An Introduction to Health Information Integration

This is the first in a series of papers that demonstrate how the health information integration framework (HIIF) provides a method for organizations to manage and control the many variables involved in creating interoperable healthcare systems.

**cgi.com/health**

Table of Contents

The current state of health information

Healthcare organizations are increasingly operating in data-rich and information-poor environments. In today's high-tech era, we are constantly gathering and storing data, only to never use it because it is inaccessible, improperly formatted or presented in an irrelevant way.

Patient health information, for example, is distributed over a number of locations and via a number of IT solutions throughout the patient's life. Depending on an individual's use of the health system, this could amount to a few tidbits or to a considerable volume of information.

The graphic below depicts the possible volume of information generated over an individual's lifetime through health services received at various locations.

Health Information Generated in an Individual's Lifetime
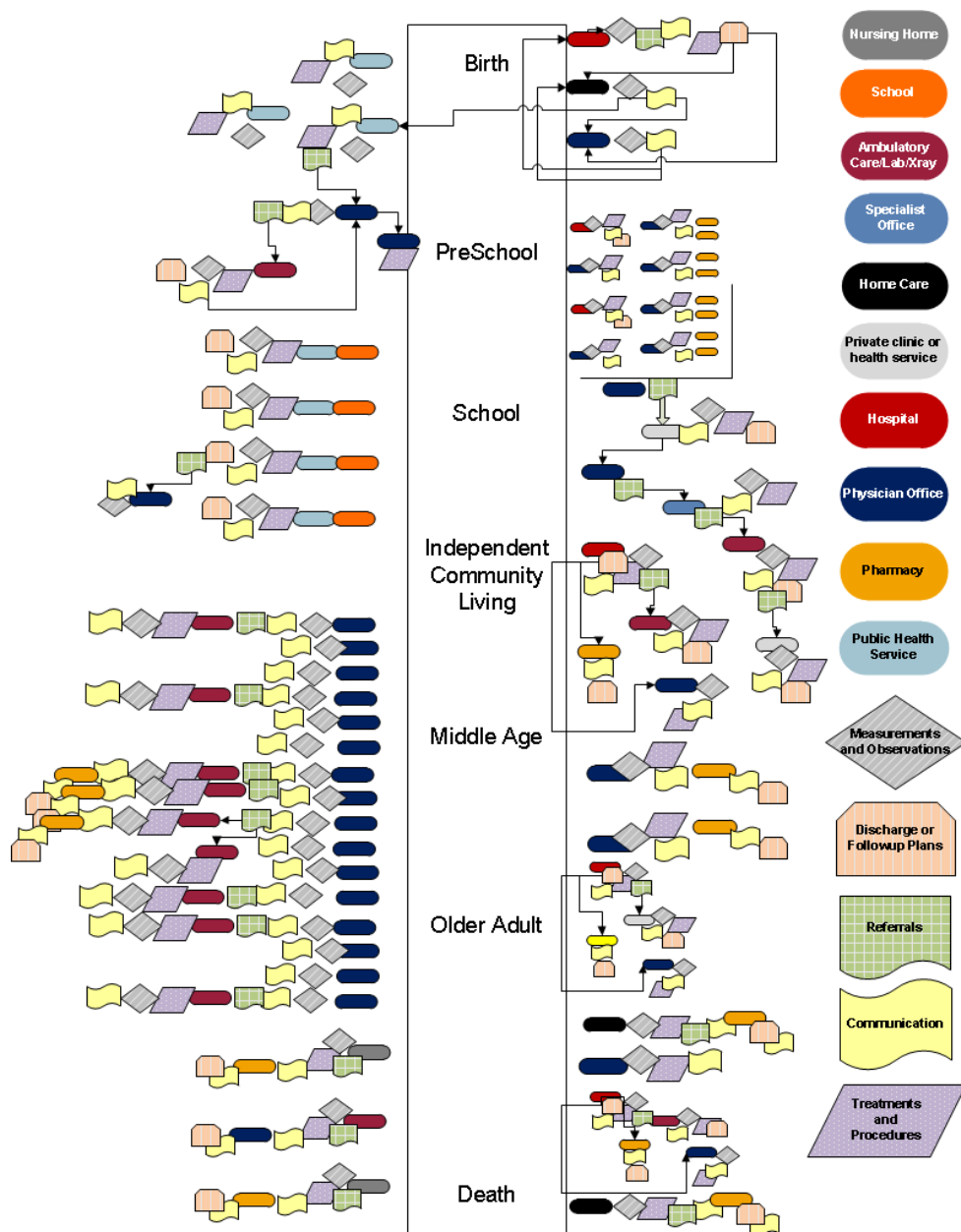
The health sector in Canada was one of the first to embrace IT to support operational needs. To better exploit patient health information and current IT resources, the Government of Canada created **Canada Health Infoway**—a corporation funded by the government to co-invest with the provinces and territories to fund and monitor projects that form a network of electronic health information systems in Canada.[1]

