A Look at Canadian EHR Implementations

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Electronic Health Records (EHRs) are secure, private, lifetime records containing patient-health and points-of-care histories within the healthcare system. Data from any connected healthcare entity, such as hospitals, clinics, doctors, pharmacies and laboratories, helps care teams provide more informed recommendations based on the longitudinal healthcare history of the patient. This information is then made accessible to healthcare professionals across a jurisdiction.

Why Use EHRs?

The fundamental goal of an EHR system is to create a longitudinal patient record with complete information about patients across all aspects of care including their demographic details, clinical history, medication list, radiology history, diagnostic investigations, procedures and encounters with the healthcare system. A comprehensive EHR is of most value to patients with complex chronic conditions such as diabetes, heart disease and COPD or patients with complex care needs. Clinical information – accessible regardless of location – means care revolves around the patient and is based on a comprehensive understanding of their clinical situation.

Healthcare delivery is often fragmented into silos that do not communicate well together. A lack of data and information sharing between healthcare providers is a persistent problem that has been resistant to change. The Orion Health Chronic Care Index, a poll of 1,551 Canadians, found that people with chronic conditions frequently experience medication errors or duplications, as well as undergo unnecessary repeat procedures. They also describe repeatedly outlining the same information about their condition every time they visit a care provider.

Experience in Canada and internationally has shown that integration of care delivery is best achieved by means of a single, complete, electronic patient health record that is made easily accessible wherever the patient is seen. This improves the accuracy of diagnoses and treatment, facilitates healthcare coordination, and enables seamless transitions of patients across healthcare settings and providers.

Comprehensive clinical data is used in the care and decision making for individual patients through an EHR system that includes the following elements:

- The ability for authorized healthcare providers and patients to access their record anywhere, anytime
- Appropriate protections around consent, privacy and security of personal health information including (though not limited to) role-based access controls
- Broad-based, comprehensive patient clinical information drawn from across a jurisdiction
- A registry of health professionals authorized to access and share information with the system
- A patient attachment registry and a relationship store showing the link between each patient and their primary provider as well as other members of their care team
- Connection to diagnostic imaging systems for images and report access
- Patient medication information and functionality to perform patient reconciliation
- Patient laboratory results
- Interoperability with a myriad of systems (Alberta Netcare for instance has over 100 data sources)
- A focus on the latest preferred standards, especially FHIR APIs
- A range of other capabilities that evolve over time

Healthcare in Canada is entirely controlled and managed by the individual provinces. Consequently, no two EHRs are the same and no one provincial installation represents the perfect EHR; nevertheless, participating jurisdictions can now look to a model of a provincial EHR well within each province's capabilities for replication and as a guide.

In addition to containing the key elements that make up a complete clinical record, EHRs in Canada also contain additional capabilities, which vary depending on the exact context of each jurisdiction. Here are some examples of these capabilities:

- Electronic referrals and discharges
- Care coordination tools
- eConsults and eNotifications
- Chronic disease management tools
- Provider to provider secure messaging
- Cross-organizational care pathways
- Clinical decision support
- Patient engagement tools such as patient portals, mobile access and remote patient monitoring

EHRs can evolve along at least two dimensions (more data sources and added functionality) to more closely meet the strategic needs of each jurisdiction. At the same time, their evolution needs to enhance the end-user experience, and deliver greater utility for all users – in particular clinicians caring for patients with complex chronic conditions.

