), vendors, innovators, IT planners, and regional delivery partners/LHINs with an expressed interest in cross-system eReferral interoperability.

The webinar audience included:

- 20 acute care representatives;
- 14 home/community care;
- 28 IT planners including LHINs, HSSO;
- 4 innovation partners;
- 8 Provincial partners;
- 2 MOHLTC representatives;
- 1 regional delivery partner;
- 105 vendor representatives.

3.2.2 Workshops

May 2, 2018

The above webinar served as a preparatory session for a one-day in-person workshop on May 2, 2018. The objective of the workshop was to collect and discuss input, gaps and concerns around the Provincial eReferral strategy deliverables. The focus was to move towards consensus on the conceptual architecture. The attendees represented a broad range of stakeholders that included:

- 40 vendors;
- 19 LHIN representatives;
- 6 acute care representatives;
- 3 home/community care;
- 4 innovators;

⁶ Participants were invited using a multi-pronged approach e.g. targeted emails, in person meetings, established distribution lists and channels e.g. Ontario Hospital Association eBlast, ITAC Health Members, EMR certified vendors, a targeted email sent to referral vendor community, IT planners, LHINs, health care sector organizations and innovators.

- 1 primary care;
- 1 provincial partner;
- 2 HSSO representatives;
- eHealth Ontario.

Four breakout sessions were conducted on the following topics:

- Deep dive on the **integration model** – are there any obstacles, challenges, or suggestions to the proposed architecture and how do we mitigate any risks?
- Deep dive on the **Provincial Service Directory** model
- Deep dive on the **standardized data sets & eReferral forms**
- **User Experience & Patient Access**

The output of the breakout sessions were captured and posted on a [publicly available Internet location](#). Input and ideas raised have been incorporated into this report.

Following the May 2 workshop, a survey sent to all participants who attended indicated 90% of respondents were satisfied or very satisfied with the workshop. 83% reported the workshop met their expectations and 86% agreed they had the opportunity to provide their feedback and opinion (See Section 10.1).

June 4-5, 2018

The *Provincial eReferral Strategy – Architecture Working Group* members hosted a two- day workshop to validate and confirm all outstanding questions, risks or issues regarding alignment to the PanLHIN Referral Management Working Group guiding principles (e.g., pathways, use cases, service directory, component diagrams, risk register, and conceptual and information architecture report draft Table of Contents). The group worked through all outstanding items to ensure consensus in preparation for the Statement of Work (SOW) deliverables circulation.

3.2.3 HIS Renewal Consultations

HIS Renewal is an opportunity to transform Ontario’s fragmented HIS landscape into a platform for a high-performing, patient-centered health care system. The nature of the approach has been to articulate a vision, principles, and a set of standards and core requirements to be used in master service agreements to procure HIS ‘hubs’ in the future⁷.

Two committees oversee the HIS renewal work – the ‘Negotiation Table’ and ‘Alignment Committee’. eHealth Ontario and the MOHLTC HIS Secretariat have agreed that the Alignment Committee should be engaged after when the conceptual architecture has completed the provincial review process to incorporate relevant eReferral technical requirements into the master service agreements.

3.2.4 Wait-Times Consultations

One of the PanLHIN Referral Management Working Group Guiding Principles (Section **Error! Reference source not found.**) focuses on the ability to capture and communicate eReferral wait times. Wait times for the following pathways contain an element of referrals, and are reported to the Ontario Wait-Time Information System (WTIS):

- Alternate level of care;
- Surgical and diagnostic imaging procedure.

⁷ *ITAC Health Members - draft of Ontario's HIS Renewal Provincial Framework posted for membership comment and feedback*
May 25 eblast

Cancer Care Ontario's (CCO) Access to Care (ATC) program, in partnership with the MOHLTC, operates WTIS in order to support provincial wait time management initiatives⁸.

eHealth Ontario and CCO have discussed the proposed conceptual architecture and its potential relationship with WTIS. Topics that require further investigation are:

- Alignment between the ATC's program foci, and the scope of the activities that will be supported by eReferrals;
- The ability to capture data that is consistent with CCO's Wait Times definitions and indicators (Appendix C).

Future discussions are planned in the coming months as the provincial eReferral Strategy progresses.

⁸ <https://www.accesstocare.on.ca/cms/One.aspx?portalId=120513&pageId=121452>. Last accessed: July 12, 2018

4.0 Business Architecture

This section provides the business-context artifacts that establish the scope within which the eReferral conceptual architecture operates.

The business service/functions of referrals are depicted with the changes that are being introduced by the technology enhancements for the eReferral solution. A business-context model is used to summarize the roles and responsibilities of the key stakeholders involved in moving towards the future-state provincial eReferral ecosystem.

4.1 Business-Service Profile

A business-service profile is an artifact that organizes key design information for the business service in a consolidated format. An End-to-End Provincial Referral Service is articulated with the changes that are being introduced by the eReferral technology enhancements are denoted in *italics*.

Table 1: End-to-End Provincial Referral Services

Name	End-to End Provincial Referral Service
Description	<ul style="list-style-type: none"> This service is initiated once a health care provider consults with or assesses the health care client (or health care client does a self-assessment in the case of self-referral), and some level of need has been identified that requires a referral. Next, the health care provider (or health care client in the case of a self-referral) would search for the applicable service, care, support, and/ or advice needed and make a referral request for the health care client. The referral request is either accepted or rejected by the service provider (referral recipient), and once the responses have been evaluated and confirmed by the referral requestor, the health care client will be notified.
Output	<ul style="list-style-type: none"> Successful Patient Referral
Service Owner	<ul style="list-style-type: none"> N/A – Shared across the Provincial Referral Ecosystem
Service Provider(s)	<ul style="list-style-type: none"> Health Care Providers (in all care settings) Community-based Service Providers <p><i>With the introduction of technology enhancements for eReferrals, the following Technology Service Providers are added:</i></p> <ul style="list-style-type: none"> eHealth Ontario; Regional Referral System (RRS) Vendors (see Section 6.4); Referral Management System (RMS) Vendors (see Section 6.4); POS Vendors
Customer Segment(s)	<ul style="list-style-type: none"> Health Care Clients (Patients) Health Client <p><i>With the introduction of eReferrals, the following Service Providers also become customers:</i></p> <ul style="list-style-type: none"> Health Care Providers (in all care settings) Community-based Service Providers
Need(s) Addressed	<ul style="list-style-type: none"> Decrease patient wait times to specialist advice and other community-based support services <p><i>With the introduction of technology enhancements for eReferrals, the following needs of the Health Care Providers and Community-based Service Providers would also be addressed:</i></p> <ul style="list-style-type: none"> Decrease workflow delays between the referral request, confirmation, and patient appointment booking notification Improve ease to discover available services and service providers across geographical and technology boundaries
Performance Measures	Appropriate performance measures for service delivery will be developed as part of the overall Provincial eReferral Strategy.

Name	End-to End Provincial Referral Service
Delivery Model	Partnership – two or more organizations share risks, resources and accountability in providing services to overlapping customers.
Service Delivery Channel	<ul style="list-style-type: none"> • In Person • Mail/ Fax • Phone • Internet (e.g. Website, E-mail) <p><i>With the introduction of technology enhancements for eReferrals, the following channels are added: Systems Integration (e.g., RRS, RMS, POS System, Patient Portal)</i></p>

4.2 Business-Function Model

The Business Function Model is an artifact that allows stakeholders to identify the functional components that the business performs, without having to reconcile the specific relationships between them.

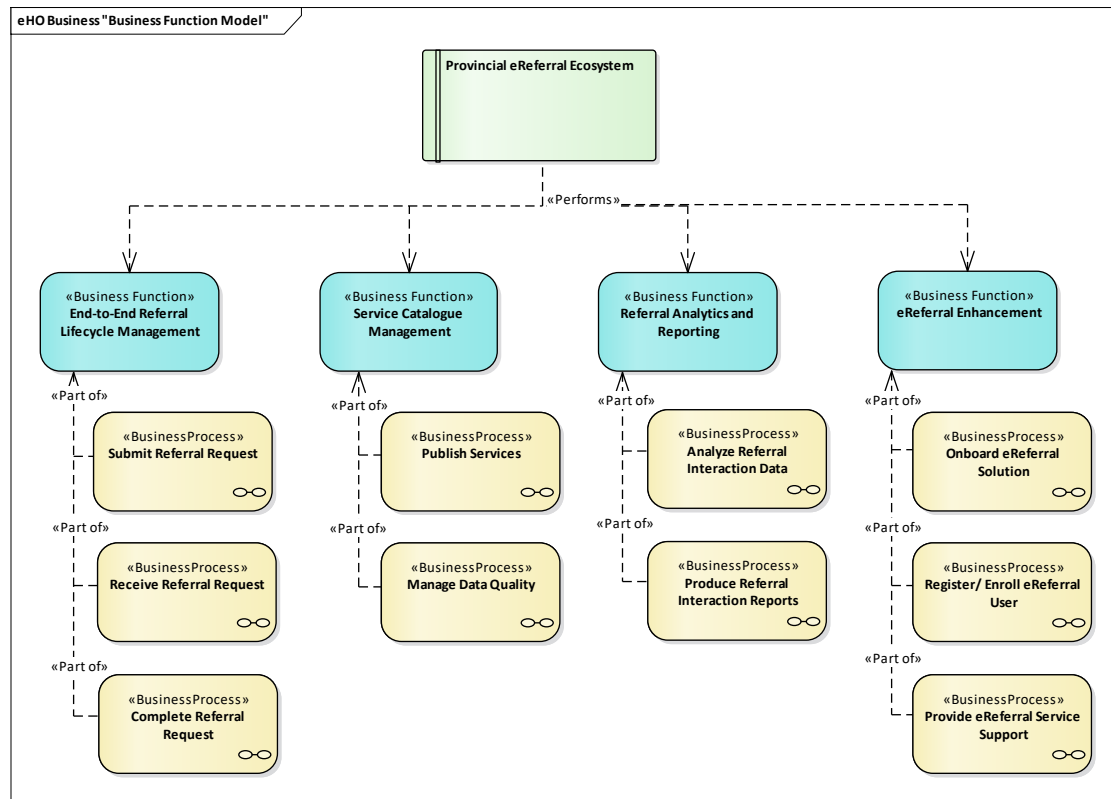


Figure 1: Business Function Models

For each business function in the table below, the changes being introduced by the eReferral technology enhancements are denoted in *italics*.

Table 2: Business Functions

Name	Type	Description
End-to-End Referral Lifecycle Management	Function	<p>This function represents all of the stages involved in completing a successful patient referral.</p> <p><i>With the introduction of technology enhancements for eReferrals, the following improvements can be realized:</i></p> <ul style="list-style-type: none"> • <i>Easier to discover services available which should also result in better selection</i> • <i>More secure and efficient routing of referral communications and notifications</i> • <i>Ability to view completed eReferrals</i>
Submit Referral Request	Process	<p>This process includes:</p> <ul style="list-style-type: none"> • Performing needs assessment • Searching for services/ resource matching • Send referral request
Receive Referral Request	Process	<p>This process includes:</p> <ul style="list-style-type: none"> • Evaluating the referral request • Forwarding the referral request to a different service delivery provider (if required) • Provide referral request response
Complete Referral Request	Process	<p>This process includes:</p> <ul style="list-style-type: none"> • Evaluating the referral request responses • Confirming the referral • Notifying the Health Care Client or Health Client
Service Directory Management	Function	<p>This function represents the ability to make services available to be discovered and maintaining the quality of the service information.</p> <p><i>With the introduction of technology enhancements for eReferrals, the following improvements can be realized:</i></p> <ul style="list-style-type: none"> • <i>Centrally maintained "Provincial Service Directory" that consolidates all programs, service and resources</i>
Publish Services	Process	<p>This process includes:</p> <ul style="list-style-type: none"> • Adding a new service • Updating an existing service
Manage Data Quality	Process	<p>This process includes:</p> <ul style="list-style-type: none"> • Identifying incorrect service information • Correcting existing service information
Referral Analytics and Reporting	Function	<p>This function represents the ability to perform analytics on completed referrals and to report on the data.</p> <p><i>With the introduction of technology enhancements for eReferrals, the following improvements can be realized:</i></p> <ul style="list-style-type: none"> • <i>Better tracking of eReferral transactions data such as duration between service request and provision, categories of services most referred to, etc. which should also result in better reporting</i>
Analyze Referral Interaction Data	Process	<p>This process includes:</p> <ul style="list-style-type: none"> • Consolidating referral interaction data • Analyzing referral interaction data
Produce Referral Interaction Reports	Process	<p>This process includes:</p> <ul style="list-style-type: none"> • Producing referral interaction reports by organization, region, and for the province

Name	Type	Description
eReferral Enhancement	Function	<i>This function represents the key process changes being introduced by the technology enhancements for eReferral.</i>
Onboard eReferral Solution	Process	<i>This process includes:</i> <ul style="list-style-type: none"> • <i>Integrating with the Provincial eReferral APIs and viewlets (Visual API's)</i> • <i>Testing systems integration</i>
Register/ Enroll eReferral User	Process	<i>This process includes:</i> <ul style="list-style-type: none"> • <i>Registering and enrolling a new user to the eReferral Solution</i> • <i>Providing user training on the eReferral Solution</i>
Provide eReferral Service Support	Process	<i>This process includes:</i> <ul style="list-style-type: none"> • <i>Providing service support intake</i> • <i>Providing technical support for eReferral Solutions (by vendors)</i> • <i>Providing technical support for the referral routing communications and the provincial eReferral assets (by eHealth Ontario)</i>

4.3 Business-Context Model

4.3.1 Overview

The Business Context Model identifies the key stakeholders and their relationships to the Provincial eReferral Program, as governors, partners/ suppliers, or customer segments.

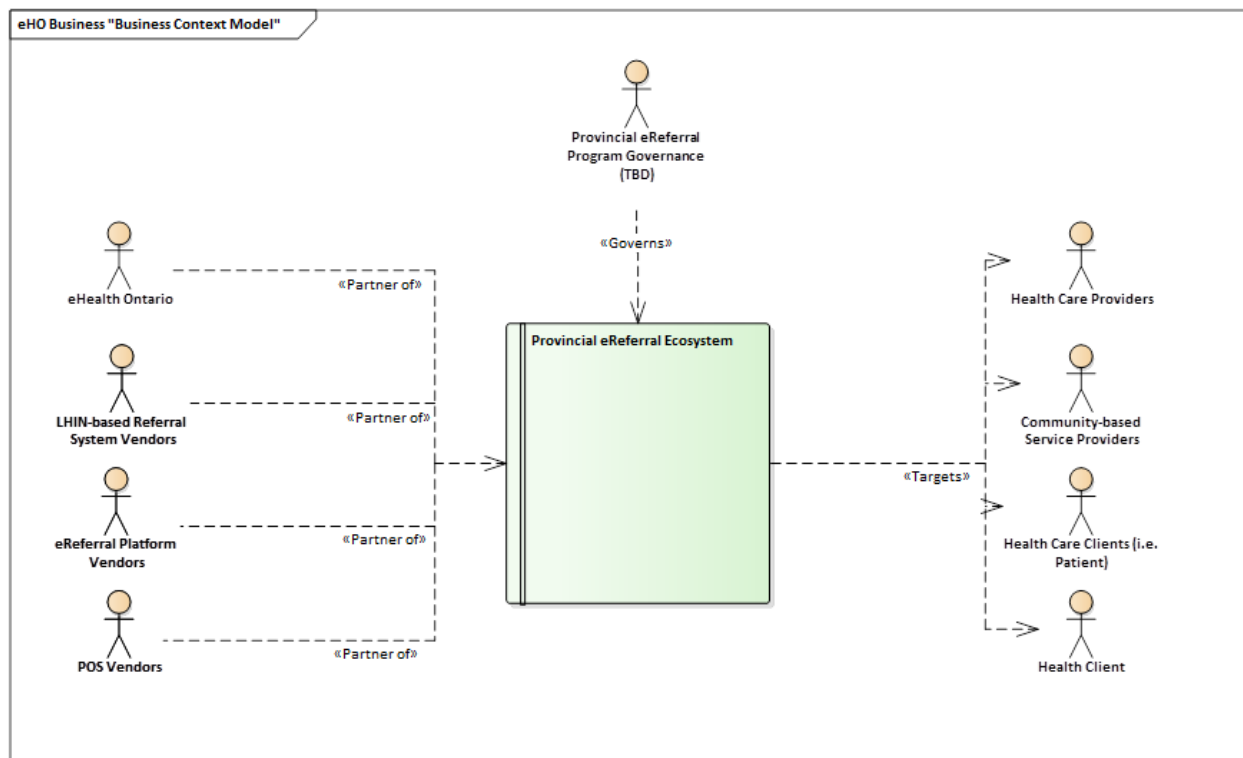


Figure 2: Business Context Model

4.3.2 Governors

Appropriate governance structures needed to support a provincial eReferral program will be developed as part of the overall Provincial eReferral Strategy.

4.3.3 Customer Segments

The customer segments that the future-state provincial eReferral ecosystem is targeting spans all Service Delivery Providers across the various care settings: Acute Care, Primary Care, Secondary Care, Long-Term Care, Home & Community Support Services, Specialists, Complex Continuing Care, Education Programs, etc.

The initial customer segments being targeted for the Provincial eReferral Strategy are illustrated in the table below. For additional information, see Section 12.1 (Referral CIM Data Dictionary).

Table 3: Customer Segments

Segment Name	Description	Segment Customers
Health Care Providers	A person or an organization that provides health care or other health-related services or products.	<ul style="list-style-type: none">• Family Physicians• Nurse Practitioners• Medical Specialists• Emergency Medical Services• Etc.
Community-based Service Providers	Person or organization providing health-related support services within the community.	<ul style="list-style-type: none">• Wheel-Trans• Meals On Wheels• Support Groups• Speech Language Therapy• Etc.
Health Care Clients (i.e. Patients)	Individuals participating in the health care system for the purpose of receiving therapeutic, diagnostic, or preventive procedures.	<ul style="list-style-type: none">• Depending on care setting, a health care client may be referred to as:• Patient (currently receiving care)• Participant (in a clinical study)• Resident (of a long term care facility)• Subject (in a public health case)• Client (in home care/community care cases/ settings)
Health Client	Legal entity (i.e. either an individual or an organization) holding rights and responsibilities for a health care client with respect to health care. A health care client managing his or her own care acts as the health client. Where care of a health care client is legally managed by another person, that person is the health client.	<ul style="list-style-type: none">• Parent• Family Member• Includes power of attorney and substitute decision maker.• Includes personal representative, advocate, healthcare proxy, legal representative, financially responsible entity.

4.3.4 Partners/Suppliers

In many cases, the business will need to collaborate with a number of partners/ suppliers in order to deliver the End-to-End Provincial Referral Service. This section will list all the partners/ suppliers involved, as well as what resource or service they are accountable for providing in support of the technology enhancements for eReferrals within the provincial eReferral ecosystem.

Table 4: Partner Roles

Partner Name	Partner Role (Service/Resource Provided)
eHealth Ontario	<ul style="list-style-type: none">• Responsible for providing the infrastructure for routing referral communications from source to target• Responsible for providing access to a centrally maintained "Provincial Service Directory" with the up-to-date information about programs, services, and resources as well as any other information that is necessary to facilitate a successful referral.• Responsible for authentication and authorization of the participating referral solutions (e.g., RRS, RMS) in the Provincial eReferral Ecosystem.• Responsible for providing access to a centrally maintained repository of provincial eReferrals and Analytics information.• See Conceptual Architecture section for detailed descriptions of the components that will support these capabilities.
RRS Vendor	<ul style="list-style-type: none">• The RRS will provide users with direct access or indirect access via an integrated POS System to submit or receive eReferrals.• In some cases, the RRS may have an integrated Patient Portal that will provide access for patients to submit or view eReferrals.
RMS Vendor	<ul style="list-style-type: none">• The RMS will provide users with direct access or indirect access via an integrated POS System to submit or receive eReferrals.• In some cases, the RMS may have an integrated Patient Portal that will provide access for patients to submit or view eReferrals.
Point of Service (POS) Vendors (e.g., EMR, HIS, etc.)	<ul style="list-style-type: none">• POS Systems that are integrated with either an RRS or an RMS will provide users with access to eReferrals.• This includes Patient Portals that provide access for patients to submit or view eReferrals.

5.0 Business Requirements

5.1 Overview

Building on the business architecture outlined above, this section introduces business requirements for individual referral pathways. A generic approach for describing requirements has been used because eReferral encompasses a plethora of potential referral pathways, but the scope of the strategy does not specify which are of primary focus.

Two inputs for representing business requirements to guide the conceptual architecture are used:

- **Business considerations stemming from the uniqueness of individual pathways** are represented through five pathways that are used as models for the types of activities and different sequences of activities that the eReferral conceptual architecture needs to support.
- The **PanLHIN Referral Management Working Group Guiding Principles** (Section **Error! Reference source not found.**) represent a set of high-level business requirements/objectives for provincial eReferral system management that encapsulate the cumulative knowledge and expertise of participants and expert stakeholders within the provincial eReferral landscape.

5.2 Pathways

5.2.1 About the Sample Pathways

5.2.1.1 Referral Patterns

The pathways described below were selected to serve as exemplars for the three referral patterns that are seen in the Health and Wellness services (as described in the [eReferral Provincial Reference Model](#)):

- **Self-referral (SR):** Referrals in which the health care client decides to seek health care services independent of a care provider. This process ends when the client's condition has been managed by the service provider.
- **Non-transfer of Care (NToC):** Referrals that are used to obtain a specific treatment or service from another health care provider (person or organization), yet responsibility and accountability for the health care client ultimately remains with the health care provider (person or organization) that is referring the health care client.
- **Transfer of Care (ToC):** Referrals in which the current health care provider (or service) intends to transition the care of a patient to another health care provider (or service).

5.2.1.2 Selected Pathways

The table below lists the five pathways that were selected and the referral pattern that they belong to. The business activities and significant decision points that comprise each pathway have been modeled using the Business Process Model and Notation (BPMN) specification version 2.0 format.