Infoway proposed an **EHR Blueprint** to guide the development of electronic health records (EHRs) in Canada by defining Canada's vision for the interoperable electronic health record (iEHR).The iEHR provides a comprehensive view of a patient's medical history that can be shared between providers and across care disciplines, care settings and jurisdictional boundaries.[2]

The EHR Blueprint is technology-neutral. It describes only how the final solution should work rather than prescribing specific technologies or services to be implemented. The EHR Blueprint offers an ideal solution for ideal conditions. While this is all well and good for planning, the reality of health organizations is typically less than ideal and finding a viable solution requires a flexible approach based on an awareness of the organization's infrastructure and strategy.

Interoperability is the keyword in this ongoing data/information/knowledge struggle. Concerns regarding the lack of interoperability and its effect on patients and providers are well documented. To address these concerns, the strategic plans of healthcare organizations envision enhanced system interoperability, supportive IT frameworks and optimal information exchange to support better patient health outcomes. However, healthcare organizations often lack the capacity and resources to integrate multiple data sources in meaningful ways.

What stakeholders have to say

Ask anyone involved in healthcare if he or she supports the integration of health information, and the answer will be yes. Ask that same individual if the information sources within his or her healthcare organization are fully integrated and you will receive various responses pointing to either a lack of integration or partial integration. Often, it is not about individuals or organizations supporting or opposing integration of health information. Integration presents unique barriers related to safety, efficacy, cost and efficiency:

- If a physician's electronic medical record were to be integrated in real time to a jurisdictional electronic health record, which system would be seen as the source of truth? Patient safety could be compromised if a clinician acted on out-of-date information.

- If a healthcare organization was to integrate diagnostic images from a private provider, would the private provider's information system meet appropriate security and privacy standards? Similarly, would the health organization's information infrastructure be sufficiently mature to accept the leading-edge technology messaging standards in use by the private provider? A new system that is not private, secure and compatible is not effective.

- If a care stream were to integrate its referral information into one application, would each actor involved in the workflow have the appropriate hardware required to run the application? Could each actor afford the implementation and training costs associated with the new application and business processes?

---

[1] Canada Health Infoway, http://www.infoway-inforoute.ca
[2] Ibid.

Would the proposed application support current workflows or would it add new steps that bring no added value to the actors? Cost and perceived inefficiencies can deter investment in integration.

When it comes to proposed integration initiatives, changing an actor's "no" to a "yes" requires careful assessment of the situation. This assessment needs to be supported by an underlying method.

The need for an integrated approach

Integrating health information is not just about getting databases to communicate with each other. It is about moving toward a worldwide trend in healthcare reform—integrated care. The World Health Organization defines integrated care as a concept bringing together inputs, delivery, management, and the organization of services related to diagnosis, treatment, care, rehabilitation and health promotion.

Integration is a means to improve services in relation to access, quality, user satisfaction and efficiency. [3] Health information integration is not a new concept. Prior to the advent of electronic health records, clinicians and health records specialists were the central "integrators" of patient information. However, they had fewer sources of patient information to consider in their decision-making process and fewer formats for presenting the information. Lab reports in tabular format, handwritten consultation notes from specialists, handwritten progress notes from care teams, transcribed and typed operative reports and historical paper charts contributed to information exchange.

Currently, healthcare providers have a seemingly infinite combination of graphic, textual, coded, statistically analyzed, collated, filtered, non-filtered and malleable data. More than ever before, clinicians must filter through large volumes of available data to retrieve information that is relevant and useful in a sometimes rapidly evolving clinical encounter.

Despite the numerous data sources and information systems providing access to patient information, clinicians cannot always retrieve and view this information quickly and easily. As a result, healthcare organizations endeavor to construct comprehensive summary views of patients' medical records.

In doing so, they hope to support healthcare providers' information needs, especially during a healthcare encounter but also for ongoing communication and continuity of care. However, not all summary views are created equal. A summary view must be constructed and presented in a way that supports the clinical decision-making process rather than fracturing or confounding it.