The Registered Nurses Association of Ontario (RNAO) and Canada Health Infoway (CHI) jointly developed a best practices guidelines document titled Adopting eHealth Solutions: Implementation Strategies, published in February 2017. The purpose of the document was to provide evidence-based individual, organization, education and system/policy level recommendations to enhance capacity, establish suitable infrastructure and facilitate technology-enabled health system transformation. While the recommendations are generalized for all eHealth initiatives, they provide insight in the ongoing efforts for the evolution of electronic health records in Canada. Here are a few of the recommendations identified within the guidelines document:

- Project leads collaborate with the steering committee to identify discipline specific champions at all levels of the organization (representing each stakeholder group impacted) to build awareness of the system and promote adoption among their peers and across the organization.
- Healthcare organizations will incorporate usability processes throughout the implementation and adoption of the eHealth solution to enhance individual and organization efficiencies, effectiveness, and user satisfaction.
- National and jurisdictional agencies responsible for eHealth will establish an effective governance structure that provides strong coordinated leadership that works in conjunction with regulatory strong, coordinated leadership that works in conjunction with regulatory bodies, and professional associations to realize the goal of nationwide health information exchange.

The State of Provincial EHR Implementations

The inclusion of clinical consulting in an EHR implementation has proven to have a direct impact on adoption rates. Provinces that have successfully integrated EHRs have done so by tailoring them to specific provincial needs, many of which were identified by people working directly with patients. Several provinces have been adding new enabling technology to their EHR infrastructure platforms to help with adoption. As shown by the selected provincial overviews below, each jurisdiction has differentiated services based on the specific needs of its patients. These EHRs have been evolved to leverage the investment and tailor the services offered to provide more personalized healthcare.

Alberta Health Services and Alberta Health

In 2003, the Orion Health Clinical Portal was selected in an open procurement as the preferred tool for clinical data access for Edmonton hospitals and clinical facilities in the community. The project was so successful that in 2006 the decision was made to use the Orion Health Clinical Portal to provide a universal solution for accessing and viewing patient information across the entire province. The Clinical Portal is layered on top of existing data structures to deliver single-view access to multiple data resources. Data is aggregated to provide in-depth analysis. The Clinical Portal features a single sign-on and connects multiple hospital information systems with a graphical interface and allows physicians to present data to patients while sharing sensitive information securely. At the onset, the features of Clinical Portal included client registry; pharmaceutical information, lab results, PACS image viewing, encounter history patient lists and eSignature.

Some current adoption metrics for Netcare include the following:

- 96% of the medications dispensed in community pharmacies are being added to the EHR each year
- 97% of community pharmacies in Alberta are actively submitting dispense data
- 92% of the laboratory test reports are available in the EHR
- 97% of all public and private laboratory facilities are submitting information to the EHR
- 96% of the diagnostic images and reports created in Alberta facilities are available in the EHR
- 92% of AHS and private diagnostic imaging facilities are providing information to the provincial EHR
- Over 51,000 health professionals have access to Alberta Netcare Portal
- 7.2 million screens of information in 2.5 million patient records are accessed monthly
- Since March 2006, more than 366.5 million screens of information in 133.6 million patient records were accessed by Alberta health professionals

Prior to and throughout the development and roll out of Alberta Netcare, Orion Health participated actively in the project steering committee to guide its evolution into a highly valuable tool for clinicians. Working closely with client-side clinicians to establish the critical clinical involvement and governance at the foundational level, the working group established a method for working with the many participating stakeholder groups and agreeing on the best options to meet the needs of clinicians. In 2004, as Netcare was

introduced, the initial rollout plan was modified as onboarding of users and identity management processes were expanded to meet increased demand.

Alberta has been building on the platform ever since. New enabling technology and integration services are added regularly – most recently, Alberta Health rolled out the award-winning Community Information Integration (CII) Program. Patient information used in CII is now flowing from early adopter primary care clinics, powered securely from a remote cloud infrastructure by Orion Health's Software as a Service (SaaS) in a managed private cloud setting.

The goal of the CII project is to improve continuity of care for Albertans through better sharing of patient information. To create a culture of collective responsibility for the collection and sharing of health information, there has been a visible shift in Alberta's efforts toward integrating health management systems. The initial focus is to make data collected in community based primary care clinics available to more than 50,000 authorized healthcare providers through Netcare (Alberta's Electronic Health Record). CII now boasts data on more than 55,000 community encounters that have been received, processed and sent to Netcare; more than 1,500 consult reports received, processed and sent to Netcare; and more than 12,000 unique patients processed by the CII hub.