Table 5: Sample Pathways

	Pathway	Referral Requestor	Referral Recipient	Referral Pattern	Section
1	Physician-to-Physician	Primary care provider	Specialist	NToC	5.2.2
2	MSK Central Intake	Primary care provider	MSK specialist	NToC	5.2.3

	Pathway	Referral Requestor	Referral Recipient	Referral Pattern	Section
3	Community Support Services	Primary care provider	Community service	NToC	5.2.4
4	Acute Care Discharge to Post-Acute Services	Acute care facility	LHIN care coordinator	TOC	5.2.5
5	Patient-Initiated Referrals	Patient	Mental health/addiction services	SR	5.2.6

5.2.1.3 Access Models

It should be noted that within the above pathways, there can exist two models of access to the target service provider:

- **Direct**, in which the Referral Requestor sends the referral to the selected Referral Recipient without an intermediary.
- **Indirect**, in which a Referring Requestor selects a type of service but not the specific Referral Recipient. This includes:
 - Brokered (Source: Health Care Provider – Intermediary Service Provider – Destination Health Care Provider);
 - Internal (Source: Health Care Provider – Internal Coordinator(s) for a Community of specialized services - Destination Health Care Provider).

5.2.1.4 Assumptions

The following assumptions apply to each of the pathway descriptions and diagrams below:

- Participants are utilizing technology to exchange referral information;
- The technology includes interoperability, enabling bi-directional information flow to communicate referral status and relevant information;
- Patients are actively involved in the progression of the referral (e.g., notification of status, scheduling).

5.2.2 Sample Pathway #1: Physician to Physician

This pathway highlights a chain of referrals - from source to destination, which, in turn, refer to another destination. The referral request to the first specialist results in a subsequent chain of referrals amongst downstream specialists. It is also important to note that interoperability is necessary in order to keep the 'upstream' participants informed.

5.2.2.1 Scenario

Mohamed Fulan has a positive thyroid biopsy for papillary cancer.

1. His primary care practitioner, Dr. Michael Chow, begins the process of referring Mohamed to a local Otolaryngologist (ENT specialist), Dr. Olga Erickson.
2. Dr. Erickson sees Mohamed and decides that he requires a thyroidectomy. She refers Mohamed to an ENT surgeon, Dr. Heather Scott.
3. There is a shortage of radioactive iodine that is required for Mohamed's Radioactive Iodine (RAI) therapy regimen at Dr. Scott's facility. She refers Mohamed to Dr. Manual Altes, another ENT specialist, at a facility in a nearby LHIN, who then delivers the RAI treatment.

5.2.2.2 Assumptions

The following are assumptions made about this pattern:

- All of the specialists are utilizing an Electronic Medical Record (EMR) to send/receive referral information or an appropriate application;
- The technology is capable of supporting the transmission of a single consultation note and distributing it to multiple providers as necessary.

5.2.2.3 Flow Diagram

Please review file: Pathway1_Physician_to_Physician.jpg

5.2.3 Sample Pathway #2: MSK Central Intake

The MSK pathway has been provincially highlighted as a priority pathway:

Ontarians with musculoskeletal (MSK) related conditions have some of the longest wait times for diagnostic imaging and surgical consultations, and many people waiting will not actually be helped by these services.

- Ministry of Health, 2017.

The workflow described in this section represents general MSK referrals. There may be slight variations in workflow depending on the type of MSK referral (e.g., lower back pain versus hip and knee-related issues (CAHO and HQO, 2017)). This pathway illustrates a chain of referrals – from source to destination, which, in turn, refers to another destination. The referral request to a common central intake results in a subsequent chain of referrals amongst a downstream assessment centre and a surgeon.

5.2.3.1 Scenario

Mary Jane has a ski accident, and her primary care practitioner (PCP), Dr. Julie Wonder, determines that Mary has torn her anterior cruciate ligament in the right knee.

1. Dr. Wonder begins the process of referring Mary Jane to the appropriate services;
2. She finds the MSK Central Intake referral information, and submits the request;
3. Central Intake routes the referral request to an assessment centre, which determines if Mary Jane is a surgical candidate;
4. After completing the assessment, the assessment centre's advanced practice clinician determines that Mary Jane is a surgical candidate. Central Intake is informed of the assessment outcome.
5. Central Intake routes the referral request to Dr. Hal Summer, the target orthopedic surgeon.

5.2.3.2 Assumptions

The following are assumptions made about this pattern:

- The PCP and surgeon in this storyboard are utilizing a system such as an Electronic Medical Record (EMR) to send/receive referral information;
- The technology is capable of supporting transmission of a single consultation note, and distributing it to multiple providers as necessary;
- PCP is able to receive electronic referral/consultation reports;
- The advanced practice clinician is able to receive and send electronic referrals, as well as receive reports.

5.2.3.3 Flow Diagram

Please review file: Pathway2_MSK_Central_Intake.jpg

5.2.4 Sample Pathway #3: Primary Care to Home & Community Care Services

This pathway illustrates the coordination of community support services, initiated by a Primary Care Practitioner (PCP), resulting in a dialogue between the PCP and the community support services provider.

5.2.4.1 Scenario

Ferdinand Herero is an elderly patient of Dr. Heather Lim. Ferdinand has limited mobility, lives alone, and resides in an assisted living complex.

1. Ferdinand tells Dr. Lim, his PCP, that he has been feeling lonely and has been in need of some support of his activities of daily living. Dr. Lim and Ferdinand decide that enrollment into a local adult day program would be beneficial for Ferdinand's well-being and quality of life.
2. Dr. Lim identifies an adult day program that is a good fit for Ferdinand, and initiates a referral request for him to be enrolled.

5.2.4.2 Assumptions

The following are assumptions made about this pattern:

- All communication/interaction between the PCP and community service provider is complete via an electronic referral service.
- PCP, as a Referral Requestor, has the capability to send electronic referral.

5.2.4.3 Flow Diagram

Please review file: Pathway3_PrimaryCare_to_HCC.jpg

5.2.5 Sample Pathway #4: Acute Care Discharge to Post-Acute Services

This pathway illustrates a transition of care between a hospital and the LHIN. The hospital-based case manager initiates the request for post-acute services. This might be home-based support services or a placement in a post-acute facility, such as a long-term care facility.

In this story, the request is for Home & Community Care Services provided by the LHINs. It illustrates the situation where the LHIN's case-management system for home and community care, uses its native eReferral capabilities to receive a patient referral from acute care, and facilitates the Care Coordinator referring the patient to LHIN-funded community services.

5.2.5.1 Scenario

Luis Vital will be discharged from the hospital to complete his recovery in his home following an organ transplant. Luis requires ongoing clinical support at home.

1. Luis' hospital-based case manager, Susie Grey, accesses the eReferral solution to select at-home wound care services via the LHIN's case management system.
2. The referral request is routed to William Mathers, the local LHIN care coordinator. He offers the referral to several of the LHIN-contracted service providers and determines that it will be delivered by Mercy Homecare Services.

5.2.5.2 Assumptions

The following are assumptions made about this pattern:

- All communication/interaction between the Hospital, LHIN Care Coordinator, and Healthcare Service Providers goes through the LHIN's case management system.

- The referral initiated within the LHIN's case management system to the healthcare service provider is not a pass-through of the initial referral request from the hospital case manager. Rather, it is a new referral request prepared by the LHIN Care Coordinator, which incorporates the original referral request.

5.2.5.3 Flow Diagram

Please review file: Pathway4_Acute_to_PostAcute.jpg

5.2.6 Sample Pathway #5: Patient-Initiated (Self-) Referral

This pathway describes the typical process of a patient self-referral, using the example of a mental health and addictions outpatient intake service. The intake service triages the referral to identify the most appropriate service provider to provide the services requested.

5.2.6.1 Scenario

Don Dubois is addicted to opiates, and has had great difficulty in trying to quit independently.

1. Don uses the Internet to search for services, and discovers an outpatient Day Detox program offered at a local community mental health hospital.
2. He completes the online self-referral form.
3. He is contacted by Theresa Hyatt, a mental health coordinator, to follow up on his request and complete an assessment.
4. Theresa completes the referral by confirming an appointment with Don for the outpatient Day Detox program.

5.2.6.2 Assumptions

The following are assumptions made about this pattern:

- Patient has access to a service channel (e.g., telephone, patient portal) that enables self-referrals;
- Mental Health Coordinator is able to receive and send electronic referral, as well as receive reports;
- Patient is able to submit electronic referral, as well as receive status updates.

5.2.6.3 Flow Diagram

Please review file: Pathway5_Patient_Initiated_Referral.jpg

6.0 Conceptual Architecture

6.1 Design Goals

Building on the Business Architecture (Section 4.0) and Business Requirements (Section 5.0), the Conceptual Architecture outlines a generic provincial integration solution that not only supports participating solutions in Ontario's eReferral ecosystem, but can also evolve into an eSTAR (e*) business network where clinical transactions of different kinds (eReferral, eConsult, eVisit, and others) are reliably and securely communicated and managed.

Specific technical goals include:

- Enable a Provincial Service Directory (PSD) approach that allows healthcare service providers to efficiently identify appropriate services (within the LHIN, across the Province, and even out-of-province) to which transactional messages (e.g., referral requests) can be routed;
- Develop a distributed/de-centralized data-contribution process that enables authoritative provider/health care service information to be contributed by stakeholders (including eHealth Ontario's Provincial Provider Registry), and shared within the network (in and out of the Province);
- Establish a high performance distributed integration model, through which vendor solutions (including existing and new eReferral systems) and provincial assets are leveraged and connected in real time within a multi-use clinical business network;
- Enable and enhance system interoperability via eHealth Ontario's ONE Access Strategy (viewlets, gateways, and security tokens), by which transactional messages (e.g., patient referrals) are exchanged in a consistent secure manner within the network;
- Reuse the existing provincial assets to build a fully extensible and sustainable integration model;
- Focus on ease of use for end users, and integration with their existing workflows;
- Expedite the solution adoption, while minimizing impact to the existing system integrations in the Province;
- Implement solution on modern technologies and standards, and establish the first step toward the use of Blockchain.

6.2 Overarching Guidelines

The following guidelines and overarching requirements have been incorporated into the conceptual architecture:

- The conceptual model aligns with eHealth Ontario's ONE Access strategy that enables accessing digital health information via modernized architecture and technology;
- The conceptual model supports the provincial PanLHIN Referral Management Working Group Guiding Principles (Section **Error! Reference source not found.**) and the Provincial eReferral Strategy so that the integration solution can continuously evolve, and achieve a broader vision of eReferral interoperability;
- There are a number of regional and provincial systems that already have capabilities to receive/send electronic referrals. These systems are unlikely to make significant changes to their existing integrations and clinical workflows;
- Referral volumes between solutions may not be sufficient to warrant an exclusively central approach. Therefore, a centralized provincial eReferral management solution is not considered an option;
- eReferral solutions need to integrate and facilitate referral communication between health care providers as not all providers have an electronic system;
- Each LHIN may require one or more Referral Management Systems (RMSs) that provide patient-centric and service-centric referral-management capabilities (e.g., end-to-end visibility of referrals that are initiated and/or resolved within the system);

- EMR vendors may have considerable difficulty in establishing integration with multiple RMSs;
- LHIN reorganizations may occur in the future, making boundary-based decisions more complex.

6.3 Design Decisions

The following key design decisions have been made for the conceptual architecture. Corresponding rationale and applicability are provided.

Table 6: Design Decisions

Category	Decision
Implementation	Implementation/adoption/rollout should be part of the provincial strategy.
Integration model	<p>There are currently several eReferral systems in the Province. To best support interoperability, a distributed integration model will be established as opposed to one single central eReferral system.</p> <p><i>As part of eHealth Ontario's ONE Access Strategy:</i></p> <ul style="list-style-type: none"> • ONE Access Launcher and Viewlets can be seamlessly embedded into POS (point of service) and RMS, facilitating various clinical flows. They not only provide SMART on FHIR capabilities, but also extend them significantly to integrate with provincial assets (e.g., ONEID, DI, Immunizations, Medications, Labs, etc.), patient context sharing, and other external systems. Once deployed, ONE Access Viewlets can be easily upgraded (i.e., do not require frequent re-development by the host system) as more pathways are implemented. • ONE Access Gateway will store all the intra- and inter-system referral transaction logs in the Province, as well as out-of-province referrals, to the Transaction History Registry (THOR). This will enable data analytics to be utilized by the LHINs and organizations outside of the LHINs (e.g., by ministry, HQO) for reporting as well as the ability to lookup transaction information. The transaction history contains sufficient information to call the particular Referral Solution to obtain or display the required content. • ONE Access Data Gateway will supply the provincial Wait Times Information System (WTIS) with relevant referral transaction information from the THOR.
Referral system interoperability	<p>To best encourage innovation and efficient product delivery in the eReferral ecosystem, vendor systems will establish their participation in the business network, and directly communicate with others in the network where and when needed, including various provincial assets:</p> <ul style="list-style-type: none"> • A variety of core digital health services exposed via ONE Access Gateway: <ul style="list-style-type: none"> ○ Provincial Client Registry (PCR) – authoritative client identity source ○ Provincial Provider Registry (PPR) – authoritative healthcare provider identity source ○ ONE ID – system/provider identity management platform ○ Transaction History Registry (THOR) – entry point to province-wide referral transactions ○ Patient consent management ○ Pub/Sub-based notifications • Cryptographic security keys to establish system connection and ensure integrity and access controls • ONE Access standards to enable universal access in the ecosystem via ONE Access Viewlets and/or federated APIs <p>To provide users with patient-centric and service-centric referral management capabilities across multiple systems within a LHIN region, vendor systems will improve interoperability by following the ONE Access Viewlet and/or API standards. They will enable the seamless integration of different vendor systems into one single user interface, providing a holistic referral view by different criteria (e.g., patient, pathway, LHIN region, etc.). This approach will also reduce potential data duplication, and lay the foundation for the future eSTAR network.</p>
Single sign-on	ONE ID will be leveraged to facilitate the single sign-on process (e.g., providers navigate from EMR/HIS system to RMS, and/or providers navigate from RMS to regional/provincial clinical viewer).
Validation	ONE ID will be used for the validation process (i.e., authenticate/authorize providers/systems sending/receiving electronic referrals).
Notifications	An enterprise-level Pub/Sub notification framework will enable provider record updates in the PPR and transaction activities in the THOR to be shared in real time.

Category	Decision
Data exchange	A fulsome set of standards-based APIs is a foundational component that enables the architecture design. HL7 FHIR has been selected as the data-exchange standard, as it offers advantages in terms of resources, cost, and ongoing maintenance. Referral communication activities and state transitions described in the FHIR Workflow Execution and Communication Patterns will be supported by the information and technical architectures. FHIR-based conformance testing services need to be built and supported by the vendors so that assurance of the validity of APIs developed by stakeholders can be provided.

6.4 System Roles and Capabilities

The table below defines the roles that various systems play in the architecture, as well as the required capabilities in the respective roles. It can be used to assign roles and integrate the systems that are supporting a given referral business process model so that they align with the provincial eReferral strategy.

Table 7: System Roles and Capabilities

System Actor	Role Within the Architecture	Minimum Technical Capabilities
Point of Service (POS)	<ul style="list-style-type: none"> Owns the relationship with the patient; Owns the relationship with the service provider (Referral Recipients); Directly used by healthcare service providers (Referral Requestors and Referral Recipients) to provide patient care; Initiates referral requests via the connectivity to the Referral Management System (RMS) Source; Responds to referral requests for service via the connectivity to the RMS Target. 	<p>As the primary electronic system (e.g., EMR, HIS) used by referral requestors, shall be able to:</p> <ul style="list-style-type: none"> Seamlessly connect service providers to RMS with appropriate patient and clinical context sharing (i.e., reducing redundant data entry); Provide service providers with access to various provincial assets (e.g., ONE ID, Consent, PCR, etc.); Initiate connectivity with the RMS to receive and store a copy of initiated referrals. <p>As the primary electronic system used by referral recipient, shall be able to:</p> <ul style="list-style-type: none"> Seamlessly connect service providers to RMS receiving intended referrals; Initiate connectivity with the RMS to process and store a copy of accepted referrals.
Regional Referral System (RRS)	<ul style="list-style-type: none"> Manages information of all the referrals in the region (e.g., LHINs); Tracks efficiency information of all the referrals in the region based on date/time stamps throughout life-cycle; Provides LHINs and other organization with referral end-to-end reporting and data analytics functions through ONE Access Viewlets, THOR/ONE Access Gateway, standardized APIs, electronic dashboards, business intelligence reporting, wait times information system, etc. 	<ul style="list-style-type: none"> Shall be able to integrate with provincial assets retrieving regional referral transaction logs from THOR via ONE Access Gateway; Shall provide patient-centric and service-centric referral management for all the referrals in the region (e.g., can see how many services a patient is waiting for, or being served by; can see which services have a waitlist); Shall be able to integrate with RMS Sources, and pull required referral details from the Source of Truth via federated APIs and/or ONE Access viewlets; Shall support analytics and reporting about all the referrals in the region (e.g., LHINs).
Referral Management System (RMS) Source	<ul style="list-style-type: none"> Allows service providers (Referral Requestors) to access the system from POS and initiate referral requests; Enables service providers to efficiently discover appropriate healthcare services (within the region, across the province, and even out of the province) to which patients can be referred; Orchestrate referral flows that are initiated by a single referral request and potentially involve multiple referrals across multiple providers; 	<ul style="list-style-type: none"> General: <ul style="list-style-type: none"> Integration with a POS shall be highly sustainable, and not require frequent redevelopment; Shall follow the ONE Access standards to ensure universal access in the ecosystem; Shall be capable of sending referrals onto a Referral Target Legacy (RTL) as a referral destination; May allow service providers (Referral Recipients) to directly access the system responding to

System Actor	Role Within the Architecture	Minimum Technical Capabilities
	<ul style="list-style-type: none"> Assists providers in locating appropriate healthcare services and resource matching across province by working with the PSD; Mediates the referral process on behalf of the referral requestor (e.g., send referral, receive updates, manage lifecycle of a patient's referrals); Serves as the Source of Truth storing and managing information of all referrals that it initiates (even for inter-system referrals to other RRSs within or out of the province); Tracks efficiency information (e.g., current status, where it is currently being processed, etc.) of all referrals that it initiates based on date/time stamps throughout the referral life-cycle, and provides these analytics through ONE Access Viewlets, ONE Access Gateway, standardized APIs, electronic dashboards, business intelligence reporting, wait times information system, etc.; Contributes transaction activity data of all referrals that it initiates to the Transaction History Registry (THOR) in real-time; Can be used to initiate and resolve intra-system referrals (within the same system); Integrates with CMS to facilitate clinical decision-making process by sharing referral status and updates. 	<p>referral requests (accept, decline, request for information, etc.);</p> <ul style="list-style-type: none"> Shall store and manage all the content associated with a referral that it initiates, and make all the content accessible via ONE Access viewlets and/or federated APIs; Shall provide patient-centric and service-centric referral management for all the referrals that it initiates (e.g., can see how many services a patient is waiting for, or being served by; can see which services have a waitlist); Shall follow the ONE Access standards and enable other RMSs and RRSs integrated into the system, providing holistic referral view by different criteria (e.g., patient, pathway, LHIN regions, etc.); Shall establish its participation in the business network, and communicate with other vendor systems via the necessary cryptographic keys issued by eHealth Ontario. <ul style="list-style-type: none"> System access: <ul style="list-style-type: none"> Shall allow service providers to securely access the system in multiple ways (e.g., launching natively within POS, logging in from a web-based portal, connecting via a mobile device, etc.); Shall act as a POS providing referral initiation capabilities for requesters without an actual POS (e.g., via a web-based access); Shall enable service providers to initiate referrals from their POS without a separate login. Interaction with ONE Access Gateway: <ul style="list-style-type: none"> Shall enable provider Single Sign-On, and participate in system validation via ONE ID integration; Shall resolve patient identity via PCR integration; Shall publish in real time the transaction logs to THOR for all referrals that it initiates. Notification and Delivery: <ul style="list-style-type: none"> Shall notify healthcare providers of any incoming referral updates in real-time. Patient Portal (PP): <ul style="list-style-type: none"> Shall support one or many patient portal(s) to offer access to generate self-referrals; Shall then be able to only show the patient services that allow a self-referral; Shall support one or many patient portal(s) that access referral details. Resource matching with the PSD: <ul style="list-style-type: none"> Shall incorporate the healthcare service information (and updates) it receives from the PSD into the system; Shall help service providers efficiently locate appropriate healthcare services across the Province based on the information stored in the PSD, and minimize manual clinical processes where possible, such as intelligent resource matching based on the patient's needs and clinical

System Actor	Role Within the Architecture	Minimum Technical Capabilities
		<p>context (e.g., service types, geographic locations, language, etc.).</p> <ul style="list-style-type: none"> • Reporting: <ul style="list-style-type: none"> ○ Shall support analytics and reporting about all referrals that it initiates.
Referral Management System (RMS) Target	<ul style="list-style-type: none"> • Allows service providers (Referral Recipients) to access the system from POS and respond to referral requests (accept, decline, request for information, etc.); • Mediates the referral process on behalf of the referral recipient (e.g., receive referrals, arbitrate referrals); • Stores and manages information of all referrals that it resolves; • Tracks efficiency information of all referrals that it receives based on date/time stamps throughout the referral life-cycle, and provides these analytics through ONE Access Viewlets, ONE Access Gateway, standardized APIs, electronic dashboards, business intelligence reporting, wait times information system, etc.; • Provides referral status and updates back to the RMS Source in real time; • Can be used to initiate and receive intra-system referrals (within the same system); • Enables service providers to store health service offerings in the local service directory; • Contributes locally managed healthcare service information to the PSD; • Integrates with CMS to facilitate clinical decision making process by sharing referral status and updates. 	<ul style="list-style-type: none"> • General: <ul style="list-style-type: none"> ○ Integration with a POS shall be highly sustainable, and not require frequent redevelopment; ○ Shall be capable, for accepted requests for service, of sending the referral information onto a POS as a referral destination; ○ Shall follow the ONE Access standards to ensure universal access in the ecosystem; ○ Shall establish its participation in the business network, and communicate with other vendor systems via the necessary cryptographic keys issued by eHealth Ontario; ○ Shall follow the ONE Access standards, and enable its own ONE Access Viewlets integrated into other systems, providing holistic referral view by different criteria (e.g., patient, pathway, LHIN regions, etc.); ○ Shall notify service providers (Referral Recipients) of any incoming referral messages in real-time; ○ May allow service providers to directly access the system responding to referral requests (accept, decline, request for information, etc.). • System access: <ul style="list-style-type: none"> ○ Shall allow service providers to securely access the system in multiple ways (e.g., launching natively within POS, logging in from a web-based portal, connecting via a mobile device, etc.); ○ Shall enable a POS to respond to referrals without a separate login. • Interaction with service directory: <ul style="list-style-type: none"> ○ Shall allow service providers (Referral Recipients) to publish their service offerings to the local service directory; ○ Shall publish healthcare service information from the local service directory to the PSD. • Notification and Delivery: <ul style="list-style-type: none"> ○ Shall notify service providers of any incoming referral messages in real-time; ○ Shall be capable of delivering referrals to the intended service providers (referral recipients) via the accepted methods (e.g., autofax, eReferral).
Provincial Service Directory (PSD)	<ul style="list-style-type: none"> • Serves as the central provincial service index by which referrals are found, matched, and connected in the province; • Facilitates eReferral transactions by healthcare service listings and associated metadata to route a referral to a desired service/system; • Serves as the master service index representing source-of-truth data from large-scale partner systems – e.g. PPR. 	<ul style="list-style-type: none"> • Shall receive healthcare service information and updates contributed by various sources (e.g., PPR, RMSs, etc.); • Shall make available PSD information updates to all RMSs in the province; • Shall support data contribution/consumption from/to out-of-province RMSs; • Shall store and share system endpoint and routing information of individual healthcare services and professionals.

