Canada's Interoperable EHR: Infoway Chooses the More Challenging Path, the Greater Benefits

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by Dennis Giokas, MSc

The goal of Canada Health Infoway, the corporation fostering and facilitating the development of an interoperable electronic health record (EHR), is to provide all Canadians with a secure and private lifetime record of their health history and care. The record is available electronically to authorized healthcare providers and the individual anywhere, anytime. It is designed to facilitate data sharing across the continuum of care, healthcare delivery organizations, and geographies.

Sharing an individual's health information is a key concept in Infoway's agenda and architecture. The EHR is viewed as a "shared space" of selected clinical information that is authoritative and reliable. Additionally, the data must be readable and safely understood by all users and systems—in other words, the data must be computably and semantically interoperable.

Common Architecture, Standards Guide the Way

The building blocks of semantic interoperability are common standards (e.g., document, messaging, and nomenclature) and architecture (e.g., business and technical). Infoway has developed an architecture, titled "The Blueprint for EHR Solutions," and selected common standards, such as HL7 v3, CDA R2, DICOM, LOINC, and SNOMED CT for use in the EHR.

The blueprint defines the enterprise systems architecture that guides the overall development of the system. It is based on a service-oriented architecture using an enterprise services bus, referred to as the Health Information Access Layer (HIAL). The blueprint also defines the longitudinal record service (LRS) for business processes, business rules, and accesses to information in the demographic registries and clinical domain repositories that support the EHR.

These elements make up the EHR Infostructure, which supports the diverse set of point of service systems in the healthcare ecosystem (see "Interoperable EHR: Conceptual Architecture," opposite).

Uniform Universal Access to the EHR

The HIAL/LRS provides a single point of interaction for point of service systems participating in the EHR. It is an application abstraction layer to all the common software services, such as those needed for privacy, security, and business processes. A key design principle of the HIAL/LRS is that it must work with any health IT system that a province deploys, because each province will have different physical EHR solution deployment characteristics.

The interface to the HIAL is standardized, using Web services with an HL7 v3 message or CDA R2 document as the payload. Both are supported by terminologies such as LOINC and SNOMED CT for the coding of clinical information.

Key patient-centric clinical data are sourced, or "put," from various point of service systems, such as laboratory information systems (lab test orders and results); radiology systems (digital image and radiologist reports); physician medical record systems (encounters, medication orders, allergies and intolerances, diagnoses, immunizations); pharmacy systems (medication dispense); and hospital systems (ADT events, reports, diagnoses) using CDA R2 or HL7 v3 messaging.

The HIAL/LRS manages the "write" into one of the EHR clinical domain repositories. The domain repositories are designed to hold fine-grained, discrete, structured, and coded clinical information. In the case of CDA, the document header and body are also stored in the repository.

Weighing Infoway's Document Options

Infoway considered other options for its document format and structure, including unstructured documents (a non-CDA document or a CDA document with only the header and narrative block and no structured content as clinical statements) and a document exchange model.

Infoway decided against an unstructured document model because even though healthcare data are largely collected in documents they are subsequently requested as individual data; that is, data often must be extracted from documents and integrated with other data.[1] For this and other related reasons, Infoway chose to pursue fine-grained, discrete, structured, and coded clinical information that can be easily accessed and used in multiple ways.

There are other benefits to this approach, including increased usability of discrete codified data and customization and personalization of data visualization. Infoway's objective is to give clinicians the opportunity to view and compare, with the support of the point of service system, the data in a way that suits them and suits the clinical context at that point in time. Thus, an application can customize the view and use of that data in a context-sensitive fashion, instead of tying it to the document format and structure it was originally rendered in.

Additionally, discrete, codified data in the EHR enable clinical decision support. This may be as basic as generating a visual cue based on a clinical rule in the visualization of the data—e.g., "show me an abnormal laboratory test result element in red text and bolded versus normal black text." It could be as complex as providing for drug utilization review or review of the necessity of a diagnostic test.

Based on an Infoway-commissioned study on the cost and benefits of the EHR, 75 percent of the $6.1 billion projected annual benefit comes from this type of advanced clinical decision support.[2] Using unstructured documents allows for basic presentation of information, but it will not yield these types of benefits.

Many would assert that it is more of a challenge to create interoperable systems using HL7 v3 messaging or CDA clinical statements, and initially it is. Clinical systems have to be enhanced to capture clinical data that are structured and coded so they can be shared with other systems and users.

But a study done on the cost benefit of health information exchange in the US suggests it is actually less expensive to implement interoperable systems with structured messages using standardized and coded data than it is with nonstandardized data. The difference cited is the requirement for translation logic from one vocabulary to another. Additionally, the annual projected benefit of the former is more than twice the latter.[3]

There are two obvious approaches to consider in a document-based model: document sharing and document exchange. Infoway's approach supports shared documents. This approach not only builds up an individual's longitudinal record of key clinical information but makes that information readily available to authorized clinicians anytime.

In an exchange model, a clinician creates a document, ranging from clinical notes to a health summary record such as the continuity of care document and "pushes," or sends, it to another clinician. This clearly creates extra work for the sourcing clinicians, who must precoordinate the availability of their records, anticipating who the records go to and what data are required.