For the first time, primary health care data and patient reports are being published into Alberta Health Services' Netcare system, granting shared access to this information. Netcare now services more than 51,000 active users and more than 10,000 concurrent users at peak usage, while providing access to nearly 3,500 healthcare provider sites across the province. Alberta is also in the process of expanding user access to additional healthcare professionals such as optometrists, dentists, and chiropractors.

Another innovative project in Alberta is the Central Patient Attachment Registry (CPAR). This centralized database captures the attachment of a Primary Care Physician or a Nurse Practitioner and their paneled patients across all clinics in Alberta, maintaining a provincial registry that is integrated with the CII community data hub.

The work on eReferral has led to an increase in adoption of Netcare by enabling access to a simplified online eReferral process. eReferral offers providers e-consults as an alternative to reduce unnecessary specialist visits for patients, and will send notifications to physicians of the status of their referrals in the near future. There are now 22 specialty groups available to respond to e-Referral requests, which has resulted in a 50 per cent increase in submissions over the past six months. Additional plans are to implement broad based email notifications based on not just on referrals and e-consults, but also on events such as in-patient and emergency department visits by patients.

eHealth Saskatchewan: Provincial Electronic Health Record - eHR Viewer

Orion Health supplied its Clinical Portal and Results Viewer to eHealth Saskatchewan to support the province's interoperable Electronic Health Record strategy. The solution aggregates data from Saskatchewan's Health Information Access Layer (HIAL), storing all results in a secure central repository and granting privacy-controlled access to authorized health providers.

Of interest to physicians is the ability to access the provincial solution directly from their EMRs via a secure single sign on connection. This approach brings the shared EHR record into easy, direct access from the physician's EMR in the context of the same patient being viewed in the EMR. This is a significant boon to clinician adoption. Today, 10,000 clinicians have access to the EHR and 6,500 clinicians use it monthly.

The solutions gives providers fast, direct access to lab results and improves the care experience for patients. A wide range of clinical information is available to providers in real time including ILaboratory results, medication information, immunization information, discharge summaries, medical imaging reports, clinical encounters, structured medical records and chronic disease management information. Recently notifications on important clinical information have been enabled and are sent to a provider's EMR or EHR account to improve patient care.

The Clinical Portal and Clinical DataResults Viewer have improved patient access to health services, which the province named as a priority. eHealth Saskatchewan outlined a desire to build an EHR and Orion Health delivered a system that is effective, efficient and complete.

Quebec: Quebec Health Record (QHR)

As one of Orion Health's first implementations of an EHR, the Dossier Santé Quebec (DSQ) is a secure provincial tool that is used to collect, conserve and release health information. The aim is to improve the quality of care and efficiency of Québec's health system.

With the DSQ, physicians and other authorized health and social services professionals in Québec can provide patients with better treatment and more efficient follow-up. For example, the DSQ allows:

- Professionals to access certain health information directly, no matter which region in Québec the consultation took place
- Medical attention to be provided more quickly, especially in emergency situations, since it takes less time to find specific health information
- Better management of samplings and examinations, eradicating the need for duplicate examinations or samples if a patient sees more than one health and social services professional
- Optimal adjustment of medication through sharing of medication history and results which helps prevent adverse interactions between prescription medications
- More efficient interprofessional collaboration as information can be obtained about specific health and social services professionals and facilities.

Quebec: Remote Patient Management (RPM)

In Quebec, RPM has been available province-wide since 2016. It provides home telemonitoring and support advice for patients with a range of chronic conditions. It is operationalized by university networks (McGill, Montreal, Sherbrooke and Laval). Each implementation tailors the program to the needs of its targeted populations, patients' cohorts and health conditions.