System Actor	Role Within the Architecture	Minimum Technical Capabilities
ONE Access Gateway (Data and API)	<ul style="list-style-type: none"> Exposes provincial digital health services (e.g. PPR, PCR, ONE ID, etc.) via FHIR-based APIs; Facilitates contributing authoritative provider information to the PSD; Enables trusted system connections by issuing security tokens to the participants; Allows external systems to store intra- and inter-system referral transaction logs to the Transaction History Registry (THR) via FHIR-based APIs; Enables data analytics to be utilized by the LHINs and organizations outside of a LHIN (e.g., by ministry, HQO) for reporting; Enables public portal to display patient referral history and user navigation to RMSs via source system API endpoints. 	<ul style="list-style-type: none"> Shall provide provincial digital services to RMSs where appropriate, including, but not limited to: <ul style="list-style-type: none"> Client identity resolution via Provincial Client Registry (PCR); Sharing healthcare provider information from Provincial Provider Registry (PPR); Facilitating communication between RMSs by issuing system security keys; Pub/Sub-based notification. Shall facilitate referral viewing capabilities in Patient Portal by providing patient referral transaction logs.
Transaction History Registry (THOR)	<ul style="list-style-type: none"> Stores province-wide transactional logs. 	<ul style="list-style-type: none"> Shall provide a general logging capability by requiring vendors to log transaction activity data via the standard ONE Access Gateway API; Shall allow RMS Sources (as Source of Truth) to contribute referral transaction activities to the THOR; Shall enable RRSs to provide the LHINs and other organizations (e.g., MoH, HQO, etc.) with referral end-to-end reporting and data analytics functions by providing transaction activity data via ONE Access Gateway. Referral transaction activities shall contain sufficient business intelligence data for the entire referral lifecycle, including but not limited to: <ul style="list-style-type: none"> Globally unique identifier Sending party (system and end-user) Receiving party (system and end-user) Current status Transaction timestamp HASH key that ensures referral activity data is not modified after the fact API URI, by which associated referral detail can be retrieved and visually rendered via ONE Access Viewlet Shall supply the provincial Wait-Times Information System with relevant referral transaction information.
Patient Portal (PP)	<ul style="list-style-type: none"> Offers a patient access to his/her referral services; Provides a central view of all referrals for a specific patient, including viewing the overall status of a transaction, where it is currently being processed, etc. 	<ul style="list-style-type: none"> Shall allow patients to securely access the system in multiple ways, including, but not limited to: <ul style="list-style-type: none"> Logging in from a web-based portal; Connecting via a mobile device (e.g., tablet, cell phone). Shall integrate with the ONE Access Gateway, pulling all referral transaction history from the THOR through various API and retrieval capabilities; Shall integrate with RMSs, and enable user pulling referral detail from the source of truth; May integrate with RMSs to offer service discovery, and enable self-referrals.

System Actor	Role Within the Architecture	Minimum Technical Capabilities
Case Management/ Assessment System (CMS)	<ul style="list-style-type: none"> Serves as a supplementary tool in the referral process; Works with the integrated RMS(s) to share referral status and updates; Guides healthcare providers through a standardized patient assessment protocol and helps them to make informed decision. 	<ul style="list-style-type: none"> Shall be seamlessly integrated into the existing clinical workflow of RMSs; Shall receive referrals from RMSs, and provide health care providers with status updates (e.g., assessment results) in real time as required by the pathway.
ONE ID	<ul style="list-style-type: none"> Serves as the secure identity solution for service providers to access patient health information; Eliminates the need to remember multiple accounts and passwords; Improves workflow and user experience when accessing multiple applications; Provides enhanced privacy and security safeguards, as well as protects patient health information and provider account information. 	<ul style="list-style-type: none"> Shall facilitate service providers accessing provincial digital health services from POS and/or RMSs by issuing and validating security tokens (OAuth2 and/or SAML); Shall facilitate referral communication between RMSs; Shall facilitate transaction-log contributions to the THOR by issuing and validating system security keys via ONE Access.
Referral Target Legacy (RTL)	<ul style="list-style-type: none"> Directly used by referral recipients to receive referrals; May allow referral requestors to directly log in and receive referrals. 	<ul style="list-style-type: none"> May be an electronic receiving system that is not integrated into the provincial eReferral ecosystem (e.g., secure email, webpage); May be a paper-based receiving system (e.g., fax).

It is important to note that for one pathway, a real-life system may play the role of one or many of the system actors above. But for another pathway, it may not be an actor at all, or play different actors.

For example, a provider may directly create a referral within an eReferral system, and the service provider will receive it and respond to it within the same system. In this case, the eReferral system will be playing the POS, RMS Source, and RMS Target system actors. For another pathway, the same eReferral system will only be the RMS Source system actor for that pathway.

It is therefore important before procuring a system to determine which system actor(s) that system will need to play across all pathways that are planned to be supported. The minimum technical capabilities will assist in ensuring that the system will be able to play the system actors identified.

6.5 Overall Model

The following diagram outlines each component of the conceptual architecture for the Provincial eReferral ecosystem.

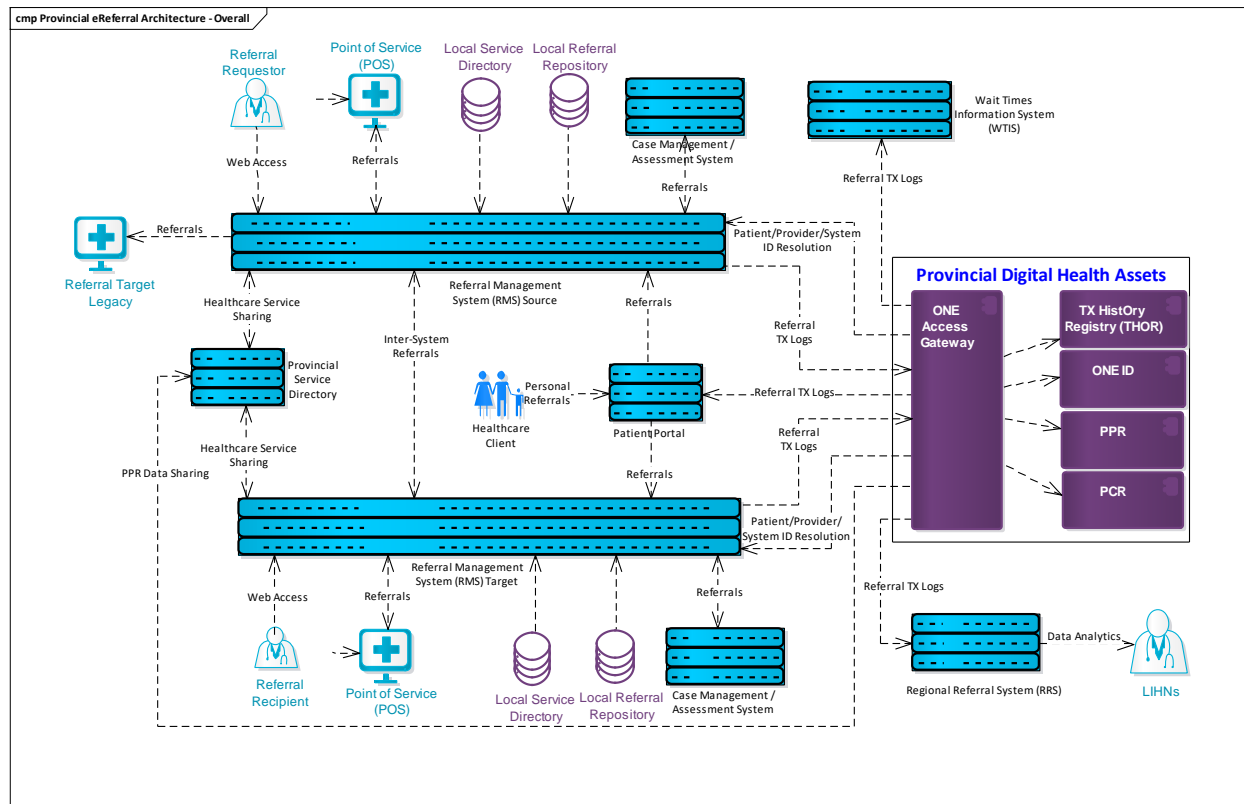


Figure 3: Overall Model

6.6 Provincial Service Directory

6.6.1 About Information Sharing in the PSD

The PSD is an information-sharing service that will be used to render, connect meaningfully, and make actionable healthcare service information across the Province.

eHealth Ontario will continue to provide “provider based” data to the service directory, but cannot provide the management of general health service providers (“Meals on Wheels” as an example). OTN has been approached to investigate the feasibility of enhancing their existing Health Services Directory asset to provide a more elaborate Service Directory.

In the current state, OTN Directory is a provider-centric platform that hosts a community of 30,000 users, including approximately 19,000 published Healthcare Providers (HCPs). It includes the necessary information to support specialist matching, as well as a standardized format to facilitate the flow of that information between primary and specialty care providers. The Directory has features for specialists to indicate detailed information that is required to initiate referrals (e.g., self-reported wait times, eligibility criteria, availability, clinical protocols and instructions, referral forms, etc.) Healthcare organizations may also create programs offering an intake channel for Primary Care Practitioners to refer to a group of specialists or a single specialist. The OTN Directory contains over 11,000 physicians, 3,000 Community Services, and 1,300 telemedicine sites/programs in searchable format with related key

referral information including: wait times, specialties, sub-specialties, patient criteria, conditions, and clinical protocols.

OTN Directory is integrated within existing provincial digital eco-systems (e.g., Provider Registry, Single-Sign-On with ONE ID, thehealthline.ca network) and other related technology solutions. These capabilities enable the OTN Directory platform to integrate seamlessly with EMR and eReferral vendors.

Recently, OTN also partnered with the Toronto Central (TC) LHIN, University Health Network (UHN), and over 40 Primary Care Providers and Healthcare Administrators to extend the reach of the Directory to include all specialists and community services in the TC LHIN, providing primary care providers with a “one-stop shop” through which to access comprehensive and up-to-date information to support referrals, whether virtual or in person.

For OTN Directory to support eReferrals provincially, there are identified areas of enhancements for further investigation. Some of these enhancements may include automatic resource matching, standardized and expanded data sets, data governance, and improved data quality control processes.

Note: The PSD is not reinventing or replacing existing Referral system functionality – it is instead supplying the data to support eReferral systems. Vendor systems and organizations have years of experience developing and improving resource matching functionality and referral functionality. The PSD is meant to share the data/information across systems to allow providers to benefit from these years of improvements. If an RRS does not have the ability to resource match on its own, the PSD can be enhanced to allow for “smarter” matching. This is area for further investigation.

6.6.2 Provincial Service Directory CIM

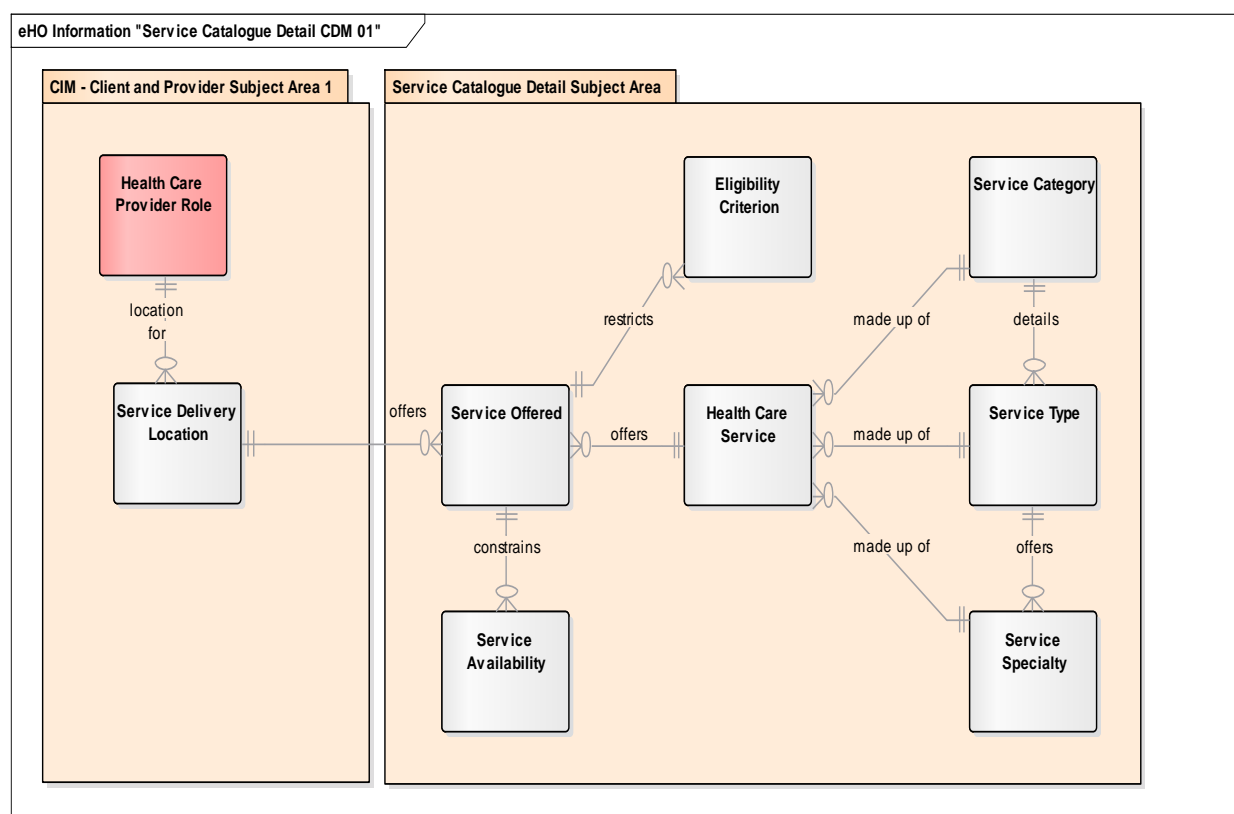


Figure 4: Conceptual Information Model: Service Directory Detail

Table 8: Service Directory: CIM Entities

Entity	Description
Health Care Provider Role	<p>A person or an organization that provides health care or other health-related services or products. It includes information about the following contact methods:</p> <ul style="list-style-type: none"> • Geographic address; • Virtual address; • Telephone number; • Other demographics. <p>In addition to specialties and sub-specialties, specialists also have clinical areas of interest (e.g., Specialty - Internist; Sub-Specialty - Medical Oncologist; Clinical Areas of Interest - Diabetes, MS, Rheumatology.)</p> <p>Note: Regional referral systems should attempt match a patient's needs to specialists' clinical areas of interest.</p>
Eligibility Criterion	A condition of patient eligibility for a service.
Health Care Service	A healthcare service or combination of services which may be offered at a healthcare provider site.
Service Availability	<p>Hours of Availability</p> <p>Availability of a service by a provider organization, in terms of business hours, working days of week or month, working dates of the month, or unavailability due to absence (e.g., vacation or retirement).</p> <p>Any fees for a particular service, from a specific provider at a specific location.</p> <p>Additional notes about the service availability will be accommodated.</p> <p>Wait Times</p> <p>Includes any of several types of wait times associated with referral services. Wait Times conform with system actor Conceptual Design Context (RMS Source) in the Provincial eReferral Strategy.</p> <p>CCO Website link to definitions: https://www.cancercare.on.ca/ext/databook/db1314/WTIS/WTIS-Introduction.htm</p> <p>Service Delivery Modalities</p> <p>Provides a record of the manner in which a healthcare service may be provided (e.g., eConsult, Telemedicine, Home Visit, etc.)</p>
Service Category	A broad category of healthcare service being performed or delivered.
Service Delivery Location	Workplace or site (physical or virtual) of a provider organization. May be a geographic or electronic location.
Service Offered	<p>Type of service provided at a provider location.</p> <p>The referral method by which a service is requested may be limited to a particular type or types, e.g., fax, eReferral, email.</p>
Service Specialty	A medical specialty or collection of specialties that may be delivered or performed at a service site.
Service Type	<p>A type of healthcare service that may be delivered or performed.</p> <p>This may be an individual service or a provider or government program.</p>

There are no privacy or security considerations for any of the above entities.

6.6.3 Accessing the Provincial Service Directory

Use of the Provincial Service Directory is expected to be through:

- **Direct Access (Referral & Non-Referral Systems):**
 - FHIR interfaces are used to execute queries against the PSD via ONE Access Gateway;
 - Queries are restricted (i.e., they need to provide a minimum set of query criteria).

- **Synchronization (eReferral Systems):**

- Where RMS systems wish to publish local data for use by other Referral systems, lean synchronization will ensure updates to and from the PSD;
- PSD notifies other systems of any changes.

Note: Resource matching, complex querying, and user interfaces can support real time PSD look up.

6.6.4 Enhanced Synchronization

6.6.4.1 Initial Synchronization

OTN has been approached to investigate the feasibility of implementing the Provincial Services Directory by leveraging and enhancing their existing Health Services Directory (HSD). The HSD is in operation, and provides meaningful search, match, and connection services to the provincial eConsult program and telemedicine video program. It increasingly acts as a gateway for primary care providers to gain access to virtual care services and tools.

OTN's Directory is integrated with the Provincial Provider Registry (PPR) and Healthline for community services. This integration will be extended to allow RMS systems to publish local data for use by other Referral systems with lean synchronization ensuring updates to and from the PSD. There are two types of datasets that can be shared in this synchronization:

1. Service catalog dataset based on agreed pathways and mutual datasets shared by participating Referral Systems.
2. Enhanced dataset that includes data and other value-added functionality (proximity search, service availability, wait-time info, community services, and telemedicine details) that OTN and other provincial delivery partners have garnered.

6.6.5 Querying

Complex queries are expected to be performed in the RMS (or equivalent) system. These include:

- Proximity searching;
- Resource-matching queries.

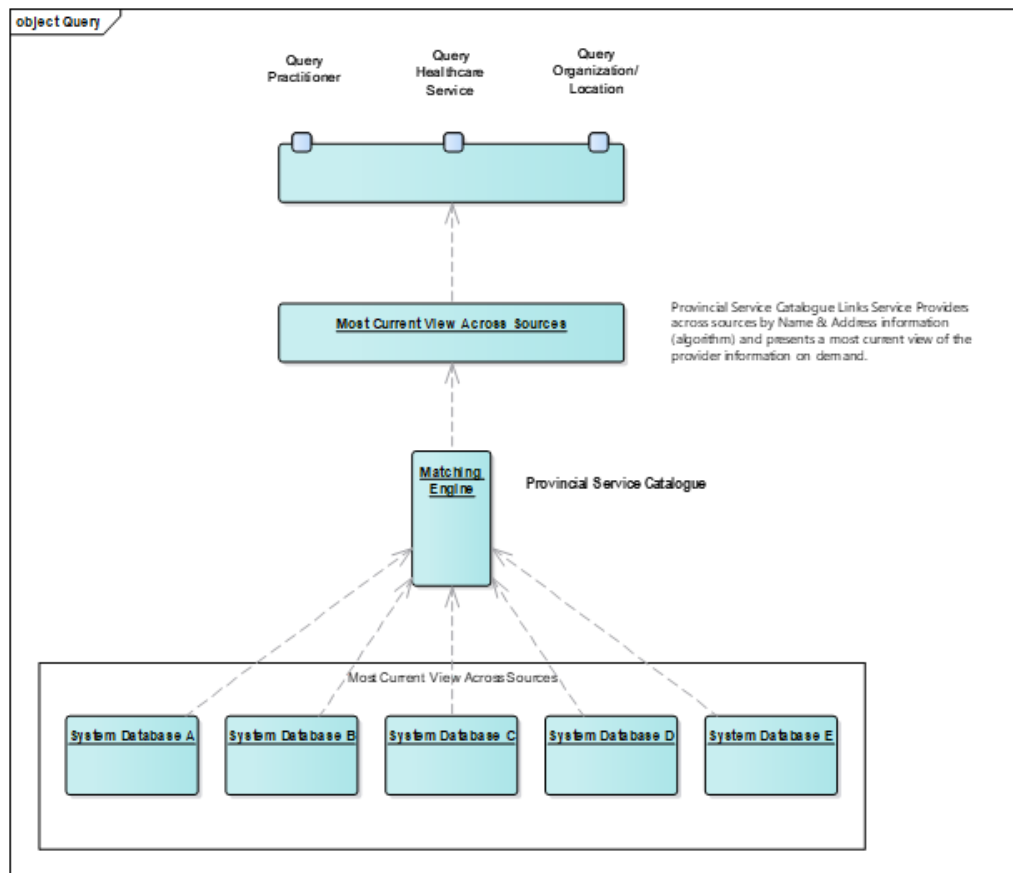


Figure 5: Querying PSD to Obtain the Updated Composite Record

6.7 System-Integration Patterns

6.7.1 About System-Integration Patterns

6.7.1.1 Types of Integration Patterns

The following system-integration patterns are supported by the eReferral conceptual architecture:

- RMS Source to RMS Target: Section 6.7.2;
- RMS Source to RTL Target: Section 6.7.3;
- Patient Portal: RMS Source to RMS Target: Section 6.7.4;
- Intra-System Referrals: Section 6.7.5.

