Canada Hits the Infoway: How Canada is Transforming Its HIM Infrastructure

by Patrick Shaw

Canada Health Infoway has big plans. By 2010, it wants half the country using interoperable health record systems.

Health epidemics such as SARS have awakened countries around the world to the importance of interoperable health information management systems. In the past year Canada has made great strides in laying the groundwork for a networked health information infrastructure (or "infostructure") that will improve healthcare delivery to Canadians.

In 2000 Canada's First Ministers formally committed to strengthening the country's health infostructure. Since then, the country's federal, provincial, and territorial deputy ministers of health have worked cooperatively to develop a sound model for interoperability, led by Canada Health Infoway.

Infoway is an independent, publicly funded catalyst organization tasked with accelerating the development and adoption of compatible electronic health information systems. Infoway makes strategic investments in select projects—the building blocks that will ultimately form the pan-Canadian system.

In 2003 the importance of the organization's mandate became clearer than ever. "The outbreak of SARS shone a light on the weaknesses in how we share health information in our country—within and between healthcare jurisdictions," says Richard Alvarez, Infoway's president and chief executive officer. The government's commitment to the health information infrastructure, he says, provides the opportunity to enhance data sharing in order to improve Canada's preparedness for future epidemics and improve the care of individual Canadians.

Distinct Benefits to Individual Care

The efforts of Canada Health Infoway and its partners are driving a significant transformation of the country's healthcare sector. A pan-Canadian HIM infostructure will provide the healthcare community with more timely access to accurate patient information. It will facilitate improved diagnoses and treatment regimens and ensure improved management and containment of public health epidemics as they arise.

Greater seamlessness in data sharing also helps eliminate instances of overprescription or prescription of contraindicated medications, notes Alvarez. "Computerized medication ordering has been shown to reduce the number of nonintercepted medication errors by up to 83 percent, through electronic functions that track medication dose and frequency, display relevant lab results, and check for drug allergies and drug interactions."

Dennis Giokas, Infoway's chief technology officer, notes additional benefits from the necessary technological innovations behind the infostructure. In the process of improving care, Giokas, says, "thousands of IT employment opportunities will be created, and we will reinforce Canada's reputation as a global technology leader."

Solid Business Strategy

As a part of defining its role and business strategy, Infoway identified six key areas in which it would invest:

- Infostructure—development of the fundamental technical architecture to ensure interoperability
- Registries—software applications through which patient identification information and healthcare practitioner listings can be compiled

- Drug information systems—through which physicians can review patient prescription regimens and histories
- Diagnostic imaging systems—through which images and radiology reports can be accessed
- Laboratory information systems—through which test results can be accessed
- Telehealth—applications enabling remote patient care

Infoway is also committed to leveraging existing IT investments made by individual provincial and territorial health ministries; collaborating with those ministries and other partners; focusing on end users as the ultimate beneficiaries; and investing jointly with public-sector sponsors. These strategies have guided all activity throughout 2003 and will continue to do so in the coming years.

The EHRS Blueprint

A key milestone for Infoway was completion of the Electronic Health Record Solution (EHRS) Blueprint—a fully validated, scalable business and technical architecture that maps out considerations and approaches that will help governments and healthcare administrators deploy EHR systems quickly, cost-effectively, and with limited risk.

In creating the framework, Infoway consulted international best practices and conducted extensive consultations with more than 300 stakeholders across Canada, including healthcare administrators and other healthcare professionals, IT specialists and providers, technology companies, academics, and an advisory group of representatives nominated by chief information officers from the provincial and territorial ministries.

The blueprint focuses on the mechanisms required to ensure interoperability of systems across Canada and, therefore, on straightforward transmission of clinical data from one healthcare provider to the next and from one region of Canada to the next.

"The EHRS Blueprint will help to ensure that as Canada modernizes its health system with enabling information technologies, a patchwork of incompatible systems will not be introduced," says Giokas. The blueprint presents a plan for establishing a new health infostructure with advanced integration capabilities that is agile, delivers cost efficiencies through standardization, and provides strategies for system development and migration, says Giokas. The blueprint defines a common integration framework and set of standards and promotes reusable and replicable solutions.

Provinces, regions, and discrete healthcare communities have invested hundreds of millions of dollars in technical infrastructures and applications, notes Giokas. "With this in mind, and recognizing that all health organizations today are challenged by resource restrictions," he says, "the EHR architecture has been created to build on the existing base of technical systems installed across Canada and to remain vendor-, application-, and provider-neutral in its solution architecture definition."

Rather than prescribe a rigid framework, the blueprint presents technical options throughout its eight core sections:

1. Business context—a description of the value to be realized through a pan-Canadian interoperable system
2. Project context—a review of objectives and assessment of the current infostructure in place across Canada
3. Business architecture—a section focused on how clinical data captured by existing applications will be replicated to EHRs
4. Conceptual architecture—a high-level view of services and data repositories
5. Service architecture—a detailed services-oriented architecture for systems integration and interoperability
6. Deployment models—consideration of the variability in deployment from jurisdiction to jurisdiction
7. Technical architecture—overview of the technologies and application architectures that can be used to deliver the solution
8. Potential applications—a discussion of the EHR's integration with applications in use today

Architectures and Models

The EHRS Blueprint presents business, conceptual, and services architectures for the EHR, and it defines integration and deployment models.