Costs of managing patients with chronic complex conditions are typically the highest expenditures of most healthcare systems. Avoiding significant percentage (up to 80% in some cases), provides RPM with a demonstrated strong positive Return on Investment (ROI) for healthcare organizations. The ROI including all costs of the programs i.e. costs of the technology, supplying services, healthcare staff, etc.

The success of RPM in Quebec is being replicated by other healthcare organizations globally as they also choose to deploy RPM in their local jurisdictions.

New Brunswick: e-Consult and Provincial Electronic Health Record

In 2011, New Brunswick's 51 healthcare facilities and seven health regions implemented a bilingual, interoperable electronic health

record (iEHR,) a key element of the province's One Record strategy. In a similar way to other Canadian EHRs, the New Brunswick solution provides comprehensive clinical information accessible from anywhere across the province. The iEHR includes information from, and access to, the Client Registry, Provider Registry, the Provincial Diagnostic Imaging Repository and the provincial medication repository. It consolidates the patient's episodes of care into a single summary and creates a standard view of the patient's clinical history and information, while prioritizing patient safety and privacy.

In the last several years, the province has begun a deployment of an e-consult product with electronic referrals. The New Brunswick eConsult initiative is part of a Pan Canadian project under Connected Medicine, and is built on the Orion Health eReferral platform that makes use of the Advice Request functionality.

New Brunswick is a small province with many rural areas. It is faced with an aging population that refuse to travel for services outside their residential area. Some specialties are not well represented in New Brunswick, therefore seeking services may be lengthy. eConsult sought to increase access to specialty expertise for family physicians, which in turn could avoid face-to-face referrals, reduce wait times for high demand specialists and decrease unnecessary referrals.

In late 2017, New Brunswick and Orion Health met to discuss an eConsult proof of concept, which used Orion Health's eReferral software and provided an eConsult solution integrated within the EHR. New Brunswick and Orion both share a common vision in leveraging the existing platform technology to build a strong digital health foundation for New Brunswick. Development work started in early spring 2018 and eConsult went live on May 7th, 2018 with initial engagement from 85 family physicians and 33 specialists.

The eConsult solution results in more effective use of a clinician's time by using a simplified form with a just a few fields to clarify with the specialist whether there is the need to progress to a full referral. This new capability, which is built directly in the EHR, creates an innovative channel to foster further collaboration between clinicians using the EHR, and paves the way for future development of technological initiatives.

During the pilot, 67% of the 93 eConsults showed the referral was originally contemplated then avoided, indicating the physician cared for patients within their home practices. Now, every family physician in New Brunswick with EHR access can submit an eConsult. New Brunswick is planning to expand the list of specialties available through eConsult and open it to other types of clinicians and plans are underway to include eReferrals as a next step.

Newfoundland and Labrador: Provincial Electronic Health Record - HEALTHeNL

Before HEALTHeNL, patients' health information was siloed, residing in separate locations such as community pharmacies, hospitals, telehealth, home care, cancer care and long term care facilities.

As with other provinces, Newfoundland and Labrador struggled with disparate data across the continuum of care including medication data, immunizations, laboratory results, diagnostic imaging and encounters. Orion Health and Newfoundland and Labrador Centre for Health Information (NLCHI) looked to leverage existing technology to identify solutions that would provide real-time access to actionable data.

With four components of the electronic health record previously implemented, NLCHI significantly used its existing infrastructure. Important components in place include a Client

Registry to help link patient data, a Provider Registry, the Picture Archiving and Communications Systems (PACS), as well as the Pharmacy Network to provide more comprehensive access to patient medication information, provincial immunizations and laboratory results. Now, NLCHI can link to the rest of the health record so clinicians, nurses and pharmacists have access to both complete medication data and complete clinical data. Providing access to medication profile helps to remove the disconnect between these healthcare providers and ultimately provides for better patient outcomes.