6.7.1.2 Pathways and System Actors

Each pattern is associated with a series of pathways and system actors as shown below:

Table 9: Pathways and System Actors for Integration Patterns

Integration Pattern	Pathways					System Actors									
	Physician to Physician	MSK Central Intake	Primary Care to Community Support Services	Acute-Care Discharge to Post-Acute Services	Patient Initiated (Self-) Referral	POS	RMS Source	CMS	RMS Target	RRS	RTL	ONE Access Gateway	WTIS	PP	ONE ID
RMS Source to RMS Target	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓		✓
RMS Source to RTL Target	✓	✓	✓			✓	✓	✓		✓	✓	✓	✓		✓
Patient Portal: RMS Source to RMS Target					✓		✓	✓	✓	✓		✓	✓	✓	✓
Intra-System Referral	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓		✓

6.7.1.3 Integration Guidelines

Table 10: Integration Guidelines

ID	Guideline	Pattern			
		RMS Source to RMS Target	RMS Source to RTL Target	Patient Portal: RMS Source to RMS Target	Intra-System Referrals
1	<p>POS connects with RMS Source and/or Target based on the ONE Access Viewlet framework for user visualization. Service providers (referral requestors or recipients) use this integration to natively launch capabilities from the RMS within the POS with patient/clinical context sharing, easily and intelligently locate appropriate healthcare services where possible (based on the patient's needs and clinical context), and manage (send or respond to) patient referrals without having to leave the POS. Those that do not have a POS can directly access RMS Source and/or Target (e.g., via a web-based portal) as an alternative.</p> <p>Note: the referral vendors shall follow the ONE Access Viewlet specification to ensure the developed viewlets are compatible with others in the ecosystem. Also, there should be standard guidelines on the viewlet functionality and UI look and feel so that the consistent user experience can be supported.</p>	✓	✓	✓	✓
2	POS uses ONE Access Viewlets and/or ONE Access Gateway to integrate with the provincial digital health assets (e.g., ONE ID, Consent, PCR, etc.).	✓	✓		✓
3	RMS Source and Target validate provider identity via ONE ID. The systems integrate with ONE ID as a federated ONE ID Service Provider. They enable service providers to launch the RMS from their POS using the same login credentials, improve workflow and user experience, and enhance the privacy protection and security safeguards.	✓	✓	✓	
4	RMS Source and Target connect with ONE Access Gateway obtaining security keys for inter-system communication.	✓	✓	✓	
5	As Source of Truth, RMS Source contributes transaction activity data of all referral that it initiates to the Transaction History Registry (THOR) in real-time.	✓	✓	✓	✓
6	RRS pulls regional referral transaction logs from THOR/ONE Access Gateway, and provides LHINs and other organizations with referral end-to-end reporting and data analytics functions via ONE Access Viewlets, standardized APIs, electronic dashboards, business intelligence reporting, etc.	✓	✓	✓	✓
7	Case Management/Assessment System integrates into RMS Source and/or Target. When reviewing referrals, healthcare providers (e.g., Practitioners, Central Intake, etc.) uses the CMS to go through the standardized patient assessment protocol and makes informed decision accordingly. These system may also utilize the viewlet mechanism if they so choose.	✓	✓	✓	✓
8	PP integrates with ONE Access Gateway. The PP integrates with the Gateway pulling patients' referral transaction history and retrieving referral details from the RMS Source(s).			✓	

ID	Guideline	Pattern			
		RMS Source to RMS Target	RMS Source to RTL Target	Patient Portal: RMS Source to RMS Target	Intra-System Referrals
9	PP integrates with RMS Source. The PP integrates with an RMS Source enabling patients to launch the system, easily locate appropriate healthcare services, and send self-referral requests without leaving the portal. THOR can be used by the PP to locate all referral associated with the patient and use that to contact the source RMS system to provide the necessary data/visualization.			✓	
10	RMS Source and PP validate patient (Referral Requestor) identity via ONE Access Gateway. The Gateway enables the PP to integrate with external systems using the same client login credentials, improves workflow and user experience, and enhances the privacy protection and security safeguards.			✓	
11	To support referral analytics and reporting across the province, ONE Access Gateway will provide a standard API and define the API message content. RMS Sources are required to connect with the API contributing referral transaction activities as it initiates and flows them through in real time. The activities include those that originate from the system and are sent to a Referral Recipient using either the same system or a different one. Note: The transaction logs will include system endpoints of RMS Sources. This way, PP can display patient referral listing and navigate users to the RMS Sources for referral details. If a referral is directly sent to an RTL, the information stored in the RMS Source will be limited.	✓	✓		✓
12	WTIS integrates with ONE Access Gateway. The Gateway will store all the intra- and inter-referral transactions in the Province, as well as out-of-province ones to the THR. It will supply the provincial WTIS with relevant referral information from the THR. WTIS can either request the required information via the API's or be provided the data through the PUB/Sub Data gateway.	✓	✓		✓
13	The referral integration should by default support real-time or near real-time referral submissions from end to end. This will allow information sharing in a timely manner where possible.	✓	✓	✓	✓

6.7.2 RMS Source to RMS Target

6.7.2.1 Overview

In this architectural pattern, patient referrals are initiated by providers using POS in a LHIN, and responded to by providers using a different RMS and POS in another LHIN. The bi-directional communication between the POS systems is facilitated by two eReferral Systems (RMS Source and RMS Target). The RRS provides the LHINs with the relevant referral transactional information.

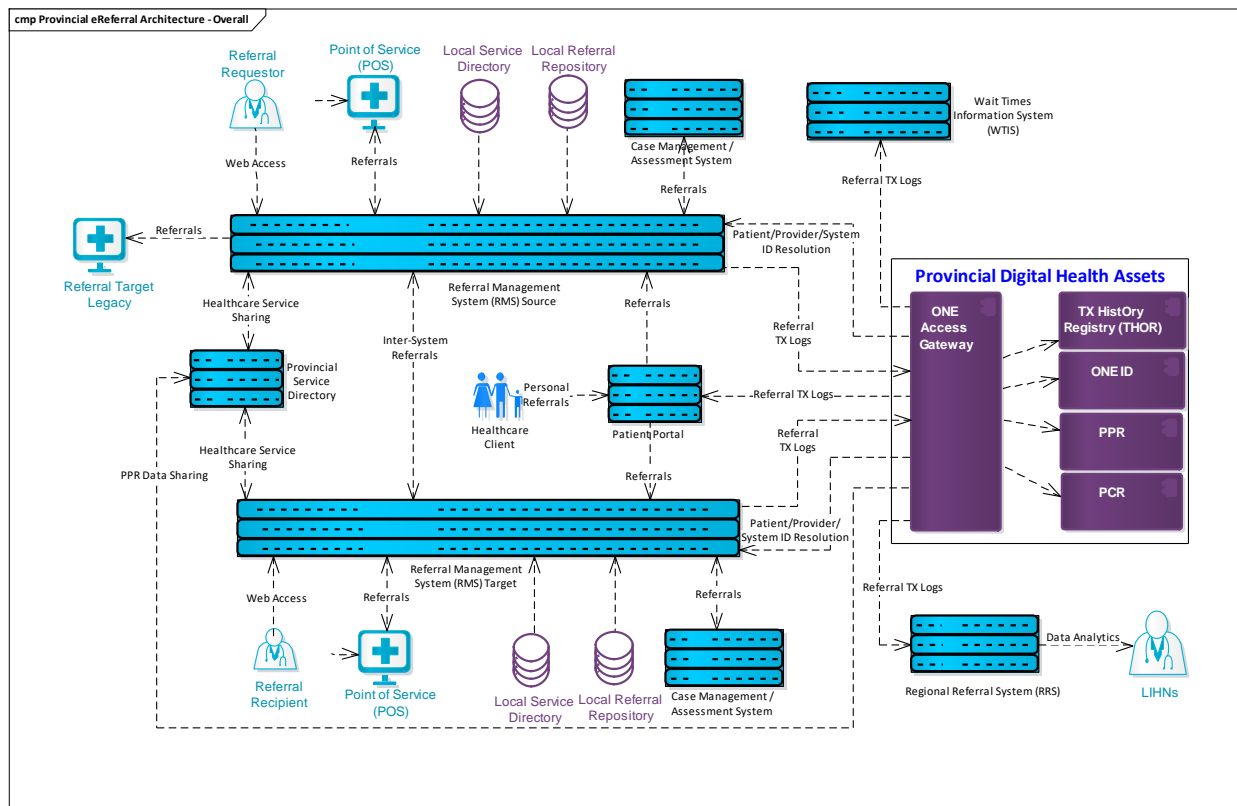


Figure 6: RMS Source to RMS Target

6.7.2.2 Applicable Scenarios

The following scenarios apply to the “RMS Source to RMS Target” pattern:

- A patient is referred to one of the Provincial Standard Referral Pathways that require and support a standard referral data set exchanged between RMS Source and RMS Target (bi-directional communication);
- or
- A patient is referred to a Bi-directional Generic Referral Pathway that requires and supports a Minimum Referral Data Set (MDS) exchanged between the RMS Source and the RMS Target (bi-directional communication).

6.7.2.3 Applicable Pathways

The following pathways apply to the “RMS Source to RMS Target” pathway:

Physician to Physician	MSK Central Intake	Primary Care to Community Support Services	Acute-Care Discharge to Post-Acute Services	Patient Initiated (Self-) Referral
✓	✓	✓	✓	

6.7.2.4 System Actors

The following system actors apply to the “RMS Source to RMS Target” pathway:

POS	RMS Source	CMS	RMS Target	RRS	ONE Access Gateway	WTIS	PP	RTL
✓	✓	✓	✓	✓	✓	✓		

6.7.2.5 Integration Guidelines

See Section 6.7.1.3.

6.7.2.6 High-Level System Flow: Bi-Directional Referral Communication

1. The Referral Requestor logs into the POS by his/her ONE ID account, and launches the RMS Source. Alternately, the Referral Requestor logs into the POS, uses the ONE Access Viewlet framework to establish ONE ID SSO, and opens the RMS Source via ONE Access Launcher;
2. The RMS Source uses ONE ID to identify the provider;
3. The POS provides appropriate patient and clinical context to the RMS Source via the ONE Access Viewlet framework, and presents the RMS UI to the Referral Requestor;
4. The Referral Requestor leverages the intelligent resource matching capabilities offered by the RMS Source, and selects the appropriate healthcare service(s) based on the patient and clinical context;
***Note:** Not only do the search results contain service and geographic information for the Referral Requestor to make an informed decision, but also they include system endpoint and routing information of individual services for the RMS Source to route referral requests to the intended RMS Target.*
5. The Referral Requestor opens an electronic referral form where the basic patient demographics and clinical information is auto-filled;
6. The Referral Requestor completes and submits the form;
7. The RMS Source generates a referral message (the standard/minimum dataset) per the chosen pathway, and delivers the request to the RMS Target by invoking the API;
8. The RMS Source contributes the referral transaction metadata (i.e., the initial referral) to the THOR via ONE Access Gateway;
9. The RMS Target sends a notification to the intended healthcare provider upon receiving the incoming message;
10. The Referral Recipient logs into the POS by his/her ONE ID account, and opens the RMS Target via the ONE Access Viewlet;
11. The RMS Target uses ONE ID to identify the provider;
12. The RMS Target presents the incoming referral to the Referral Recipient;
13. The Referral Recipient reviews and accepts the referral;
14. The RMS Target sends the referral acceptance message to the RMS Source;

15. The RMS Source contributes the referral transaction metadata (i.e. the referral update) to the THOR via ONE Access Gateway;
16. The RRS retrieves the referral metadata from THOR, and provides the LHINs with the relevant referral transactional information;
17. ONE Access Gateway provides the WTIS with the relevant referral information.

6.7.3 RMS Source to RTL

6.7.3.1 Overview

In this architectural pattern, patient referrals are initiated by Referral Requestors using their POS and sent to the Referral Recipients RTL. The one-way communication from the POS to the RTL is facilitated by the RMS Source. The RRS provides the LHINs with the relevant referral transactional information.

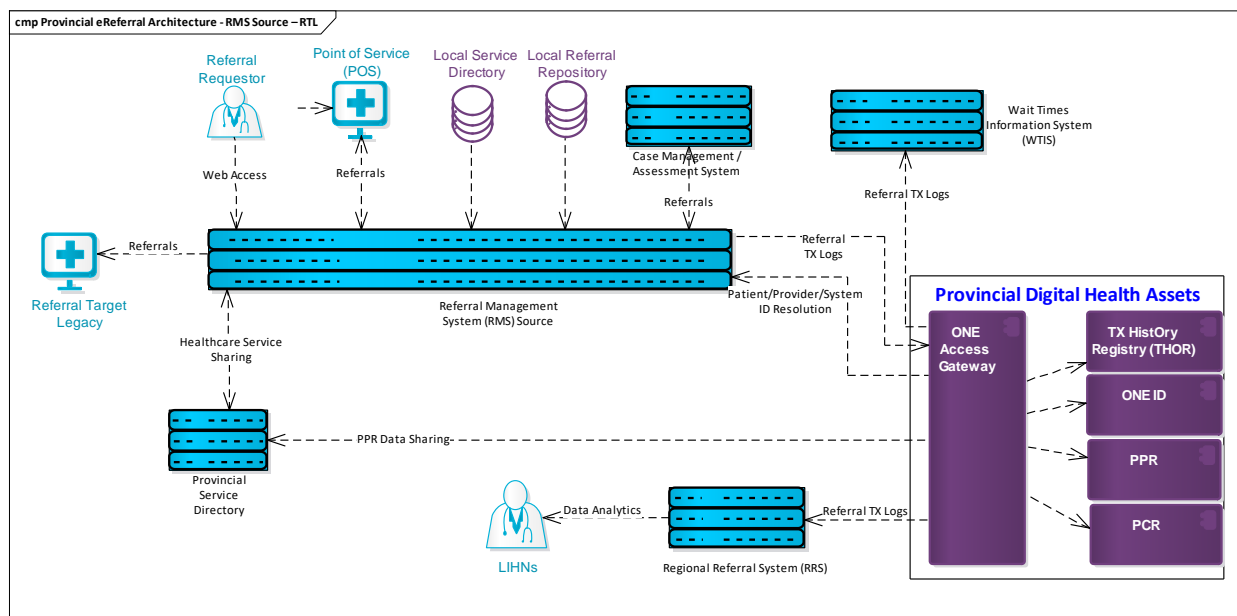


Figure 7: RMS Source to RTL Target (Legacy)

6.7.3.2 Applicable Scenarios

The following scenarios apply to the “RMS Source to RTL” pattern:

- A patient is referred to a One-Way Generic or Standard Referral Pathway where the Referral Recipient is using a paper-based or non-integrated electronic receiving system;
- or*
- A patient is referred to a One-Way Generic or Standard Referral Pathway where the Referral Recipient is using non-integrated external electronic system or providing a downloadable (e.g. PDF) and/or fillable referral form on the Internet

6.7.3.3 Applicable Pathways

The following pathways apply to the “RMS Source to RTL” pattern:

Physician to Physician	MSK Central Intake	Primary Care to Community Support Services	Acute-Care Discharge to Post-Acute Services	Patient Initiated (Self-) Referral
✓	✓	✓		

6.7.3.4 System Actors

The following system actors apply to the “RMS Source to RTL” pattern:

POS	RMS Source	CMS	RMS Target	RRS	ONE Access Gateway	WTIS	PP	RTL
✓	✓	✓	✓	✓	✓	✓		✓

6.7.3.5 Integration Guidelines

See Section 6.7.1.3.

6.7.3.6 High-Level System Flows

There are two high-level system flows for the “RMS Source to RTL” flow:

- Non-integrated electronic receiving system;
- Paper-based receiving system.

Non-Integrated Electronic Receiving System

1. The Referral Requestor logs into the POS by his/her ONE ID account, and launches the RMS Source. Alternately, the Referral Requestor logs into the POS, uses the ONE Access Viewlet framework to establish ONE ID SSO, and opens the RMS Source via ONE Access Launcher;
2. The POS provides appropriate patient and clinical context to the RMS Source via the ONE Access Viewlet framework, and presents the RMS UI to the Referral Requestor;
3. The Referral Requestor leverages the intelligent resource matching capabilities offered by the RMS Source, and selects the appropriate healthcare service(s) based on the patient and clinical context;
***Note:** Not only do the search results contain service and geographic information for the Referral Requestor to make an informed decision, but also they include system endpoint and routing information of individual services for the RMS Source to route referral requests to the intended RTL.*
4. The RMS Source presents the user with a hyperlink to an external RTL;
5. The Referral Requestor completes the referral request on the RTL;
6. The RMS Source contributes the initial referral transaction metadata to the THOR via ONE Access Gateway;
7. The RRS retrieves the referral metadata from THOR, and provides the LHINS with the relevant referral transactional information;
8. ONE Access Gateway provides the WTIS with the relevant referral information.

Paper-Based Receiving System

1. The Referral Requestor logs into the POS by his/her ONE ID account, and launches the RMS Source. Alternately, the Referral Requestor logs into the POS, uses the ONE Access Viewlet framework to establish ONE ID SSO, and opens the RMS Source via ONE Access Launcher;
2. The POS provides appropriate patient and clinical context to the RMS Source via the ONE Access Viewlet framework, and presents the RMS UI to the Referral Requestor;
3. The Referral Requestor leverages the intelligent resource matching capabilities offered by the RMS Source and selects the appropriate healthcare service(s) based on the patient and clinical context, and selects one that is offered by a healthcare service provider using a paper-based receiving system;

Note: not only do the search results contain service and geographic information for the Referral Requestor to make an informed decision, but also they include system endpoint and routing information of individual services for the RMS Source to route referral requests to the intended RTL.

4. If there is a downloadable and/or fillable Acrobat/PDF referral form on the Internet, the RMS Source presents the form to the user. Otherwise, the RMS Source presents the user with an electronic referral form that supports and includes the Minimum Data Set (MDS) per the chosen pathway;
5. The Referral Requestor completes and submits the form;
6. The RMS Source automatically faxes the form to the intended Referral Recipient;
7. The RMS Source contributes the initial referral transaction metadata to the THOR via ONE Access Gateway;
8. The RRS retrieves the referral metadata from THOR, and provides the LHINs with the relevant referral transactional information;
9. ONE Access Gateway provides the WTIS with the relevant referral information.

6.7.4 Patient Portal: RMS Source to RMS Target

6.7.4.1 Overview

In this architectural pattern, patient referrals are initiated by client themselves using a public-facing Patient Portal (PP) and responded by providers (as a Referral Recipient) using their POS or RMS in a LHIN. The bi-directional communication between the PP and the POS/RMS Target is facilitated by two eReferral Systems (RMS Source and RMS Target). In addition, clients also use the PP to access their own personal referrals. The RRS provides the LHINs with the relevant referral transactional information.

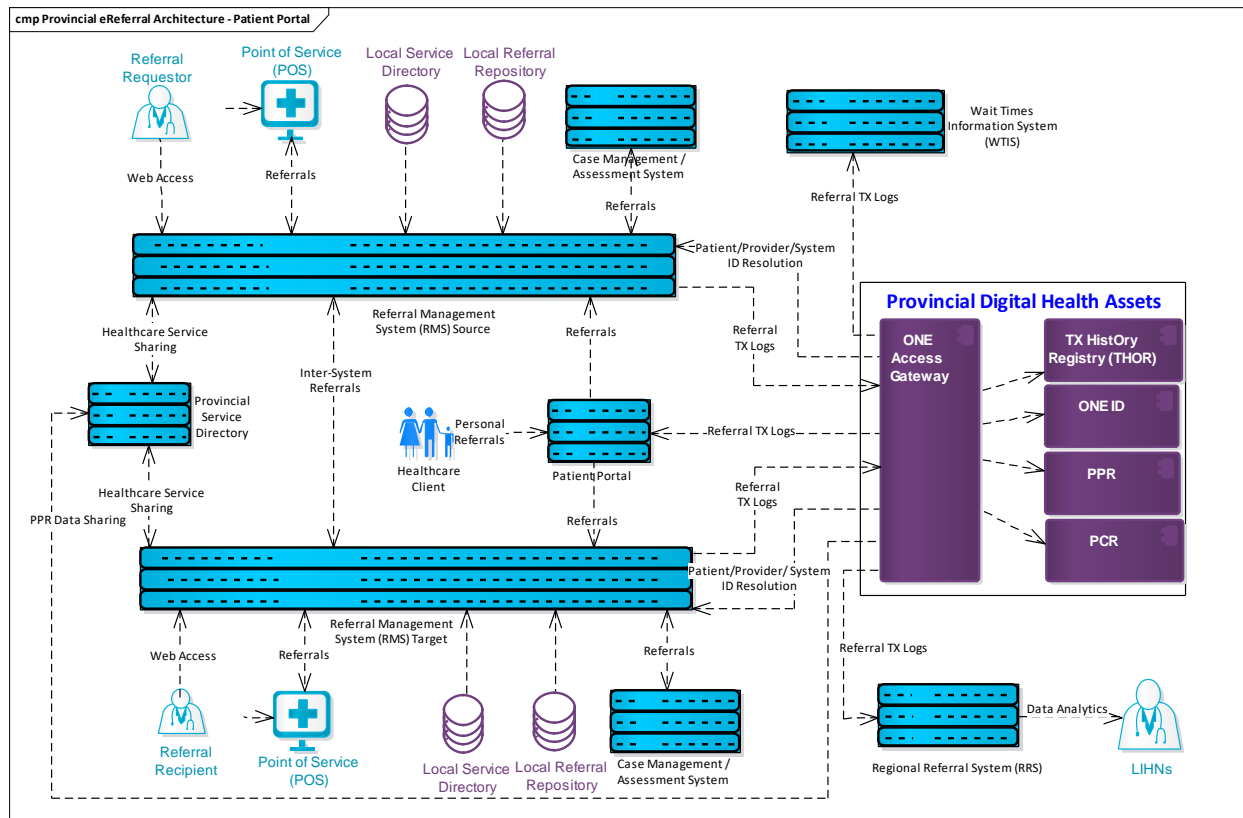


Figure 8: Patient Portal: RMS Source to RMS Target

6.7.4.2 Applicable Scenarios

The following scenarios applies to the Patient Portal pattern for “RMS Source to RMS Target”:

- A patient self-refers to a healthcare service on RMS Target;
- A patient (or a caregiver on behalf of the patient) reviews his/her personal referral information.