The business architecture has been structured to ensure providers can use their preferred applications to capture clinical data at the point of care and replicate longitudinal patient-care data to the EHR so that information may be used across the care

continuum. Those same applications will read data out of the EHR and present it to care providers in a way most relevant to individual care encounters.

The conceptual architecture presents a high-level view of data repositories and pinpoints where they will be hosted in the enterprise. It describes the solution components required for an interoperable EHR—the people, organizational entities, business processes, systems, technology, and standards that must interact and exchange clinical data to provide high-quality and effective healthcare.

The conceptual architecture solution is a scalable, distributed, peer-to-peer network of systems and data repositories integrated through a common infostructure called the EHRi. The EHRi is a collection of common and reusable components that support a diverse set of health information management applications. It consists of software services, data definitions, and messaging standards. Applications integrate with the EHRi using a standards-based, message-oriented architecture.

The services-oriented architecture for systems integration and interoperability promoted by the blueprint defines a common specification for the distribution of business applications in healthcare enterprises.

A service is a system that groups related functions used by multiple components. It provides published interfaces to permit proper use of these functions while hiding implementation details. The collection of services that form the basis for the EHR is known as the Health Information Access Layer (HIAL). The HIAL provides the common language and entry point for all applications that will interoperate with the EHR. It provides for a cost-effective, secure, private, and scalable runtime environment for a broad set of provider applications.

The integration models allow for optimal flexibility for integrating the HIAL and EHR with applications currently in use. As part of Infoway's commitment to leveraging existing investments, the services-oriented architecture provides for a system migration strategy that can be implemented over time. Clinical domain data repositories—such as pharmacy and diagnostic imaging repositories—will be preserved and protected while the HIAL, with its valued-added services, is phased in over time.

The deployment models have also been designed to ensure flexibility in supporting how systems will be configured in different jurisdictions—an urban center, a health region, at the provincial and territorial level, and even on a shared-services basis between two or more provinces or territories.

Individual solution components will offer configuration flexibility, too. For instance, two jurisdictions may choose to share a domain repository for diagnostic images yet keep all other components such as registries and the EHR segregated. This will allow jurisdictions to deploy the solution in a manner consistent with their approach to healthcare delivery. Each EHRS will be connected in a peer-to-peer fashion via communication services in the HIAL, creating a fully distributed network.

There is no attempt to standardize applications. Instead, the EHRS Blueprint emphasizes the importance of providing clinicians with an integrated and interoperable suite of information technology tools that help them deliver the best possible care. It recognizes that no single application can meet the needs of every point-of-care setting or every clinical domain, and it highlights the key role the EHR can play in eliminating information application silos.

As Infoway's investment criteria is based on standards compliance, the blueprint was designed as a model for systems development—one to be referenced as Infoway determines in which technology and services it will invest.

EHR Data and Standards Definition

Recognizing that interoperability between diverse care settings, information systems, and jurisdictions cannot possibly occur without a clearly defined set of common standards, Infoway investigated current health information standards in Canada and established a plan for defining EHR standards. Cross-Canada consultations were undertaken to identify:

- The data required for exchange in an interoperable EHR
- Standards gaps and priorities for advancing the interoperable EHR
- Criteria for standards selection
- The best approach to achieving interoperability and moving toward the emerging pan-Canadian vision
- Stakeholder roles in adoption, adaptation, or development of standards to support interoperable EHR

The findings and recommendations, published in March 2004, represent the foundation on which the interoperable health records system will be based. The report addresses such issues as the need for transparency in the stakeholder engagement process, the importance of clearly defined accountability for individual projects, and the necessity of a clear standards approval process.

"A myriad of health informatics standards exists in Canada; the landscape is as complex and varied as the many aspects of health services delivery. Our research has enabled us to identify the steps required to establish EHR standards in a timely fashion," Giokas says. Recommended initiatives related to standards development include:

- Introduction of a defined stakeholder engagement model
- Development of a change management framework for standards development, implementation, and maintenance
- Building of capacity to sustain the stakeholder engagement model
- Development of tools and templates for standards initiatives
- Creation of a communication plan
- Development of an evaluation plan to assess the progress of standards adoption

"By ensuring standards initiatives are grounded in structured change management and transition processes, we can provide an environment in which stakeholders understand the need for change, support new standards initiatives, and feel meaningfully engaged in the process," Giokas says. "This type of approach will facilitate adoption and ensure we are moving toward the pan-Canadian EHR as effectively and efficiently as possible."

Client and Provider Registries

Beyond development of the blueprint and establishment of a model for standards definition, Infoway has also invested in the development of robust, reusable provider- and client-registry applications that allow the assembly of an electronic listing of healthcare practitioners and patients within the healthcare system.

The provider- and client-registry applications will be ready for deployment this year. Infoway is working with Canada's federal, provincial, and territorial governments to roll the registries out across the country over the next three years.

The accomplishments of the past year show that the project is building momentum. Infoway's ultimate goal is to have half of Canada automated with interoperable health record systems by 2010. Alvarez is optimistic. "The collaborative model on which our business is based has already yielded exceptional results," he says. "We gained considerable momentum in 2003. We look forward to driving ahead, buoyed by the continued unanimous support of our deputy ministers of health and our private-sector partners."

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