In 2012, the Newfoundland and Labrador Centre for Health Information started implementing a province-wide, interoperable Jurisdictional Laboratory Information System as part of the province's EHR project. Since then, HEALTHe NL has grown with additional sources of data being added regularly. It now includes:

- Access to 100% of community pharmacy medication profiles, including drugs, medical devices, allergies, adverse drug events, and medical conditions.
- Laboratory test reports, diagnostic imaging reports (including PACS images), and clinical documents from all Regional Health Authorities in the province.
- Provincial immunization data for anyone born after 2003
- Information about where health services have occurred, by whom, and other key clinical events such as inpatient admission and discharge.
- Electronic orders for Vascular Imaging, including decision support tooling for clinicians, helping to both speed up patient care with prioritization and automated booking, and reduction in unindicated tests.
- Electronic notifications (via e-mail, text, or secure messaging) of patient events to interested clinicians.
- Single Sign-On capability from physician EMRs and Meditech HIS into HEALTHe NL to view the longitudinal patient record.

The EHR framework, which is the backbone of HEALTHe NL, supports the province's vision of improving the quality, safety and delivery of patient care by providing more complete and timely health information to providers at the point of care delivery.

Best Practices From Across The Country

Building a successful shared electronic health record in Canada is not a simple task. Critical elements to ensuring success in such an endeavor include the following:

Clear Articulation of the Vision and Values

A clear and compelling vision and the ability to articulate the value it will bring to stakeholders and the community at large. For instance, having access to a patient's complete history when care is being administered is a significant boost to accurate clinical decision making. Similarly, e-referrals, care coordination or chronic disease management provide benefits that directly improve clinical processes and target high need aspects of care delivery.

Broad Stakeholder Engagement

Stakeholder engagement is a critical element of success. Clinicians across many traditional roles will derive benefit from a shared EHR, including physicians, medical students, nurses, pharmacists, care coordinators, dentists, physiotherapists and social workers. It is important, however, to engage with each group in a meaningful way. It is also important that everyone impacted by the software and everyone who could derive benefit from the software feels they are a part of the decision making. Projects need to establish a robust

framework for collecting as much stakeholder input and feedback as often as possible.

Maximum Usability and Utility

EHRs need to include functionality that is of enduring value to clinicians, such as comprehensive lab results reporting, quality medication data, tools for chronic disease management, care coordination and care transitions. Usability is related to the ease with which clinicians can find the information they need, with minimum training required. Utility is related to the value clinicians derive from the information and functions offered within the tool and is key to long-term acceptance. Orion Health believes that our EHRs represent very high utility to clinicians, though this is dependent on them being deployed with due consideration to all the factors being discussed herein.

Clinician Leadership

Clinician leadership is a core part of any safe, high quality and patient-focused system. When it comes to deployment of potentially complex new clinical software into high demand clinical environments, clinician leadership is even more important. Clinician leaders need to exhibit a wide range of behaviors such as being good listeners, being empathetic yet able to balance multiple conflicting demands, and being highly competent clinicians in their own right. In the case of an EHR deployment, clinicians need to show their colleagues the high value that can be derived from the solution while also helping teams to push through the inevitable challenges as they arise.

Provides Other Clinical and Business Benefits Such As:

- Ready access to high quality information not available by other traditional means
- Improved care of patients with complex chronic conditions
- Improved coordination of care via dedicated tools such as e-Referrals, shared care plans, the circle of care, notifications and being a single source of truth.

Each province is a learning example for how adoption can be improved or reduced by consideration of the factors listed here. Locally based resources are recommended when possible. Specifically, project teams that are located at or near the client site help to deliver the project on time and within budget. The “one team” approach greatly facilitates effective planning, scope management, implementation, and improves the effectiveness of the clinical working group. Clinical representation during all implementation stages is important to establish direction for each project and ensure clinicians see the solution as valuable. Finally, testing is essential to quality. Participants must understand the importance of providing production quality data for testing to provide accurate information that can be used to solve issues as they arise.