6.7.4.3 Applicable Pathways

The following pathway applies to the Patient Portal pattern for “RMS Source to RMS Target”:

Physician to Physician	MSK Central Intake	Primary Care to Community Support Services	Acute-Care Discharge to Post-Acute Services	Patient Initiated (Self-) Referral
				✓

6.7.4.4 System Actors

The following system actors apply to the Patient Portal pattern for “RMS Source to RMS Target”:

POS	RMS Source	CMS	RMS Target	RRS	ONE Access Gateway	WTIS	PP	RTL
✓	✓	✓	✓	✓	✓	✓	✓	

6.7.4.5 Integration Guidelines

See Section 6.7.1.3.

6.7.4.6 High-Level System Flows

Patient Views Active Referrals

1. The patient logs into the PP that uses the ONE Access Viewlet framework to establish ONE ID SSO for consumer, and connects to ONE Access Gateway to retrieve his/her referral transaction listing;
2. The PP connects to RMS Sources via ONE Access Viewlet and enables patient to retrieve detail of individual referrals;
3. The PP displays individual referrals to the patient via ONE Access Viewlet.

Patient Self-Referral

1. The patient logs into the PP and launches the RMS Source via the ONE Access Viewlet framework/Launcher.
2. The PP provides appropriate patient and clinical context to the RMS Source via the ONE Access Viewlet framework, and presents the RMS UI to the patient user;
3. The user leverages the intelligent resource matching capabilities offered by the RMS Source, and selects the health care services that offer self-referral based on the patient and clinical context;

Note: Not only do the search results contain service and geographic information for the Referral Requestor to make an informed decision, but also they include system endpoint and routing information of individual services for the RMS Source to route referral requests to the intended RMS Target.

4. The patient opens an electronic referral form where the basic demographics information is auto-filled;
5. The patient completes and submits the form;
6. The RMS Source generates a referral message (the standard/minimum dataset) per the chosen pathway, and delivers the request to the RMS Target by invoking the API;

7. The RMS Target sends a notification to the intended healthcare provider upon receiving the incoming message;
8. The Referral Recipient logs into the POS by his/her ONE ID account, and opens the RMS Target via the ONE Access Viewlet;
9. The RMS Target uses ONE ID to identify the provider;
10. The RMS Target presents the incoming referral to the Referral Recipient;
11. The Referral Recipient reviews and accepts the referral;
12. The RMS Target sends the referral acceptance message to the RMS Source;
13. The RMS Source contributes the referral transaction metadata to the THOR via ONE Access Gateway;
14. The RRS retrieves the referral metadata from THOR, and provides the LHINs with the relevant referral transactional information;
15. ONE Access Gateway provides the WTIS with the relevant referral information.

6.7.5 Intra-System Referrals

6.7.5.1 Overview

In this architectural pattern, referrals are initiated and exchanged within a single eReferral system. The transaction logs are contributed to the THOR via ONE Access Gateway after the fact. The RRS provides the LHINs with the relevant referral transactional information.

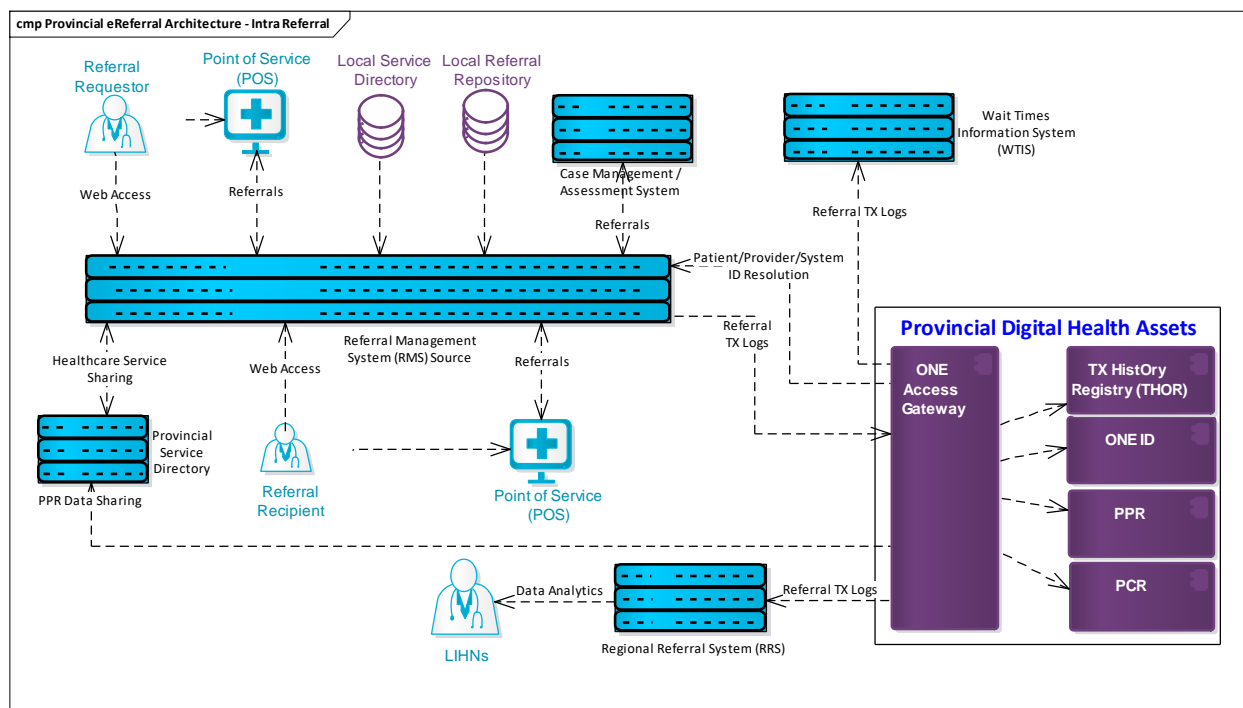


Figure 9: Intra-System Referrals

6.7.5.2 Applicable Scenarios

Both Referral Requestor and Referral Recipient use the same eReferral system to manage patient referrals. Transaction logs of the referrals exchanged within the same system are contributed to the THOR.

6.7.5.3 Applicable Pathways

The following pathways apply to intra-system referrals:

Physician to Physician	MSK Central Intake	Primary Care to Community Support Services	Acute-Care Discharge to Post-Acute Services	Patient Initiated (Self-) Referral
✓	✓	✓	✓	

6.7.5.4 System Actors

The following system actors apply to the Referral System pattern for intra-system referral:

POS	RMS Source	CMS	RMS Target	RRS	ONE Access Gateway	WTIS	PP	RTL
✓	✓	✓	✓	✓	✓	✓		

6.7.5.5 Integration Guidelines

See Section 6.7.1.3.

6.7.5.6 High-Level System Flow: Intra-referral contribution

1. The participating referral system generates intra-referral messages (the standard/minimum dataset) per the chosen pathway;
2. The system contributes the referral transaction metadata to the THOR via ONE Access Gateway;
3. The RRS retrieves the referral metadata from THOR, and provides the LHINs with the relevant referral transactional information;
4. ONE Access Gateway provides the WTIS with the relevant referral information.

6.8 Alignment with PanLHIN Referral Management Working Group Guiding Principles

The table below shows how the design features of the eReferral conceptual architecture satisfy the PanLHIN Referral Management Working Group Guiding Principles.

Table 11: Alignment of Conceptual Architecture with PanLHIN Referral Management Working Group Guiding Principles

ID	Guiding Principle	Alignment
1	Integration to EMR / Provincial Assets/ Regional Referral Solutions is a critical success factor. The initiative must address the opportunity if a provider doesn't have an EMR Regional Referral Solution, and how they will be included in the architecture.	<ul style="list-style-type: none">• eHealth Ontario's One Access Viewlets as part of One Access Strategy not only provide SMART on FHIR capabilities, but also extend them significantly to integrate with provincial assets (e.g., ONEID, DI, Immunizations, Medications, Labs, etc.), patient context sharing, and external systems. Once deployed, One Access Viewlets can be easily upgraded (i.e., do not require frequent re-development by the host), and seamlessly embedded into POS and RMS, facilitating various clinical flows as more pathways are implemented.

ID	Guiding Principle	Alignment
		<ul style="list-style-type: none"> • POS and RMS use One Access Viewlets and ONE Access Gateway API to easily connect to appropriate external integration points including the provincial assets and other eReferral vendor systems. • RMSs allow service providers to securely access the system in multiple ways, including, but not limited to: <ul style="list-style-type: none"> ○ Launching natively within POS; ○ Logging in from a web-based portal; ○ Connecting via a mobile device. • ONE ID will be leveraged to identify Referral Requestors and Referral Recipients in the involved systems. • RRSs track efficiency information of all the referrals in the region based on date/time stamps throughout life-cycle. • RRSs provide the LHINs and other organization with end-to-end reporting and data analytics functions.
1a	<p>All referrals within a LHIN will flow through the Regional Referral Solution if one exists. This includes all referrals that are sent or received within a LHIN (refer to End-to-End Reporting / Analytics) and includes out-of-province referrals. This enables the Regional Referral System to have a record of all referrals processed within a LHIN.</p>	<ul style="list-style-type: none"> • The RMS will serve as source of truth for all referrals that it initiates and interacts with. • RMS will provide patient-centric and service-centric referral management (e.g., can see how many services a patient is waiting for, being served by; can see which services have a waitlist; can update referral status); • RMS will follow the ONE Access Viewlet and/or API standards to enable different vendor systems to be integrated into one single user interface providing a holistic referral view by different criteria (e.g., patient, pathway, LHIN region, etc.). • RMS Sources are required to connect with the ONE Access Gateway API, contributing referral transaction activities as it processes them in real time. Those activities will be stored to eHealth Ontario's Transaction History Registry (THOR) via One Access Gateway. • RRSs retrieve all referral transaction logs from THOR, and track efficiency information of all the referrals in the region based on date/time stamps throughout life-cycle. • RRSs provide the LHINs and other organizations with end-to-end reporting and data analytics functions. • Anyone with access rights can retrieve transaction history of referrals regardless of where they originated or terminated. This data can be used for statistical purposes, as well as be used by PP to locate and view referrals originating from any solution in the network. • POS can initiate/respond to out-of-province referrals through an RMS within or out of the province. • The architecture pattern can also support multiple referral systems within a region.

ID	Guiding Principle	Alignment
1b	Pathways developed would be available in all Regional Referral Solutions as part of the strategy. The work must factor in development and spread of existing pathways along with net new pathways. This will require standardized forms or data sets to pass between solutions.	<p>The architecture pattern enables new pathways to be readily available to service providers. It supports various referral delivery options by being agnostic to referral pathways:</p> <ul style="list-style-type: none"> • Pop-up RMS Source window within POS or RMS Target window within RMS Source via ONE Access Viewlets. • Provincial Standard Referral Pathways: Standard datasets between electronic systems (bi-directional communication); • Bi-directional Generic Referral Pathways: Minimum Data Set (MDS) exchanged between electronic systems (bi-directional communication); • One-way Generic or Standard Referral Pathways: MDS one-way communication from RMS to a paper-based or non-integrated electronic receiving system (e.g., generic or provincial standard referral forms with MDS being faxed/auto-faxed out to Referral Recipients); • One-way Pathway Hyperlink: Navigate from RMS to non-integrated external electronic system or a website providing a downloadable and/or fillable acrobat referral form that a provider uses.
1c	Integration approach will consider relevant / associated Provincial / Regional Assets / Services with the aim to ensure a seamless and efficient (system performance) experience for both referral senders and receivers.	<ul style="list-style-type: none"> • RMSs allow service providers (Referral Requestors/ Recipients) to access the system from POS. • RMSs can share provider service information with each other via the central HSD. With data integration, RMS enables service providers to minimize manual search process and efficiently select appropriate healthcare services (within the region, across the province, and even out-of-province) to which patients can be referred, and to which referral requests can be made. • The central service directory model enables vendor systems (and other solutions) to post and retrieve healthcare service listings and associated metadata used to route referrals to desired services. The relevant provider information from PPR can be also contributed to the directory. • RMS Source mediates the patient referral process on behalf of referral requestors. • RMS Target mediates the referral process on behalf of referral recipients. • All RMSs incorporate provincial services (e.g., Provincial Client Registry and Provincial Provider Registry) as required during the eReferral process.
1d	Approach must be strategic, scalable and sustainable.	<ul style="list-style-type: none"> • ONE Access Viewlets as part of ONE Access Strategy not only provide SMART on FHIR capabilities, but also extend them significantly to include integrated provincial assets (e.g., ONE ID, DI, Immunizations, Medications, Labs, etc.), patient context sharing, and external system launcher. Once deployed, One Access Viewlets can be easily upgraded (i.e., do not require frequent re-development on the host) and seamlessly embedded into POS and RMS facilitating various clinical flows as more pathways are implemented. • Vendor systems can choose to utilize eHealth Ontario's One Access Gateway that provides access to various provincial assets (e.g., Provincial Provider Registry, Provincial Client Registry, ONE ID, etc.). • This modular approach allows new RMSs and RRSs to easily participate in the provincial eReferral ecosystem at any given time. Innovation is encouraged and supported.

ID	Guiding Principle	Alignment
2	Utilize Existing Systems and infrastructure and not build duplication.	<ul style="list-style-type: none"> There are currently multiple existing RMSs in the Province that should be leveraged and connected with each other, thereby enabling patients to be seamlessly referred across the Province. The architecture allows multiple eReferral solutions to cooperate and appear as one integrated provincial solution. ONE Access Viewlets and Gateway provide multiple methods for referral systems to easily access the provincial assets where appropriate. The solution doesn't introduce any data duplication (except after-the-fact transaction history) and enables external systems to obtain referral detail from the source of the truth.
3	Consistent User Experience should be aspired to, regardless of referral pathway, Regional Referral System used, or location of referral senders and receivers.	<ul style="list-style-type: none"> Referral Requestors will use their existing POS systems to initiate referrals via the connectivity to the RMS. Referral Recipients will use their existing POS systems to respond to referral requests for service via the connectivity to the RMS. Referral Requestors and/or Recipients that do not have a POS will use an RMS acting as POS. ONE Access Viewlets extend the Smart-on-FHIR capabilities and provide users with more enhanced and consistent experience when connecting to external systems.
4	Patient Access and Use needs to be considered as part of the strategy.	
4a	Patients need to know where to go or whom to call to obtain services (e.g. navigation centre or listing of programs/services to access).	<ul style="list-style-type: none"> Patient Portals developed by vendors can directly integrate with referral systems, enabling healthcare service lookups and self-referrals.
4b	Patients need to be able to self-refer, as appropriate.	<ul style="list-style-type: none"> Patient Portals developed by vendors can integrate with referral systems enabling healthcare service lookups and self-referrals. Patient Portals developed by vendors can leverage ONE Access Viewlets to render transaction history of patients' referrals, regardless of where they originated or terminated. This requires RRS vendors to provide those viewlets and/or APIs.
4c	Patients need to have access to referral information (e.g. know the status of referral, appointment information, etc.) in a manner that adheres to privacy and security standards and has value to the patient (e.g. text message, phone call, portal, letter, etc.).	<ul style="list-style-type: none"> Patient Portals developed by vendors can leverage ONE Access Viewlets to render transaction history of patients' referrals regardless of where they originated or terminated. Patient portals may also use THOR and the RRS APIs to access the actual referral content.

ID	Guiding Principle	Alignment
5	Standardization must be a critical cornerstone of the strategy including referral forms, data sets, data exchange standards, and terminology.	<ul style="list-style-type: none"> The API specifications will be used to encourage standardized data / terminology where appropriate. API conformance testing services need to be built and supported by the vendors so that assurance of the validity of APIs developed by stakeholders can be provided. FHIR profiles can be leveraged to support implementing standardized referral data and/or minimum data sets for pathways. The architecture assumes that standardized interfaces (federated APIs) will be supported by every RMS and RRS to encourage a 'plug and play' POS experience (e.g., any POS can connect to any RMS without customization). With eHealth Ontario in cooperation with the LHINs and MOHLTC governing the provincial eReferral standards, the vendors can directly exchange referral messages by federated APIs. It enables faster product delivery and seamless interoperability within the ecosystem.
6	Sustainability must be built into the strategy (e.g., resources, ongoing costs, oversight, support, ongoing maintenance and enhancements).	<ul style="list-style-type: none"> See comments on 1d. Selecting HL7 FHIR as the data exchange standard offers advantages in terms of resources, cost, and ongoing maintenance. Provincial program sustainability, outside the scope of the Conceptual Architecture, will be included in the overall eReferral Strategy work.
7	Governance for eReferrals needs to be integrated into the overall provincial governance structures and enable bi-directional input between provincial and regional bodies and include patient and clinical needs and requirements.	<ul style="list-style-type: none"> Outside the scope of the Conceptual Architecture; to be included in the overall eReferral Strategy work.
8	Automated Matching of Patient Needs to Appropriate Services is integral to reduce the need for clinicians to sort through multiple lists selecting options i.e. have the computer system perform much of the searching / matching functions and present the clinicians with options that meet the patient's needs. This automated matching should be sourced by a centralized services directory (refer to #9).	<ul style="list-style-type: none"> RMS Source will integrate with the PSD and provide intelligent matching functionality that minimizes manual search processes, and efficiently locates needed health care services based on the patient and clinical context. RMS Source and Target will be required to ensure the accuracy of the service directory data they collect. Referral Requestors use the integration to natively launch the RMS within the POS, and easily locate appropriate healthcare services where possible (based on the patient's needs). Refer to 1c.
9	Centralized Services Directory is a core asset that is needed to ensure referrals can match patient needs to the most appropriate and timely care, and providing patients' a choice of options (including those available through telemedicine).	<ul style="list-style-type: none"> A distributed and/or global services directory needs to effectively maintain up-to-date information about programs, services, resources, referral routing, and any other information that is necessary to facilitate a successful referral. Refer to 1c.
10	Wait Time Information must be captured, measured, communicated and available for reporting.	<ul style="list-style-type: none"> For LHINs, RMSs will store all referrals that they initiate for that LHIN, including intra- and inter-referrals, as well as out-of-province referrals. RMSs track efficiency information of all referrals that they initiate based on date/time stamps throughout the referral life-cycle, and provides these analytics through reports. THOR will store all the intra- and inter-referral transaction logs in and out of the Province. It enables these analytics to

ID	Guiding Principle	Alignment
		<p>be utilized by LHINs and organizations outside of a LHIN (e.g., by ministry, HQO) for reporting purposes.</p> <ul style="list-style-type: none"> RRSs retrieve all referral transaction logs from THOR, and track efficiency information of all the referrals in the region based on date/time stamps throughout life-cycle. RRSs provide the LHINs and other organization with end-to-end reporting and data analytics functions. ONE Access Gateway will supply the provincial Wait-Times Information System with relevant referral transaction information.
11	GP: End-to-End Life-Cycle Visibility, Reporting, and Analytics must be available throughout the life-cycle of a referral to inform ongoing, system-wide improvements. This includes end-to-end visibility of all referrals that are sent or received within a LHIN, and includes out-of-province referrals i.e. need to know where referrals are coming from and where they are going to.	
11a	<p>Referrals Sent from within a LHIN: The number of referrals that were sent:</p> <ul style="list-style-type: none"> by which health service providers within a LHIN, and to whom they were sent (includes health service providers within the LHIN, within other LHINs, and within other provinces). 	<ul style="list-style-type: none"> For LHINs, each RMS will have a record of all referrals that it initiates within their region. RMS will provide patient-centric and service-centric referral management (e.g., can see how many services a patient is waiting for, being served by; can see which services have a waitlist; can update referral status). RMS will follow the ONE Access Viewlet and/or API standards, and enable different vendor systems integrated into one single user interface, providing a holistic referral view by different criteria (e.g., patient, pathway, LHIN region, etc.) The THOR will store all the intra- and inter-referral transaction logs in and out of the Province. It enables these analytics to be utilized by LHINs and organizations outside of a LHIN (e.g., by ministry, HQO) for reporting. RRSs retrieve all referral transaction logs from THOR and track efficiency information of all the referrals in the region based on date/time stamps throughout life-cycle. RRSs provide the LHINs and other organization with end-to-end reporting and data analytics functions.
11b	<p>Referrals Received within a LHIN: The number of referrals that were received:</p> <ul style="list-style-type: none"> by which health service providers within a LHIN, and from whom they originated from (includes health service providers within the LHIN, within other LHINs, and within other provinces). 	<ul style="list-style-type: none"> Refer to 11b
12	Out of Province Referrals need to be considered to support patients' receiving needed care outside of their province. This is especially required by patients in LHINs that border other provinces, as well as, those that need to travel out-of-province to receive specialty care.	<ul style="list-style-type: none"> Out-of-province referral systems can be treated as an RMS and be integrated to the ecosystem. Alternately, service providers can be given access directly through an RMS. This will enable out-of-province providers to make referrals, receive referrals, and share healthcare service listings and associated meta-data. eHealth Ontario will treat an out-of-province system as any other RMS. Security from out-of-province solution will need further work. A distributed and/or global service directory will enable these service listings to be identified within RMSs, and enable referrals to be routed to a desired service or out-of-province referral system.

7.0 Conceptual Information Model

7.1 What is a Conceptual Information Model?

A Conceptual Information Model (CIM) is a set of high-level business information entities, including their relationships and representative attributes in an entity diagram and data dictionary. At a high level, it represents the information in scope for a business solution. The model enhances communication between technical and business staff, clarifying business information requirements and rules by:

- being independent of any specific technical solutions or restrictions;
- offering a formal representation of the information needed to run the enterprise or business activity.