More critical is that the information is not readily available to others who may need it, as those needs cannot be anticipated. Avoiding, for example, unnecessary duplicate tests because information is readily available is a big part of the benefit proposition of the EHR.

EHR Interoperable: Conceptual Architecture
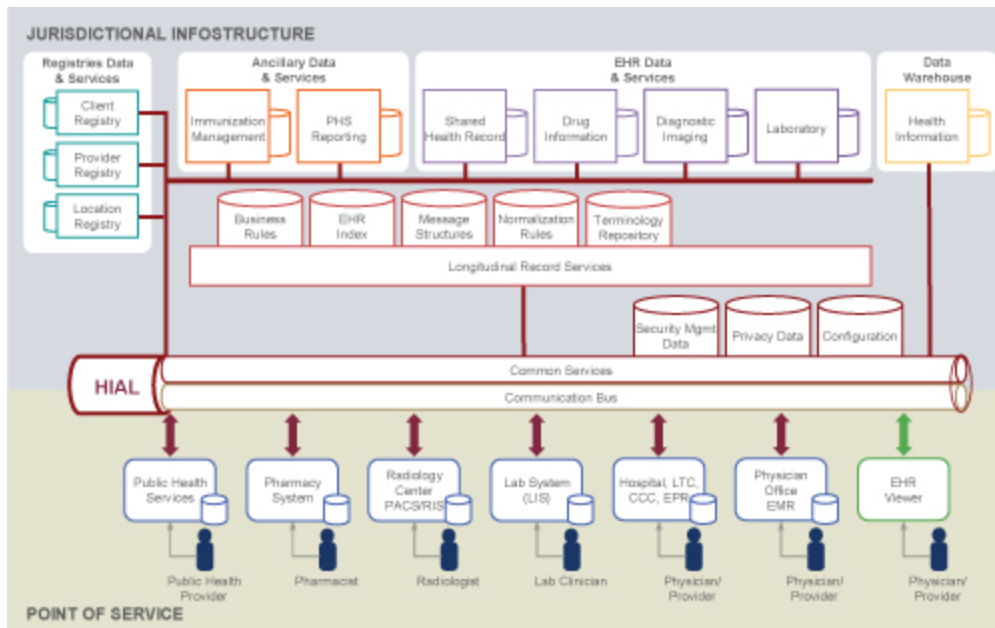
The Infoway "Blueprint for EHR Solutions" defines the enterprise systems architecture that guides the overall development of the system. It is based on a service-oriented architecture using an enterprise services bus, referred to as the Health Information Access Layer (HIAL). The blueprint also defines the longitudinal record service for business processes, business rules, and accesses to information in the demographic registries and clinical domain repositories that support the EHR. These elements make up the EHR infostructure, which supports the diverse set of point of service systems in the healthcare ecosystem.

Benefits of a Shared Interoperable EHR

Did Infoway choose a more challenging path to an EHR? On the surface, yes. While there are certainly inherent benefits in exchanging client summary information as electronic documents, it is, in a sense, just eliminating the fax machine or the courier, the consumption of paper, and the file folder (albeit maybe electronic) for those documents. Having structured and codified clinical information in a longitudinal, shared EHR helps with data analysis, data comparison, and decision support.

It also supports the eventuality of secondary use (which includes managing the healthcare system on dimensions such as quality, safety, efficiency, and access), health surveillance, research, innovation, and health system strategy and planning. This ability to repurpose information for analysis and the care of individuals and groups of patients, by chronic disease, for example, is where much of the power of the EHR lies. These are both short- and long-term benefits to citizens, clinicians, and the health system.

The Infoway Mission

Infoway was founded by the Canadian federal government in 2001 to lead the deployment of EHR solutions nationwide. Its mission is to foster and accelerate the development and adoption of electronic health information systems with compatible standards and communications technologies on a pan-Canadian basis with tangible benefits to Canadians.

Infoway's vision is a high quality, sustainable, and effective Canadian healthcare system supported by an infostructure that provides residents of Canada and their healthcare providers timely, appropriate, and secure access to the right information when and where they enter into the healthcare system. Respect for privacy is fundamental to this vision.

Notes

1. Mead, Charles N. "Data Interchange Standards in Healthcare IT-Computable Semantic Interoperability: Now Possible but Still Difficult, Do We Really Need a Better Mousetrap?" *Journal of Healthcare Information Management* 20, no. 1 (2007): 71–78.
2. Canada Health Infoway. "Pan-Canadian Electronic Health Record: Quantitative and Qualitative Benefits." *In Canada Health Infoway's 10-year Investment Strategy*. Booz-Allen-Hamilton, 2005.
3. Walker, Jane, et al. "The Value of Health Care Information Exchange and Interoperability." *Health Affairs*, January 2005. Available online at www.healthaffairs.org.

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Dennis Giokas (dgiokas@infoway-inforoute.ca) is chief technology officer at Canada Health Infoway.

Article citation:
Giokas, Dennis. "Canada's Interoperable EHR: Infoway Chooses the More Challenging Path, the Greater Benefits" *Journal of AHIMA* 79, no.5 (May 2008): 56-57;60.

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