Currently, healthcare organizations are inundated with existing sets of data and information. However, when you try to get a summary of a patient's health record, what you get is often ineffective or incomplete because the information is not concise and thorough. Not all data sets are created equal either. Therefore, integrated summary views need to be created with an overall vision in mind.

What is considered relevant information may change depending on the patient's encounter. A family physician, a surgeon and a physiotherapist seeing a patient for a post-operative follow-up will all have different information needs. Accordingly, a relevant summary view is one that can evolve with each new encounter, to meet each actor's needs.

---

[3] Gröne, O & Garcia-Barbero, M (2002): Trends in Integrated Care – Reflections on Conceptual Issues. World Health Organization, Copenhagen, EUR/02/5037864

The Health Information Integration Framework (HIIF)

Interoperability in both legacy and emerging health information systems, patient-centered health records and encounter-specific, integrated summary views can be realized through use of a basic underlying structure—the, **health information integration framework (HIIF)**. This framework is important because it provides a way to use existing data to create comprehensive health record views that summarize information from various sources, target clinicians' needs and evolve over a patient's lifetime.

An HIIF is not simply a way to use existing data to create effective summary views; it is the foundation for creating improved health information. When integrated data is de-identified and aggregated, comprehensive information collated using the framework can be used to provide statistics for program evaluation and alert management. It can also help with surveillance and outbreaks.

HIIF CONCEPTS

Consider the following scenario. A 56-year-old male arrives at the emergency department with chest pain after building a fence in his backyard. He has a history of heart problems but by managing his lifestyle and diet and taking his medications regularly, he has remained symptom-free for five years. The physician must determine whether the patient has suffered a new cardiac event, is having symptoms related to his cardiac history and current medication regime, or has strained his shoulder and chest muscles with his recent manual labor.

The ER physician completes an examination, orders some preliminary tests, and the ER team begins looking for key patient records:

- The patient's last report from his cardiologist
- A record of the patient's medications
- The results of the patient's latest ECG and blood tests.

The physician and his team obtain the cardiologist's report as a fax from the cardiologist's office and log in to the Pharmaceutical Information Network for a list of currently prescribed and dispensed medications. The team finds out from the patient's wife that the patient's most recent ECG and blood tests were performed last month during a yearly checkup with his family physician. The team has the family physician's office send a secure file transmission of the patient's last ECG from the family physician's EMR. And, finally, the physician logs in to the jurisdiction's electronic health record to view the lab results.

In addition to the multiple log-ins required in this scenario, the team must sometimes search through months and even years of patient records to find the few key pieces of information they require. What the team needs in this situation is a responsive summary view of the patient's information that anticipates their needs based on the context of the current encounter yet allows them to drill down to more detailed information as their decision-making and critical thinking processes evolve.

Achieving a balance of anticipatory and encounter-related information in a contextually relevant way can be a daunting task. The health industry has a surplus of well-designed, soundly implemented and appropriately supported clinical information systems and clinical data repositories, as noted in the above scenario:

- Electronic health record (EHR)
- Electronic medical record (EMR)
- Jurisdictional repositories
- Specialized information networks.

Achieving a balance of anticipatory and encounter-related information in a contextually relevant way can be a daunting task.

cgi.com/health

However, the health system lacks integrated system solutions that pull all of these information sources together in a meaningful, contextually relevant way.

HIIF RISKS AND BENEFITS

To develop an effective summary view with the appropriate level of data detail, it is important to involve the clinicians who will be using it. Right now, we rely on humans to search multiple databases through various interfaces using dissimilar processes and search techniques. Although this is inconvenient, there are important diagnostic and critical thinking processes going on that support decision making. Is there a risk to these processes when information is integrated into a relevant view and fed to a healthcare provider?

When using an integrated summary view constructed within the HIIF, caregivers will have to consider not only what information is being presented to them but also what other information might be missing that could prove relevant. On the other hand, integrated information provided through the use of the HIIF may pull in data that might have otherwise been completely left out of the decision-making process.

At what point do diminishing returns start to apply to the volume of information provided? Caregivers' ability to consume integrated information may be greatly varied. A flexible HIIF will need to consider the caregiver's ability to process information—turning relevant information into pertinent knowledge. Care will also be required to avoid prematurely acting on the information given. Even though it seems ideal to get as much information as quickly as possible, we cannot undervalue patience and critical thinking in the diagnostic process.

How humans process information will be discussed in a future paper within this series.

No matter how you look at it, the rewards of an HIIF outweigh the risks. Using the HIIF would assist clients in developing information sharing solutions that connect silos of data. Without information sharing, current practices prevent optimal use of patient information and result in duplicate tests, delayed referrals, asynchronous decision making and postponement of time-sensitive treatments.