7.2 eReferral Conceptual Information Model

The eReferral CIM represents the structure of the information of importance to the Provincial eReferral Strategy solution design. It offers a model-based view of the information that comprises:

- The portion of the future Service Directory in scope for eReferral;
- The future Provincial eReferral repository.

7.2.1 Service Directory

eReferral information to be provided by the Service Directory includes:

- Health service and program categories;
- Types and specialties;
- Hours of operation and calendar availability;
- System endpoints;
- Geographic and electronic addresses;
- Patient eligibility;
- Preferred referral methods; and expected wait times.

For more information, see Section 6.6.

It is recommended projects using the Provincial eReferral Strategy collaborate to create and follow a single Logical Data Model (LDM) for eReferral solutions. A normalized, relational model would include field-level detail about the above information. Model content would be drawn from the FHIR specification. Where service catalogues are implemented in databases for high performance, a common model is recommended to ensure the database designs are the same. This is a requirement to support semantic interoperability of eReferral data throughout the province.

7.2.2 CIM Entity Diagram

The eReferral CIM is derived directly from the latest version of the eHealth Blueprint CIM, known as CIM 2.0, which is the overarching information model for the provincial electronic health record.

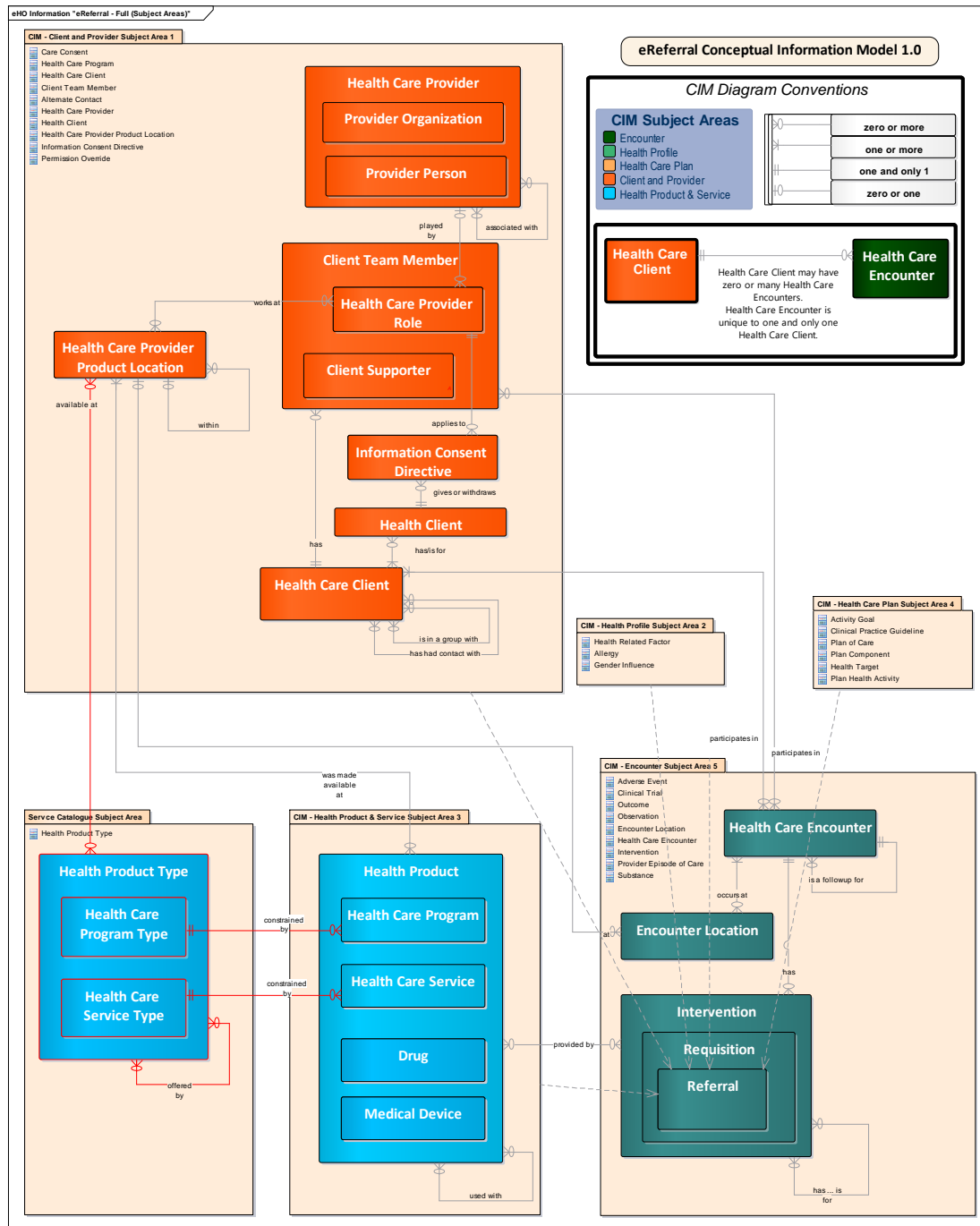


Figure 10: Figure: Conceptual Information Model – Summary Diagram.

New information entities for eReferral Service Directory are outlined in red at the bottom left of this figure. The Encounter subject area at the bottom right contains the Referral Requisition, to be stored in a new Provincial eReferral Repository. Reference relationships may exist between the referral entity and any other entity.

In later detailed design, conceptual information entities will be developed into logical data entities with logical data attributes and their datatypes, optionality, etc. Notwithstanding the selection of FHIR as the governing message standard for this eReferral Strategy, formal mapping between the eReferral data models and message designs governed by interoperability standards will be performed during logical design.

7.2.3 Data Dictionary

The data dictionary that accompanies the above CIM diagram can be found in the Appendix D.

8.0 Deployment Priorities

Publication of this report, upon MOHLTC approval, will inform stakeholders of the strategic direction for eReferral Interoperability Solutions in Ontario. The distributed design of the eReferral conceptual architecture allows LHINs to proceed with regional projects in a manner that aligns with the future-state vision.

To maximize alignment in the near term, it is important to provide additional direction and deployment priorities. The following five priorities will assist stakeholders and projects to “deliver today with tomorrow in mind”.

Table 12: Deployment Priorities

	Priority	Description	Benefits
1	Select the first three to five provincially standardized referrals pathways	Ontario has experience with standardizing post-acute referral pathways across the Province (acute–community; acute–complex continuing care; acute–long-term care). This is a dedicated effort that requires resources and time to achieve agreement on the clinical and administrative process, and to institute changes to the business rules, processes and culture. As such, it is important to initiate the Planning and Analysis phases of this work in the near term. This priority will be identified as part of the overall strategy using the Pathway Prioritization Matrix that is to be developed as part of the strategy (SOW Section 3.1 #6).	<ul style="list-style-type: none"> Stakeholders are clear which pathways they should not address individually; Stakeholders can incorporate this work into their planning and roadmaps, as well as allocate resources (project team members, subject matter experts) to support the standardization work; Synergies and overlaps between regional referral pathways can be identified and addressed.
2	Define the key performance indicators and associated data concepts that will be used to manage and evaluate the eReferral ecosystem	Stakeholders require clear definitions of what is being measured, and what data is necessary to enable measurement. Process metrics (such as delays in response from the service provider, wait times between referral and service, inappropriate and/or declined referrals) and outcome metrics (such as reductions in returns to the emergency department, patient satisfaction, provider satisfaction) that correlate with the desired business goals for the eReferral system should be set and defined. It is urgent to define the measures and data in the near term while stakeholders have flexibility in defining data models for their systems. Data must be captured and stored using the same structure, format, and terminology across all systems.	<ul style="list-style-type: none"> Stakeholders can measure improvement in the referral processes across the Province and achieve value from the eReferral ecosystem. Identifying the first provincially standardized referral pathways early on will assist in defining the goals to be measured and managed. Note: Many considerations are involved in defining these rules, so this work should begin at the earliest opportunity. If not addressed early, it will be very difficult and costly to rectify, and will divert resources from eReferral expansion.
3	Communicate with stakeholders about their roles and responsibilities	Governance is essential for planning and coordinating the eReferral ecosystem, especially the proposed distributed design. A preliminary step is to clarify with every stakeholder the role(s) its system will be responsible for performing in the ecosystem. Section 6.4 defines the minimum capabilities of each role. Stakeholders may believe they should play more roles or a different role than the one recommended by the conceptual architecture. They may have a different perspective on the capabilities required and how they should be implemented, so communication is critical.	<ul style="list-style-type: none"> Obtaining agreement from each stakeholder to its role and commitment to develop the capabilities required within a set timeline required will enable the key components of the eReferral ecosystem to be built in parallel. An eReferral program roadmap will be necessary to plan, communicate and track all of the parallel development activities.

	Priority	Description	Benefits
4	Build the provincial eReferral services	<p>eHealth Ontario will need to incorporate the following assets into its business planning:</p> <ul style="list-style-type: none"> • Transaction History Registry (THOR); • ONE Access Gateway ; • Enterprise-level pub/sub capabilities. <p>Some of these services are being developed in support of the Ocean eReferral Network led by the SCA Program in Waterloo Wellington and can be built upon to achieve provincial-level services.</p>	<ul style="list-style-type: none"> • Enables provincial assets to be leveraged for future e-services. • Enables eReferrals to follow a distributed /decentralized model. • eHealth Ontario assets are accessible by any authorized vendor in the same way via the API Gateway.
5	Develop the full set of data exchange and terminology interoperability standards	<p>To ensure interoperability, eReferrals standards must be developed, and strictly adhered to by all stakeholders.</p> <p>Systems should be able receive and send the same data in the same structure and format to every other partner without any customization. Systems need to be able to seamlessly incorporate/accommodate multiple versions and be able to adapt to updates and changes to these standards. The ability for a referral system to seamless accommodate change will ensure the entire business network can evolve in a natural way.</p> <p>It is also recommended that rigorous, open conformance testing capabilities and services be offered to ensure that all eReferral stakeholders have implemented the standards fully and correctly before they integrate with the provincial eReferral ecosystem.</p>	<ul style="list-style-type: none"> • Reduce costs of systems integration. • Improve portability. • Increase data standardization to enable reporting and analytics. • Ensures innovation can proceed without all participants having to change and accommodate the change simultaneously.

9.0 Emerging Trends

9.1 Referral Blockchain Proposal

This section describes a proposal for the implementation of a common blockchain service that would support eReferral, eConsult, and other eSTAR (e*) initiatives and transactional-type clinical services. *It should be noted that the conceptual architecture has been designed with the possibility of this approach in mind. This proposal is being provided for information purposes and does not constitute a promise by eHealth Ontario to proceed. The final solution will incorporate these ideas based on final direction and funding.*

Blockchain provides a number of characteristics that makes it ideal for a solution such as this. However, Blockchain is still new, and will require further investigation before a full implementation can be contemplated. This section proposes a number of smaller blockchain prototypes to demonstrate its capabilities, provide training and experience for the team, as well as establish the overall architecture and governance schemes.

9.1.1 Approach

The following approach is proposed in order to test and prove this technology:

- Establish a business network to demonstrate a subset of the overall capabilities;
- Establish a set of partners that have a common goal towards utilizing and implementing Blockchain;
- Establish, early on, a governance structure to aid and direct an Ontario Health Care Blockchain Service;
- Establish a base-level set of expertise and resources (across multiple partners);
- Establish a blockchain technology or set of technologies.

9.1.2 Prototypes

Part 1: Establish a mechanism for identifying, publishing, and managing a health care services directory (HCSD)

This would include information from the provider registry (PPR) that provides relatively authoritative sources of claims for Health Institutions, Sole Providers, and Health Care Providers.

However, there are many other “general services” utilized by the health care sector that also need to be included, such as “Meals on Wheels”, “YMCA”, etc. that are more difficult to manage, maintain, and validate. So the core idea is to provide a mechanism for third parties to:

- Declare their identities, services, and service claims (i.e., what health-related services they provide);
- Have the information validated, and then published to the blockchain to be used by Referral Services and other e* applications.

OTN and the current referral vendors collect a great deal of this information today, and would be able to provide some of that data as a starting point. OTN has also established a significant Services Directory, which can be utilized as part of the prototype.

Part 2: eSTAR Business Network: Establish a general mechanism for securely exchanging and publishing Referral (and eventually any type of e* transactional information)

Initially this would take the form of recording a transaction log of referrals that are (a) managed within an referral service and (b) managed across a number of referral services. In a full implementation, this service would itself become the “exchange” mechanism for managing and handling transactions between e* services.

9.1.3 Health Care Directory Service (Directory of Health Services)

The idea is to first have HCPs and Service Provider (SPs) identify themselves on the blockchain. Identities would be confirmed through a variety of means such as use of ONEID credentials, CPSO affiliations, attestation by other HCPs, etc. Once we have confidence in the identities, we can then associate them with “service claims.”. All claims must be verifiable by one or more third parties. A service claim could include:

- A particular role for which the HCP is licensed;
- Services (Pathways) the HCP is capable of providing;
- The general service provided such “Meals on Wheels”, “Personal monitoring”, “taxi services” etc.;
- Their “service location” in geographic coordinates;
- Referral Providers with which the HCP is associated, including the corresponding pathways (aka supporting the ability to use multiple RRS);
- Associations with Hospitals and Practices;
- Just about anything with which an HCP or Health Service might want to be associated.

Each service claim would need to be "endorsed" or "approved" by some other party. For example, CPSO could attest that the HCP is licensed for a particular role (or OHIP could do so). A hospital/clinic could attest to the fact that an HCP works at the hospital. The Regional Referral Service (RRS) could attest to the fact that the HCP is signed up for their service, etc. LHINS could provide the necessary support to validate general service providers in their region (e.g., “meals on wheels”).

Deliverables:

- Publish PPR and PCR data to the blockchain to establish a base directory;
- Allow additional attributes to be included to support Health Care Provider Service definitions and publication, including geographic capabilities for establishing locations and service boundaries;
- Provide an API for Referral vendors to publish/modify/update service data with which they are associated;
- Provide a mechanism for third parties to identify and register themselves, with appropriate validation for value-added services;
- Provide a utility for the Administrators to manage, monitor and audit the business network;
- Provide a FHIR-based API for vendors to look up and provide basic matching services (Note the intent is not to provide a full matching service, only to provide such services as to allow for vendors to build and extend the business network with this type of functionality);
- Provide a basic governance model for the onboarding of vendors and partners in the blockchain business network.

9.1.4 eStar Business Network (ESTAR e* Business Network)

The ESTAR Business Network would initially provide a comprehensive log/ledger for all Referral transactional activities such as:

- Referral Requests (internal RRS);
- Referral Responses (Internal RRS);
- Referral Transfers (RRS to RRS);
- Referral Matching Services.

The current proposal to establish an Ontario Scale Referral Service provides for a general transactional logging capability by requiring vendors to log the above activity through an API provided by eHealth Ontario. In this case, the vendors would be trusted to provide the correct information, and abide by a set of rules for doing so.

This proposed Referral Network could be established as follows:

- **Federated APIs:** Each referral vendor will publish and expose a set of FHIR APIs that can be used to transact Referral business between multiple referral solutions. This approach is part of the current conceptual design.
- **Visualization and Data APIs:** Referral vendors will also provide a set of viewlets (Progress Web Application Components) that authorized parties can use to display referral data from their respective repositories, or to provide additional services. Viewlets are a new standard proposed by eHealth Ontario as part of its ONE Access Strategy. Viewlets are fundamentally web applications that follow the Progressive Web Application design pattern, and implement the Viewlet Framework specification (TBD) for providing interoperability, single sign-on, and patient context switching. This approach is part of the current conceptual design.
- **Consent:** In the future, eHealth Ontario will enable vendors to integrate with the Consent Gateway in order to ensure that appropriate privacy and logging rules are followed.
- **Registration and Transaction Tokens:** Referral vendors will establish their participation in this business network with eHealth Ontario, which will provide the necessary cryptographic keys that must be used to establish communication among vendors. A transaction token will be required from eHealth Ontario in order for vendors to communicate with each other to ensure only valid members of the business network can participate. This approach is part of the current conceptual design.
- **Access to eHealth Ontario Services:** eHealth Ontario will provide services to allow vendors access to PPR, PCR, and ONE ID, as well as provide an API to record the transactional activity for both internally managed referrals as well as those transacted between multiple vendors. This approach is part of the current conceptual design.
- **Transactional Log Services:** The transaction log will contain sufficient information to identify the API associated with the transaction, and to enable construction into an API call to retrieve the required data or to invoke a viewlet to render the data visually. This API will be provided and managed by eHealth Ontario. The THOR is the first step towards a blockchain service. This approach is part of the current conceptual design.
- **Authoritative sources of Referral Content:** Referral vendors will store and manage all the content associated with the Referral, which will be accessible via their APIs. eHealth Ontario will not be storing PHI data associated with eReferrals. Vendors are encouraged to support data references and not arbitrarily copy data from sources systems - the EHR in particular. The transaction log will consist of timestamps and meta-data associated with these transactions, as well as a HASH to ensure that referral data is not modified after the fact. This approach is part of the current conceptual design.
- **Governance and Stewardship:** The Business network will be operated with an established Governance model and a set of stewards. The general model is to allow referral vendors to innovate and expand their services without changes to a core hub.

The ESTAR Business Network (blockchain) for the prototype extends the Transaction Log Services (described in the currently proposed implementation) to a full blockchain service with smart contracts to automatically apply the required business rules.

1. The Ministry can use this service for monitoring referrals for fairness, audit, wait-times and other analytical purposes.
2. Vendors can use the service to submit requests to/from other vendors securely and with confidence, and have them recorded and validated accurately.
3. Vendors can establish third-party services, and publish these services on the network. The eSTAR business network would provide the governance and methods for service providers to join and participate securely on the network.
4. The prototype allows a “central” view of all referrals for a specific patient, provider, or institution for use in Patient and Provider Portals. This would include maintaining the overall status of a transaction, where it is currently being processed, etc.
5. Smart Contracts would ensure that only valid services are published on the network, that referrals are being routed fairly, and that patients are being given their choice, etc.

6. The prototype supports an eco-system for vendors to participate and provide value-added services to the network such as “matching services” (match referral requests to referral service providers, patient portals, etc.)


9.1.5 Participants Providing Instances of the Blockchain

The following agencies/institutions could be the initial participants capable of providing Blockchain instances. The LHINs would be expected to participate in the administration and governance model.

- eHealth Ontario;
- OTN;
- UHN;
- Possibly some of the Referral Vendors.

10.0 Appendix A: Stakeholder Engagement

10.1 Sessions

Date	Delivery Mode	Artifacts	Details
April 23, 2018	Webinar	See attached spreadsheet for organization names and contact info.	 Microsoft Excel Worksheet
April 23, 2018	Webinar	Presentation and recording	Webinar presentation: https://3.basecamp.com/3573371/join/6GrNGkAmgFpd Webinar recording: https://3.basecamp.com/3573371/buckets/5819382/vaults/803286956
May 2, 2018	Break-Out Session	Meeting Notes	https://3.basecamp.com/3573371/buckets/5819382/vaults/803286956

10.2 Lessons Learned

Workshop Satisfaction Survey Results (May 2, 2018):



Conceptual Arch WG
- Survey Results - Ma

10.3 Engagements to Date

Date(s)	Delivery Mode	Engagement	Comments
March 27/18; April 24/18; May 8/18; May 22/18; June 26/18.	Webinar	PanLHIN Referral Management Working Group engagements on Conceptual Architecture.	Endorsement of draft Conceptual Architecture received.
April 23/18	Webinar	Overview of the proposed Conceptual Architecture (open to everyone)	Held in advance of the May 2/18 in-person meeting.
May 2/18	In person	Overview of the proposed Conceptual Architecture In-Person Workshop	Open to everyone
May 17/18	Webinar	Overview presentation of the proposed Conceptual provided to EHR Governance Strategic Committee	Conducted by K. Malench, T. Jin.
June 28/18	Conference Call	CCO meeting	J. Routliffe
June 13/18	Email	Hubbed HIS vendors / hospitals	B. Pye, HIS Renewal Committee to P. Bascom indicating to touch base in Sept/Oct 2018 to ensure the Provincial HIS Requirements specifications reflect the Conceptual Architecture requirements and interconnection to EHO assets. Additionally,

Date(s)	Delivery Mode	Engagement	Comments
			HIS Vendors and hospitals can participate in Provincial Open Review process (Aug – Nov 2018) to have their feedback incorporated. (P. Bascom)

11.0 Appendix B: Wait Times Definitions

Table 13: Wait Times Definitions and Indicators

System Label/ Data Item	ATC - WTIS System Label Definition	MSK CIAC/RAC Data Definition Ministry Guidance
Wait 1 (Days)	The total number of days the patient waited for the first consultation with a clinician. It is measured from the date the referral is received to the date of the first consultation with the clinician.	The time that the patient waits for a first consultation with a surgeon. It is measured from the date the referral is received (either by the central intake or a surgeon) to the date the first consultation with the surgeon. It is comprised of Wait 1a and Wait 1b.
Wait 1a	n/a	The time that the patient waits for an initial assessment with an Advanced Practice Provider (APP) related to their hip or knee arthritis. It is measured from the date the referral is received by the central intake to the date of the assessment with the APP.
Wait 1b	n/a	The time that the patient waits for a first consultation with a surgeon related to their hip or knee joint. It is measured from the date the patient meets with the APP to the date of the first consultation with a surgeon.

12.0 Appendix C: Conceptual Information Model

12.1 Referral CIM Data Dictionary

The following table describes entities in the Conceptual Information Model (CIM) that support the eHealth Blueprint CIM. It also highlights key information related to privacy and security.

Generally reference entities are not included in the eHealth Blueprint CIM. They are included in the Service Directory project conceptual model to illustrate the catalogue's primary content-type lookup entities. These entities and associated relationships are outlined in red on the CIM diagram (see Section 7.2.2). They will not be promoted in the eHealth Blueprint CIM.