Where Are EHRs Going and How Do We Get There?

The gold-standard for a comprehensive EHR system is complete adoption in every province, at every level with full use of the associated functionality like care coordination, referrals and chronic disease management. Clinicians should be using the solution at every point in the care delivery process where it could make a positive difference, in particular for care coordination and in the management of chronic disease.

In spite of the fact that many clinicians find EMRs difficult to use or unnecessarily complex, it’s important they have easy access to high value information in the EHR or they will not get into the habit of using it and will choose instead to stay in the limited envi-

ment, housing and transportation

- Genomics data
- Community data contributed by healthcare workers including social workers, psychologists, dentists, optometrists, physiotherapists, chiropractors and midwives
- Point of Care Testing outside of regular diagnostic centres e.g. Community pharmacy, primary care testing.

Another very promising idea is the emerging national data platform based on a consumer held and managed electronic patient record, not impeded by privacy legislation and other regulations. There are many good reasons to prefer patients having direct control over their healthcare data. In general, EHRs and HIEs deployed across North America today do not allow patients much control of their records at all. Our solutions tend to assume that clinicians are allowed access in order to care for the patient and there's no requirement for patient consent at a highly granular level. This will inevitable evolve and patients will demand improved understanding and control over their health data.

Today in Canada, there's not much use of EHR data for quality measure reporting as part of a move to value-based care or enhanced primary care. In the USA, HIEs are a major source of the data used to derive and report on providers performance with respect to quality of care and therefore an enabler of the move to value based care and primary care reform. Canadian jurisdictions should consider to what extent a similar approach could work in Canada.

The new HL7 FHIR standard will revolutionize the ability of third-party applications and solutions to work in a fully interoperable manner with the EHRs outlined in this white paper. The anticipated result will be an ecosystem of applications and solutions that leverage complete patient information to drive innovation and progress with respect to patient care. Clinicians could well find themselves in the position of needing to recommend specific apps to their patients and will need help in determining the most valuable ones.

If challenges related to efficacy, accuracy, utility, safety, privacy, and security can be met, this emerging "apps model" for health information technology will open up the point of care for innovation and connect patients at home to their healthcare data.

These apps will give new life to data entered into EHRs and other health IT platforms by providing the ability to visualize risks, trends, and trajectories; mash up clinical records with external data sources; and deliver decision support to clinicians and patients during and between encounters. Apps will also create new flows of data from sensors, devices, and patient reports into EHRs.

Conclusion

A major objective of Canadian provincial healthcare organizations and vendor partners is to end silos and fix a disconnected system. This will improve the patient's journey through the health system, so it is more efficient and better serves patients' needs. Providers readily admit the system's different elements don't communicate well. As a consequence, patients may be discharged after surgery without follow-up home care being arranged. Additionally, hospitals may be unaware of a patient's medical care that has already been provided by a family doctor.

Fragmentation of care is not unique to Canada – it is the case to greater or lesser extent in all regions of the world. Care fragmentation reveals itself in many ways; a lack of communication between specialists and primary care

physicians is one of the most frequent and obvious in its impact on patients. A sizeable proportion of Canadians believe their care providers need better means to share health information.

Integration of information across the community can help significantly those who are most at risk of falling through the cracks, as they are being cared for by many providers for several different reasons. However, while care coordination involves the creation and use of a single, patient-centric care plan that synchronizes all providers involved in the care of each patient, there also needs to be regular analysis and reporting of care gaps and overall health system performance. Finding ways to best use the mass proliferation of health data and make it appropriately available is challenging. Nevertheless, digital health technology provides an opportunity to improve the existing disconnected system and significantly advance patient care.

When healthcare providers and patients have access to complete information through EHRs, including an integrated care plan, then they can realize the full potential of a streamlined, coordinated healthcare system.