With information sharing, volumes of independent sets of data across multiple systems can be brought together in integrated, relevant and useful summary views. Integrated data can also be de-identified and aggregated in such a way as to enable policy-making decisions at the public health level. However, a number of questions must be considered.

Data use, governance, privacy/security, ownership and stewardship all need to be taken into consideration. For example, who does a set of data belong to? Who is responsible for maintaining and updating the data? How should data be shared and with whom? Information is the lifeblood to any healthcare system, and it needs to be treated with the utmost care.

THE BASIC SOLUTION

The need for health information integration has evolved and is mentioned with increasing frequency in the healthcare industry. Currently, when it comes to health information integration, health systems tend to do one of three things:

- They create a new application or add-on to display information in refined, specific, patient-centric views.

- They use existing applications to view additional data elements retrieved from external sources via integration, but displayed using the existing applications' format and structure—which means no change to end user workflows or application navigation patterns.

- They use existing applications to launch into external data sources/systems/applications (e.g., portals, web services).

Information provided through an HIIF will follow the patient as a silent but powerful advocate.

Integration initiatives are often limited in scope and integrate only a small portion of patient data available because it is difficult to move information among disparate clinical and business software applications within and beyond healthcare enterprise borders.

It requires a thorough understanding of data governance, expert knowledge in health messaging standards, access to sophisticated technology, and expertise in systems integration including service-oriented architecture (SOA) and enterprise architecture management (EAM). CGI's HIIF defines and describes all the parameters necessary to achieve the integration that healthcare organizations require.

Information provided through an HIIF will follow the patient as a silent but powerful advocate.

The CGI framework

What does a healthcare organization have to gain from a **health information integration framework**?

Remember, an HIIF is not just about making data systems compatible with each other; rather, it is about providing the right information, in the right format, at the right time in order to fully supplement the decision-making power of healthcare providers. With relevant information, providers can convert patient data into patient-centered knowledge. However, no such system comes without its inherent risks and rewards.

Key to a successful HIIF is careful assessment of an organization's technological and business assets. Following careful assessment, increased clinical and business functionality can be delivered with minimal new investment in specific, sophisticated technology and maximum re-use of existing assets.

CGI's HIIF is based on a standard cycle of organizational planning and effort. It brings both technical and business planning and execution together, creating the necessary alignment for health information integration mandates. It provides healthcare organizations with a way to evaluate, prepare, implement and support a new information sharing reality by applying a flexible yet structured approach to information integration. It also provides a flexible underlying foundation to deliver increased clinical and business functionality through expert integration and enterprise architecture management. Ultimately, its strength in leveraging existing data, processes and infrastructure will provide the relevant information required for creating patient-centered knowledge.

While the concepts surrounding health information integration are complex, investment in integration initiatives promises to address many of the current interoperability issues faced by healthcare organizations. CGI's knowledge in system integration ensures that we will respect healthcare organizations' current constraints as well as their multiple needs related to clinical and business workflows, health information management processes, data stewardship principles, and governance processes. In providing clarity to the health industry's milieu of information sharing dilemmas, CGI stands to shift the industry paradigm of how health professionals are supported in collaborating with one another.

Next steps

This white paper series was designed to provide a business-oriented introduction to integrating health information and serve as a guide when considering implementation of an integrated health information system. We have presented and discussed a number of factors that are critical when analyzing the gap between the current and future state of an integrated information system. For further information on integrated solution best practices, implementation and deployment considerations and achieving a steady state, contact CGI at HealthIT@cgi.com.
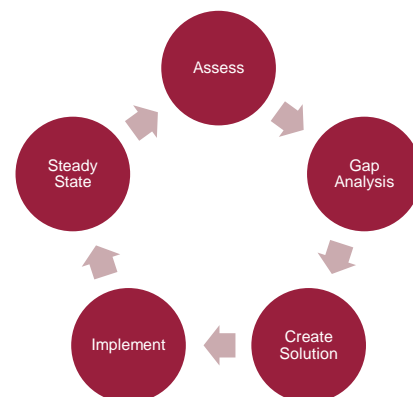
ABOUT CGI

Founded in 1976, CGI is a global IT and business process services provider delivering high-quality business consulting, systems integration and managed services. With 68,000 professionals in 40 countries, CGI has an industry-leading track record of delivering 95% of projects on-time and on-budget, aligning our teams with clients' business strategies to achieve top-to-bottom line results.