Table 14: Entity Table

Entity	Description	Sensitivity PHI/PI/Sensitive/ None
Health Care Client	<p>An individual participating in the health care system for the purpose of receiving therapeutic, diagnostic, or preventive procedures. (U.S. National Library of Medicine - Medical Subject Headings)</p> <p>A natural person (i.e., a human being) who:</p> <ul style="list-style-type: none"> Is eligible to receive health care services in Ontario, or Has received or is receiving health care services in the Province of Ontario (i.e. a health care client). <p>This entity covers personal identifying information but not health information. It includes information about:</p> <ul style="list-style-type: none"> Identity within the health system e.g. a Health Number ; each care setting may have a separate unique ID. E.g. a research study may uniquely identify a health care client as a test subject; Administrative gender, e.g. Male, Female , undisclosed; Adoption: whether or not the health care client was adopted; Birth and death dates; Official versus preferred name; Whether or not the health care client would prefer to receive correspondence. <p>The health care client's identity may be unknown e.g. for a protected person or if the health care client is a 'John Doe'. A health care client may be a VIP whose identity must be omitted from reporting. A health care client may be identified by an alias. Health care client-identifying information could include a photograph. May be related genetically or by physical co-location (e.g. residential, occupational, travel, etc.) to another person not necessarily a health care client.</p> <p>Depending on care setting, a health care client may be referred to as:</p> <ul style="list-style-type: none"> Patient (currently receiving care); Participant (in a clinical study); Resident (of a long term care facility); Subject (in a public health case); Client (in home care/community care cases/ settings). <p>References:</p> <ul style="list-style-type: none"> ISO/HL7 10781 - EHR System Functional Model, Release 2, 4/21/2014 http://www.hl7.org/implement/standards/product_brief.cfm?product_id=269 	PI

Entity	Description	Sensitivity PHI/PI/Sensitive/ None
Health Client	<p>Legal entity (i.e. either an individual or an organization) holding rights and responsibilities for a health care client with respect to health care. A health care client managing his or her own care acts as the health client. Where care of a health care client is legally managed by another person, that person is the health client.</p> <p>Includes power of attorney and substitute decision maker. Includes personal representative, advocate, healthcare proxy, legal representative, financially responsible entity.</p> <p>It includes information about contact method e.g. geographic or virtual address, telephone number.</p> <p>References:</p> <ul style="list-style-type: none"> ISO/HL7 10781 - EHR System Functional Model, Release 2, 4/21/2014 http://www.hl7.org/implement/standards/product_brief.cfm?product_id=269 	PI
Health Care Provider	<p>A person or an organization that provides health care or other health-related services or products. It includes information about contact method:</p> <ul style="list-style-type: none"> Geographic address; Virtual address; Telephone number; Other demographics. <p>References:</p> <ul style="list-style-type: none"> ISO/HL7 10781 - Electronic Health Record System Functional Model, Release 2, 4/21/2014 http://www.hl7.org/implement/standards/product_brief.cfm?product_id=269 	PI
Provider Organization	<p>An organization that provides health care or other health-related services or products. Example include insurers and transcription services.</p> <p>May have information on service classification e.g. Regional Cancer Centre.</p> <p>[For Single Sign On application, a Provider Organization may be a Sponsoring Organization, a Health Care organization that has users that require access to at least one Federated Service. 2015-6-15]</p> <p>References:</p> <ul style="list-style-type: none"> ISO/HL7 10781 - Electronic Health Record System Functional Model, Release 2, 4/21/2014 http://www.hl7.org/implement/standards/product_brief.cfm?product_id=269 	None
Provider Person	<p>Describes a health care provider involved in the delivery of healthcare services. Encompasses both professional and non-professional members.</p> <p>Has professions, areas of practice for which the provider is qualified. May have information on clinician credentialing and privileging as defined by the applicable professional and governing organizations. This includes remote participation (e.g., via tele-health activities such as tele-consultation, home health monitoring.) Includes any information about licensing status and license suspension. May be an author, authenticator or scribe/transcriber of clinical documentation.</p> <p>Has a Unique Provider Identifier, a key assigned by eHealth to uniquely identify each Provider. May have a health system universal ID. May have a license number or national provider identifier (U.S.). May have multiple unique identifiers.</p> <p>References:</p> <ul style="list-style-type: none"> SC-3004-EN-CeRx Terminology Worksheet- CeRx4.4.2-20160311 https://infocentral.infoway-inforoute.ca/2_Standards/1_pan-Canadian_Standards/Terminology/3_pan-Canadian_Terminology_Artifacts ISO/HL7 10781 - Electronic Health Record System Functional Model, Release 2, 4/21/2014 http://www.hl7.org/implement/standards/product_brief.cfm?product_id=269 	PI
Information Consent Directive	<p>A directive received from a health care client or health client for the purpose of restricting access to Personal Health Information (PHI) by Health Information Custodians (i.e. implied consent directive).</p> <p>If a consent directive is in place, it is only to prevent access to PHI in the EHR for health care purposes. Consent directives will apply only in respect of sharing of PHI for provision of health care (since EHR is to be accessed only for this purpose). Consent directives do not have a time limit.</p> <p>May be overridden by Consent Override in a 'break the glass' scenario. Consent overrides may be permitted only for the following three purposes as authorized by law:</p>	PI/PHI

Entity	Description	Sensitivity PHI/PI/Sensitive/ None
	<ul style="list-style-type: none"> If health care client or Substitute Decision Maker (SDM) provides express consent for the override to facilitate provision of health care to the health care client, or To prevent, eliminate or reduce risk of serious bodily harm to a person (if it is not reasonable to obtain consent in timely manner) or to a group, where the HIC believes on reasonable grounds that the collection is necessary for this purpose. <p>Additional purposes are not permitted.</p> <p>References:</p> <ul style="list-style-type: none"> ISO/HL7 10781 - Electronic Health Record System Functional Model, Release 2, 4/21/2014 http://www.hl7.org/implement/standards/product_brief.cfm?product_id=269 	
Health Care Provider Product Location	<p>An address or other identifiable locale at which health products have been provided to an individual health care client in a Health Care Encounter, often by a particular provider playing a particular role.</p> <p>It may also be:</p> <ul style="list-style-type: none"> Temporary (e.g., flu shot clinic in a mall); Mobile (e.g., ambulance, mobile lab); In the field (e.g., car, accident site); The health care client's home; Virtual (e.g., a tele-health activity such as tele-consultation or home health monitoring). <p>Locations and contact information may refer to the location of the provider within a health care facility's premises e.g. a hospital unit.</p> <p>Products and services can be provided by non-licensed providers e.g. care-givers.</p> <p>References:</p> <ul style="list-style-type: none"> ISO/HL7 10781 - Electronic Health Record System Functional Model, Release 2, 4/21/2014 - http://www.hl7.org/implement/standards/product_brief.cfm?product_id=269 	None
Client Team Member	<p>A member of a multidisciplinary team providing care of health care clients, usually organized under the leadership of a physician. Each member of the team has specific responsibilities and the whole team contributes to the care of the health care client.</p> <p>Examples:</p> <p>Encounter provider;</p> <ul style="list-style-type: none"> Primary care provider; Attending; Resident; Consultant; Most responsible provider (not applicable in home care); Nurse case manager; Medical specialist; Clinical pharmacist; Social worker; Lay health worker; Health care client advocate; Home care worker; There will be one instance per role played. May elect to receive communication regarding the health care client. <p>References</p> <ul style="list-style-type: none"> U.S. National Library of Medicine - Medical Subject Headings - https://www.nlm.nih.gov/cgi/mesh/2016/MB_cgi?mode=&index=10325&field=all&HM=&II=&PA=&form=input ISO/HL7 10781 - Electronic Health Record System Functional Model, Release 2, 4/21/2014 http://www.hl7.org/implement/standards/product_brief.cfm?product_id=269 	PI
Client Supporter	<p>A person who provides care to a health care client who needs supervision or assistance. He or she may provide the care in the home, in a hospital, or in an institution.</p>	PI

Entity	Description	Sensitivity PHI/PI/Sensitive/ None
	<p>Although caregivers include trained medical, nursing, and other health personnel, the concept also refers to parents, spouses, or other family members, friends, members of the clergy, teachers, social workers, fellow health care clients.</p> <p>This could be an informal care giver: unpaid, unlicensed, often untrained, often a friend or family member of the health care client.</p> <p>For example:</p> <ul style="list-style-type: none"> • Neighbour providing housework and meals; • Teacher reporting violent behaviour; • Policeman assisting in a roadside childbirth; • Faith-based organization e.g. a church, synagogue, mosque, temple, etc.; • Community volunteer; • Postal worker; • Student. <p>It includes information about contact method (e.g. geographic or virtual address, telephone number and other demographics).</p> <p>References</p> <ul style="list-style-type: none"> • U.S. National Library of Medicine - Medical Subject Headings - https://www.nlm.nih.gov/mesh/MBrowser.html • ISO/HL7 10781 - Electronic Health Record System Functional Model, Release 2, 4/21/2014 • http://www.hl7.org/implement/standards/product_brief.cfm?product_id=269 	
Health Care Program	<p>Mandate and resources conferred by legislative or administrative authority to achieve health outcomes within a jurisdiction and based on a strategy.</p> <p>Supports health care client registration in specific business programs e.g.:</p> <ul style="list-style-type: none"> • Ontario Drug Benefit (ODB) Program; • Special Drugs Program (SDP); • Inherited Metabolic Diseases (IMD) Program; • Breast Cancer Screening Program; • Assistive Devices Program; • Home Palliative Care Program; • Home Dialysis Program. <p>Refers to actual referral or enrollment of a health care client in a Program. These programs are invoked for a particular health care client, for the treatment or prevention of disease or injury.</p> <p>References</p> <ul style="list-style-type: none"> • ISO/HL7 10781 - Electronic Health Record System Functional Model, Release 2, 4/21/2014 • http://www.hl7.org/implement/standards/product_brief.cfm?product_id=269 	None
Health Product Type	<p>Health Product Type represents a catalogue entry for a Product. It supports the 2018 Service Directory.</p> <p>Health Product Description:</p> <p>Material (i.e., medication or devices) or service provided for a particular health care client for the treatment or prevention of disease or injury or the promotion of wellness.</p> <p>Product examples include insulin test strips, adult briefs. Also includes a human-product donation received by a health care client e.g. blood or biological products. May include radiation such as X-rays. May include a reason for use of the product.</p> <p>References</p> <ul style="list-style-type: none"> • ISO/HL7 10781 - Electronic Health Record System Functional Model, Release 2, 4/21/2014 • http://www.hl7.org/implement/standards/product_brief.cfm?product_id=269 	none
Health Care Program Type	<p>Health Care Program Type represents a catalogue entry for a Program. It supports the 2018 Service Directory.</p> <p>Health Care Program Description:</p> <p>Mandate and resources conferred by legislative or administrative authority to achieve health outcomes within a jurisdiction and based on a strategy.</p>	none

Entity	Description	Sensitivity PHI/PI/Sensitive/ None
	<p>Supports health care client registration in specific business programs, including:</p> <ul style="list-style-type: none"> • Ontario Drug Benefit (ODB) Program; • Special Drugs Program (SDP); • Inherited Metabolic Diseases (IMD) Program; • Breast Cancer Screening Program; • Assistive Devices Program; • Home Palliative Care Program; • Home Dialysis Program. <p>Refers to actual referral or enrollment of a health care client in a Program. These programs are invoked for a particular health care client, for the treatment or prevention of disease or injury.</p> <p>References</p> <ul style="list-style-type: none"> • ISO/HL7 10781 - Electronic Health Record System Functional Model, Release 2, 4/21/2014 • http://www.hl7.org/implement/standards/product_brief.cfm?product_id=269 	
Health Care Service Type	<p>Health Care Service Type represents a catalogue entry for a Service. It supports the 2018 Service Directory.</p> <p>Health Care Service Description:</p> <p>Action performed with the intention of directly or indirectly improving the health of the person or populations for whom it is provided.</p> <p>Each service may include a range of actions and interactions over time.</p> <p>Classification of types of health care service:</p> <p>Primary care:</p> <ul style="list-style-type: none"> • Treatment of chronic illness; • Family planning; • Vaccination. <p>Secondary care:</p> <ul style="list-style-type: none"> • Specialist care such as psychiatric and therapeutic care; • Acute care; • Hospital emergency care; • Obstetrics; • Intensive care; • Medical imaging. <p>Tertiary care:</p> <ul style="list-style-type: none"> • Cancer management; • Surgery; • Treatment for severe burns; • Advanced neonatology; • Palliative care. <p>Examples:</p> <ul style="list-style-type: none"> • Provision of a Health Product e.g. a blood transfusion service includes a blood product • A Community Care Service such as home care, homemaking, respite services or home palliative care <p>May include expected turnaround time for service delivery, e.g., the time from when a lab receives a specimen to when test results are available.</p> <p>References:</p> <ul style="list-style-type: none"> • ISO/HL7 10781 - Electronic Health Record System Functional Model, Release 2, 4/21/2014 • http://www.hl7.org/implement/standards/product_brief.cfm?product_id=269 	None
Health Product	<p>Material (i.e., medication or devices) or service provided for a particular health care client for the treatment or prevention of disease or injury or the promotion of wellness.</p> <p>Product examples include insulin test strips, adult briefs. Also includes a human-product donation received by a health care client e.g. blood or biological products. May include radiation such as X-rays.</p>	none

Entity	Description	Sensitivity PHI/PI/Sensitive/ None
	May include a reason for use of the product.	
Drug	<p>Any substance or mixture of substances used in the diagnosis, treatment, mitigation or prevention of a disease, disorder or abnormal physical state, or its symptoms, or when used for non-medical purposes, solely for its effects on the central nervous system.</p> <p>Includes prescription drugs, herbal medicine, vitamins, minerals, Chinese medicine, and other over the counter medicines. Also there are extemporaneous mixtures which are combinations of drugs.</p> <p>May have the following attributes:</p> <ul style="list-style-type: none"> • Administration route; • Drug identification e.g. DIN; • Name, including brand name and generic name, in English and French; • Manufacturer; • Therapeutic class; • Pharmaceutical format (e.g. capsule, tablet); • Strength (e.g., 200 mg). 	none
Medical Device	<p>Wide range of products used in the treatment, mitigation, diagnosis or prevention of a disease or abnormal physical condition.</p> <p>Some examples include pacemakers, artificial heart valves, hip implants, synthetic skin, medical laboratory diagnostic instruments, test kits for diagnosis and contraceptive devices.</p> <p>May include:</p> <ul style="list-style-type: none"> • Brand name; • Common device name; • Manufacturer; • Model number; • Catalog number; • Device serial number; • Lot number; • Expiration date; • Single or multiple use device indicator (i.e. if this is a single use device that was reprocessed and reused on a health care client); • Dates of manufacture, use, removal/reactivation, etc.; • Reason for removal or deactivation/reactivation; • Anatomical location. 	none
Health Care Encounter	<p>An event occurring at a given time and place, where one or more services or products are provided to assess, maintain or improve the health of the health care client.</p> <p>Types of encounter include: inpatient, outpatient, emergency, ambulatory, telehealth, community care, long-term care etc.</p> <p>Could be unplanned (e.g. ER visit) or planned (e.g. doctor's appointment). A self-care encounter is self-provided, e.g. glucometer reading, treatment of a wound, non-prescription medication.</p> <p>An encounter may be a step in a larger care process. The status of the care process may be noted by the provider as part of the encounter.</p> <p>Also includes phone calls and email correspondences between health care clients and health care providers.</p> <p>Encounter information should be categorized to support functionality to consolidate diverse, high-volume encounter information gathered over an extended period.</p> <p>May have an encounter-level outcome (as distinct from an Episode of Care Outcome) with information details such as:</p> <ul style="list-style-type: none"> • Appointment was kept; 	PHI

Entity	Description	Sensitivity PHI/PI/Sensitive/ None
	<ul style="list-style-type: none"> • Discharge; • Admission; • Transfer; • Death; • Left without being seen (LWBS); • Left without treatment (LWOT); • Elopement (i.e. leaving without notifying the facility or wandering); • Left against medical advice (AMA); • Health care client triaged to another clinic; • Recommendation for future care (e.g. book a follow-up); <p>May include time provider was notified of encounter and time he or she arrived.</p> <p>Encounters can also be for individual health care clients or for groups of health care clients. If it is a group encounter then the EHR should document the fact that it is a group and group characteristics such as name of group, size of group, health care professionals conducting the group should be included.</p>	
Encounter Location	<p>A geographic or virtual address at which an encounter has occurred, or has been scheduled to occur, for a particular health care client or group of clients.</p> <p>It may be: temporary (e.g. flu shot clinic in a mall), mobile (e.g., ambulance, helicopter, mobile lab), in the field (e.g., car, accident site) or in the home. May be an enroute location (e.g. EMS system tracking health care client arrival to an Emergency Department).</p> <p>May include health care client's or group's location within a facility, e.g. in the emergency department of a hospital, or a floor and room in a particular building on a large campus.</p>	PHI
Intervention	<p>Activity performed for a health care client with the intention of directly or indirectly improving or maintaining physical or psychological condition.</p> <p>May include:</p> <ul style="list-style-type: none"> • Provider treatment; • Self-care; • Preparatory activity e.g. fasting requirements, pre-medication; • Clinical test activities i.e. diagnostic interventions and assessments; • Transfer activity, i.e. movement of the health care client from one care setting to another; • Information about deviation from research trial protocol; • That an activity was not attempted or not completed, including reasons e.g., information about overriding a drug interaction warning, including the reason for the override; • Reasons disease management or preventative services/wellness prompts from clinical care guidelines were overridden. <p>Surgery is a primary example of intervention, but less invasive procedures such as physiotherapy, massage, or blood donation also apply. Includes intake of a substance, ingestion and implantation i.e. of medical devices. A psychotherapy session would be an example of altering a psychological condition.</p> <p>May be one in a sequence of treatments. May be completed, attempted, not attempted, or not completed.</p> <p>May be performed by a health care provider or the health care client.</p> <p>Also may include:</p> <ul style="list-style-type: none"> • Treatment name; • Date and time of treatment; • Site; • Administering provider; • Reactions and complications; • Details associated with continuous treatments (e.g., infusions, tube feedings, bladder irrigations, suction levels); • Routine scheduling, "one-time", "on-call" or "PRN"; • Reason treatment not given and/or related activity not performed. 	PI/PHI

Entity	Description	Sensitivity PHI/PI/Sensitive/ None
Requisition	<p>A request for a Health Product, fulfilled by providers.</p> <p>A requisition may come with instructions, which may come from the provider, a pharmacist, or a manufacturer.</p> <p>May have:</p> <ul style="list-style-type: none"> • A life cycle to manage the creation, renewal, modification and discontinuation or cancellation of a requisition; • Oral verification (i.e., a 'read-back') of the complete requisition by the person receiving the telephone or verbal requisition; • An association with an order set, a frequently used and institutionally-approved preferred group of requisitions facilitating retrieval and ordering. They allow a care provider to choose common orders for a particular circumstance or disease state according to standards or other criteria such as provider preference. <p>May include:</p> <ul style="list-style-type: none"> • A status (e.g. captured, verified, filled, or dispensed to health care client; for inpatient: captured, verified, filled, or medication administered); • Indication of urgency (e.g. ASAP or STAT); • Recurrence. 	PI/PHI
Referral	<p>Request for clinical care or evaluation requiring expertise outside the domain of the Referral Requestor, or beyond his or her capacity.</p> <p>May include community services (such as home care), genetic profiling, and stress testing.</p> <p>May include:</p> <ul style="list-style-type: none"> • Source of the referral; • Reason for the referral; • Administrative details from a referral that was received (e.g., insurance information, or a consent and authorization for disclosure); • Results of electronic referral eligibility and health plan/payer checking; • Information supporting financial eligibility verification; • Referral life cycle status as the recipient may reject the referral; • Reason for status change. 	PI/PHI

12.2 CIM Modeling Method and Diagram Notation

12.2.1 Constructs

The CIM 2.0 Entity Relationship Diagram (ERD diagram consists of two types of constructs:

1. Boxes that represent business **entities**. The types of people, places, things, events and concepts of interest to the business, such as:
 - Health care client;
 - Health care provider;
 - Observation;
 - Health care provider product location;
 - Plan of care;
 - Clinical practice guideline.

These are boxes labelled with the entity names. Each entity has a description which includes a definition and may include a deeper explanation, examples, and detailed entity characteristics.

2. Lines between pairs of boxes that represent **relationships** between two entities. Each relationship is described by a brief verb phrase, e.g. “enrolled in”, as “*a health care client is enrolled in a health care program*”.

12.2.2 Conventions

The following are conventions used in CIM diagrams:

Subtypes

Boxes within boxes represent **subtypes**: the entity represented by the inner box is a sub-type of the entity represented by the outer box. For example, “Sensitivity” is a sub-type of “Health Condition”; other sub-types of Health Condition are “Acute Condition” and “Chronic Condition”.

Attributes

Attributes of an entity are absent from a conceptual model. Attributes are only provided in logical data models, and defined in interoperability standards.

Relationships

Relationships are refined by representing 'cardinality', i.e., how many instances of another entity can an entity be related to, as explained by the following legend.

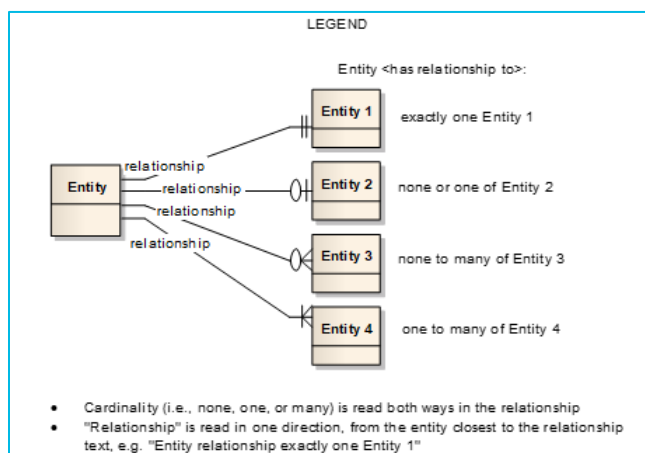


Figure 11: CIM Conventions

Relationship examples include:

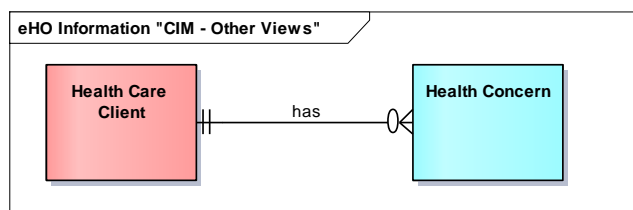


Figure 12: CIM Relationship: Example 1

In the diagram above, a health care client has zero to many health concerns (in general). Reading the relationship in the other direction, a health concern must be related to exactly one health care client – the nature of the relationship is not indicated.

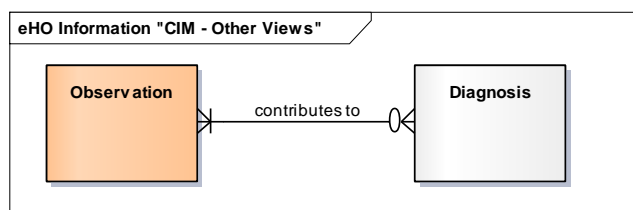


Figure 13: CIM Relationship: Example 2

In the diagram above, an observation may be related to many, one, or no diagnoses. In the other direction, a diagnosis must be related to at least one observation, and may be related to many.

A conceptual information model represents assertions about a business domain that are the basis for representing relevant facts about the business in databases and messages. If these assertions are correct, the data maintained about the business will accurately reflect the state of the business.

A legend accompanies the diagram.

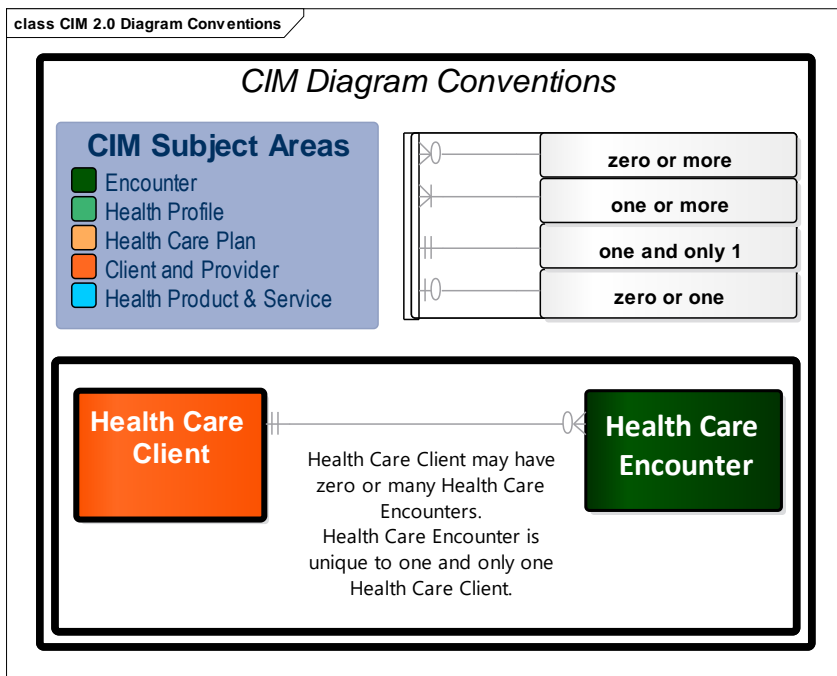


Figure 14: CIM Diagram Conventions

13.0 Appendix D: Glossary of Acronyms and Frequently Used Terms

Term	Acronym	Definition
Access to Care	ATC	Cancer Care Ontario is the Ontario government's principal advisor on the cancer and renal system that encompasses Cancer Care Ontario and the Ontario Renal Network. CCO also manages an Access to Care Program that helps improve patient access to healthcare services and reduce wait times, and support Ontario's Wait Time and Emergency Room/Alternate Level of Care Strategies.
Application Programming Interface	API	API is the acronym for Application Programming Interface, which is a software intermediary that allows two applications to talk to each other.
Business and Technical Committee	BTC	An external committee that ensures business and technical requirements for Ontario EHR architecture and standards are clearly and accurately scoped, documented and met.
Business Process Model and Notation	BPMN	Business Process Model and Notation (BPMN) is a graphical representation for specifying business processes in a business process model.
Canada Health Infoway	CHI	Federally-funded, independent, not-for-profit organization whose members are Canada's 14 federal, provincial and territorial Deputy Ministers of Health. Infoway is Canada's catalyst for collaborative change to accelerate the use of electronic health information systems and electronic health records (EHRs) across the country.
Cancer Care Ontario	CCO	Cancer Care Ontario is the Ontario government's principal advisor on the cancer and renal system that encompasses Cancer Care Ontario and the Ontario Renal Network. CCO provide tools, resources and evidence-based data to help our healthcare partners improve the delivery of care.
Case Management System	CMS	An IT application designed to meet an individual's health needs through communication and available resources to promote quality cost-effective outcomes.
Case Management/Assessment System	CMS	A Case Management System (CMS) guides clinicians through a standardized patient assessment protocol and produces an evidence-based self-management plan for care teams, patients and primary care providers to follow.
Central Intake & Access Centre / Regional Access Centre	CIAC/RAC	Initial procedures (as interviews) conducted by a social worker, juvenile-court officer, or clinician in considering a client for treatment or service.
Centralized		In which a Referral Requestor selects a type of service but not the specific provider. This includes: Brokered (Source: Health Care Provider – Intermediary Service Provider – Destination Health Care Provider); Internal (Source: Health Care Provider – Internal Coordinator(s) for a Community of specialized services - Destination Health Care Provider).
Chief Executive Officer	CEO	The position of the most senior corporate officer, executive, administrator, or other leader in charge of managing an organization – especially an independent legal entity such as a company or nonprofit institution.
Client Health and Related Information System	CHRIS	CHRIS (Client Health and Related Information System) supports the delivery of care at home and in the community for 670,000 patients in Ontario. Patients get the right care at the right time and place because of features in CHRIS.

Term	Acronym	Definition
Conceptual Information Model	CIM	Represents assertions about a business domain that are the basis for representing relevant facts about the business in databases and messages
Consumer Gateway		A new set of client focused web services are being developed to provide consumer applications access to EHR assets. These interfaces are developed as RESTful FHIR web services in line with the current industry and healthcare domain trends and best practices. These consumer interfaces for EHR assets will be exposed via the consumer gateway. It is a conceptual extension of the HIAL for the consumer based interactions.
Distributed Systems Model		A client-server environment in which data are located in many servers that might be geographically dispersed but connected by a wide area network.
Digital Health Gateway		Future state term for HIAL.
Direct		In which the Referral Requestor sends the referral to the selected provider without an intermediary.
Ears, Nose and Throat	ENT	Abbreviation for ears, nose and throat. A field of medicine also called otolaryngology.
EHR Governance Strategic Committee	SC	An external committee that discusses Strategic decisions and directions on Ontario EHR architecture and standards products, services, policies, and processes in support of establishing Ontario's EHR.
Electronic Medical Record	EMR	An application environment that is composed of the clinical data repository, clinical decision support, controlled medical vocabulary, order entry, computerized practitioner order entry, and clinical documentation implementations. This environment supports the patient's electronic medical record across inpatient and outpatient environments, and is used by healthcare practitioners to document, monitor, and manage the healthcare delivery.
Emergency medical services	EMS	Ontario's Emergency Health Services (EHS) system is a series of interrelated land and air emergency medical services and programs designed to provide timely response and prehospital care. Emergency medical services are a branch of the EHS.
eReferral		Electronic referrals (eReferrals) enable clinicians to request a referral for service from another health care provider electronically.
eReferral Provincial Reference Model		Provides architectural and standards guidance to regional initiatives.
eReferral Repository		Holds referral requisitions, responses, and eReferral management data. eReferral records in the Repository will also contain references to other clinical information associated with the eReferrals.
Fast Healthcare Interoperability Resources	FHIR	Fast Healthcare Interoperability Resources (FHIR, pronounced "Fire") is a standard for exchanging healthcare information electronically that defines a set of "Resources" that represent granular clinical concepts. The resources can be managed in isolation, or aggregated into complex documents. Technically, FHIR is designed for the web; the resources are based on simple XML or JSON structures, with an http-based RESTful protocol where each resource has predictable URL. Where possible, open internet standards are used for data representation.
Five High-Level		The first five referrals pathways that will be prioritized for provincial standardization.

Term	Acronym	Definition
Health Information Custodian	HIC	Person or organization collecting, using, or disclosing personal health information for care and treatment, planning and management of the health system, or health research. In general, persons involved in delivering health care services are included.
Health Level Seven	HL7	Health Level Seven International is one of several American National Standards Institute (ANSI) -accredited Standards Developing Organizations (SDOs) operating in the healthcare arena. Most SDOs produce standards (sometimes called specifications or protocols) for a particular healthcare domain such as pharmacy, medical devices, imaging or insurance (claims processing) transactions. Health Level Seven's domain is clinical and administrative data.
Health Quality Ontario	HQO	Health Quality Ontario is the provincial advisor on the quality of health care. We are motivated by a single-minded purpose: Better health for all Ontarians.
Hospital Information System	HIS	A comprehensive, knowledge-based system used in a hospital setting, capable of providing information to all who need it to make sound decisions about health.
Hospital Information System (HIS) Renewal	HIS	An opportunity to transform Ontario's fragmented HIS landscape into a platform for a high-performing, patient-centred health care system.
International Organization for Standardization	ISO	An independent, non-governmental international organization with a membership of 163 national standards bodies. Through its members, it brings together experts to share knowledge and develop voluntary, consensus-based, market relevant International Standards that support innovation and provide solutions to global challenges.
Internet of Things	IoT	The interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data.
Local Health Integration Network	LHIN	Local Health Integration Networks (LHINs) plan, integrate and fund local health care, improving access and patient experience.
Logical Data Design	LDD	The data design document for a business solution at eHealth Ontario, shown in the context of the business application solution. The LDD is a section of, and is aligned with, the Logical Application Design (LAD) document.
Master Data Management	MDM	A generic approach to data management.
Minimum Data Set	MDS	An essential and appropriate set of coherent, explicitly articulate set of standardized data elements required to meet information requirements of key stakeholders.
Ministry of Health and Long-Term Care	MOHLTC	Works to establish a patient-focused, results-driven, integrated and sustainable publicly funded health system. Its plan for building a sustainable public health care system in Ontario is based on helping people stay healthy, delivering good care when people need it, and protecting the health system for future generations.
Non-Transfer of Care	NTOC	Referrals are used to obtain specialist or specific treatment from another health care provider (person or organization), yet responsibility and accountability for the patient ultimately remains with the health care provider (person or organization) who is referring the patient.
ONC		Office of the National Coordinator
ONE ID		A ONE ID account provides easy and secure access to digital health services such as the ConnectingOntario ClinicalViewer, the regional clinical viewer ClinicalConnect™ and the Ontario Telemedicine Network Hub. Individuals involved in delivering health care, including clinicians and administrators, can register for a ONE ID credential (login ID & password) and enroll for access to online digital health services offered by eHealth Ontario and other health solution providers.

Term	Acronym	Definition
Ontario Public Service	OPS	The Government of Ontario includes ministries, agencies and Crown corporations. It's workforce of 60,000+ public servants is called the Ontario Public Service (OPS). Ontario's public service provides government services to citizens and promotes an innovative, diverse, eco-friendly and accessible workplace.
PanLHIN Referral Management Working Group	PanLHIN Referral Management Working Group	A working group that works with MOHLTC to develop the Provincial eReferral Management Strategy to provide the foundation to guide the Province, the LHINs, and digital health partners to advance the implementation of new and existing electronic referrals pathways across the Province.
Referral Management SubGroup		A subset of the larger PanLHIN Referral Management Working Group which does work on behalf of the larger group
PanLHIN Referral Management Working Group	PanLHIN Referral Management Working Group	Includes all 14 LHINs (and others)
Patient Portal		Integrates with a RMS Source enabling patients to launch the referral system, easily locate appropriate healthcare services, and send self-referral requests without leaving the portal. The PP also integrates with the PCG enabling patients to view their personal referral information from the Provincial Referral Repository (PRR).
Point of Service	POS	Application system employing electronic health records in a clinical setting. Eg. Electronic Medical Record system in a health care provider's office, Pharmacy Management System, Laboratory Information System, and Hospital Information System.
Primary care provider	PCP	Person or organization providing health care or other health-related services and acting as a principal point of contact/ consultation for patients within a health care system.
Provincial Consumer Gateway	PCG	The consumer gateway provides a new set of client focused web services that provide consumer applications access to EHR assets. These interfaces are developed as RESTful FHIR web services in line with the current industry and healthcare domain trends and best practices.
Provincial eReferral Strategy		Creation of a strategy for Provincial eReferral Management, based on a coordinated PanLHIN Referral Management Working Group approach. Describes the opportunity of having a Provincial eReferral Management Strategy for the Province of Ontario. The benefits to patients, providers and the system as it aligns with the provincial directives: Access, Connect, Inform and Protect
Provincial eReferral Strategy – Architecture Working Group		Includes digital health partners.
Provincial Provider Registry	PPR	The provincial provider registry helps uniquely identify regulated health care professionals and organizations as well as those involved in collecting, using, and / or disclosing personal health information.
Provincial Referral Repository	PRR	The provincial system that contains a comprehensive set of all electronic referral requests. It is used to maintain referral status throughout the eReferral lifecycle, present a patient's comprehensive referral portfolio and enable province-level reporting and analytics.
Provincial Service Directory	PSD	The PSD is an information-sharing service that will be used to supply, rationalize, and synchronize healthcare service information across the Province. It serves as the centralized information resource in the Province for posting and retrieving healthcare service listings and associated meta-data used to route a referral to a desired service.

Term	Acronym	Definition
Referral		Referral is the practice of requesting a service, care, support, and/or advice for a health care client from a health care provider
Referral Management System	RMS	Mediates the referral process on behalf of the Referral Target (RT) – e.g., receive referral, arbitrate referrals. Assists in managing information of referrals for all the healthcare services that it provides Can be used to initiate and resolve intra-referrals (within the same system)
Referral Source	RS	Owns the relationship with the patient and is directly used by healthcare service providers (Referral Requestors) to provide patient care. Initiates referral requests via the connectivity to the Regional Referral System (RRS) Source.
Referral Target	RT	Owns the relationship with the service provider (referral recipients)
Referral Target Legacy	RTL	Directly used by referral recipients to receive referrals and may allow referral requestors to directly log in and receive referrals.
Regional Referral System	RRS	Allows service providers (Referral Requestors) to access the system from RS and enables service providers to efficiently discover appropriate healthcare services (within the LHIN region, across the province, and even out of the province) to which patients can be referred.
Representational State Transfer	REST	REpresentational State Transfer, is an architectural style for providing standards between computer systems on the web, making it easier for systems to communicate with each other.
Self Referral	SR	The ability of patients to refer themselves directly to a specialist/program without going through a gatekeeper.
Substitute Decision Maker	SDM	A person authorized under legislation to consent on behalf of the individual to the collection, use or disclosure of personal health information about the individual related to decisions around treatment, admission to a care facility, and personal assistance services.
System Coordinated Access	SCA	A coordinated and strategic system-design approach to improving links and communication between residents, referrers, and providers through improving transitions between health care programs and services.
Transaction HistOry Registry	THOR	Stores province-wide transactional logs.
Transfer of Care	TOC	Transfer of care
User Interface	UI	The user interface, in the industrial design field of human–computer interaction, is the space where interactions between humans and machines occur.
Wait Time Information System	WTIS	A web-based information system for Ontario to collect accurate and timely wait time data

14.0 Bibliography

This section lists the documents reviewed, analyzed, and considered in the development of the original *EHR Conceptual Information Architecture* in 2012. They are two major categories of documents:

- Published standards/specifications/architectures;
- Materials under development by working groups.

The published materials are further subdivided into three sub-categories of international, national, and provincial. They were used in the development of the CIM as follows:

- **International:** Best practices and knowledge base;
- **National:** To be in alignment with, or to be able to implement national practices/standards, and fulfill interoperability;
- **Provincial:** To be able to fulfill provincial requirements, and implement provincial standards.

14.1 Published Standards/Specifications/Architectures

14.1.1 International

- OPS Information Modeling Handbook
- ISO TC 215 Date: 2008-08-0111-09-30 prEN ISO/DIS ISO TC 215/WG 3 Health Informatics – System of concepts to support continuity of care. (2008-08-01)
- HL7 Reference Information Model (RIM) Release 4 (May, 2011)
- HL7 Version 3 Standard Care Provision, Release 1 (September, 2009)
- The openEHR EHR Information Model. Revision 5.1.1 (2008-08-16)
- Dr. Lawrence Weed. Problem Oriented Medical Record.
- Formal Representation of a Conceptual Data Model for the Patient-Based Medical Record (<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2248552/pdf/procascamc00002-0482.pdf>)
- ONC Standards and Interoperability Framework. Clinical Element Data Dictionary and Information Model Reference Mapping. Version 1.9 (2011-12-19)

14.1.2 National

- Canada Health Infoway (CHI) Electronic Health Record Reference Architecture. Version 1.2.8 (2006-03-21)
- SC-0003-EN HL7 v3 pan-Canadian Messaging Standard. Master Glossary. R02.04.00 (2009-03-16)
- SC-0006-EN HL7 v3 pan-Canadian Messaging Standard. Implementation Guide Volume 0 - Overview. R02.04.02 (2010-03-26)
- SC-0006-EN HL7 v3 pan-Canadian Messaging Standard. Implementation Guide Volume 3 – Shared Interactions. R02.04.00 (2009-03-16)
- SC-0009-EN HL7 v3 pan-Canadian Messaging Standard. Implementation Guide Volume 8 – Pharmacy. R02.04.00 (2009-03-16)
- Canadian Clinical Drug (CeRx) Messaging Standard - Business Model. V01R04.3 (2007-07-12)
- Canadian Institute for Health Information (CIHI) Primary Health Care Indicators Electronic Medical Records Content Standards. Version 1.1 (2009)

- Medical Devices http://www.ic.gc.ca/eic/site/lsg-pdsv.nsf/eng/h_hn01706.html Industry Canada
- My Diary - <https://www.sharedcareplan.org/MainPage.aspx?PageToLoad=CarePlan&CtrlToLoad=CareTCar>
- Public Health Agency of Canada www.publichealth.gc.ca – Immunization

14.1.3 Provincial

- Ontario's 2015 eHealth Blueprint – the Foundation for Innovation and Action
- eHealth Ontario Client Registry Interface Specification. Version 0.2 (2010-10-29)
- eHealth Ontario Provider Registry Interface Specification. Version 1.11 (2011-09-28)
- Chronic Disease Management Data Framework (CDMDF)
- eHealth Ontario Laboratories Information System (OLIS) Interface Specification. Version 1.09 (2011-10-07)
- eHealth Ontario eReferral Specification Implementation Guide – Clinical Information Model. Version 3.0 (2010-06-18)
- eHealth Ontario Discharge Implementation Guide – Clinical Information Model. Version 2.0 (2009-11-30)
- eHealth Ontario Clinical Document Specification Implementation Guide – Clinical Information Model. Version 1.0 (2011-02-28)
- eHealth Ontario – Compliance Management and Consent Directives
- College of Physicians and Surgeons of Ontario. Policy Statement #5-05. Medical Records. (March/April 2006)
- OntarioMD Electronic Medical Record (EMR) Specification. Version 4.0 (2011-01-17)
- MOHLTC Physician Discharge Summary Documentation Guide.
- Community Mental Health Common Assessment Project. Ontario Common Assessment of Need (OCTAN). Version 2.0
- Ontario Association of Community Care Access Centres (OACCAC) Solution Architecture. CHRIS/HHS Integration. Version 0.1 (2009-01-12)
- MOHLTC - Panorama
- Personal Health Information Protection Act (PHIPA)
- Council of Academic Hospitals of Ontario (CAHO), & Health Quality Ontario (HQO). (2017). Transforming Musculoskeletal Care in Ontario: MSK Centralized Intake, Assessment, and Management Model Implementation (Rep.). Ontario: ARTIC.
- Ministry of Health. (2017, October 27). Health Bulletins. Retrieved from http://www.health.gov.on.ca/en/news/bulletin/2017/hb_20170127_25.aspx
- OntarioMD eReferral Business Team et al. (2012). Electronic Referral Business Requirements. Published Jan 30. 2013.

14.2 Working Groups Materials

- Standards Collaborative Working Group 2 – Individual Care. Allergy/Intolerance/Adverse Reaction Recommendations (2011-12-19)
- HL7 Patient Care Working Group. Care Plan Project. Chronic Conditions Care Plan Storyboard. Version 0.5 (2012-01-06); Home Care Plan Storyboard. Version 0.3 (2011-12-31); Stay Healthy Health Promotion Care Plan Storyboard. (draft) (2012-01-17)
- Zac Whitewood-Moores – NHS Care Planning Content using SNOMED CT

14.3 CIM 2.0 Materials (2016)

- MOHLTC Patients First: Action Plan for Health Care - a roadmap to provide care that is coordinated and integrated, so health care clients get the right care from the right providers. (see http://www.health.gov.on.ca/en/ms/ecfa/healthy_change/)
- ISO/HL7 10781 - Electronic Health Record System Functional Model, Release 2 (Functional Model). This international standard was published by ISO in April 2014. It describes electronic health functions at a conceptual level, providing a foundation for more detailed work. Every part of this model was assessed for its effect on the CIM and, in large part, CIM 2.0 is the result.
- Two healthcare dictionaries:
 - The Standards Knowledge Management Tool (SKMT), a collection of terms and definitions supporting digital health solutions in Canada, from the Joint Initiative on SDO Global Health Informatics Standardization (see <http://www.jointinitiativecouncil.org/>)
 - U.S. National Library of Medicine - Medical Subject Headings (MeSH).
- Health Canada's websites 'Safe Medical Devices in Canada' (see http://www.hc-sc.gc.ca/dhp-mps/md-im/activit/fs-fi/meddevfs_matmedfd-eng.php)
- The Public Health Agency of Canada's website 'What Determines Health?' (see <http://www.phac-aspc.gc.ca/ph-sp/determinants/index-eng.php#determinants>).