BRITISH COLUMBIA

Framework for an Electronic Health Record for British Columbians

PRESENTED BY THE HEALTH CHIEF INFORMATION OFFICER COUNCIL

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Executive Summary

The Framework for an Electronic Health Record (EHR) for British Columbians, hereafter called the Framework, provides an information technology blueprint for the future – a future where health information is shared electronically to support health care decisions by caregivers. This future will be possible through the creation of a secure and private lifetime health record for each British Columbian; available twenty-four hours a day, seven days a week anywhere in British Columbia.

How will this be done? The tactical approach to creating an EHR taken by the Health CIO Council on behalf of all six health authorities and the Ministries of Health Planning and Health Services will be collaborative, based on replicating solutions and constructed on the basis of a convergence strategy. It will be evolutionary and guided by common priorities, standards and architecture. The strategy will also apply common project management tools and templates for all projects and manage each project in an open, transparent way. The approach will be divided into three phases. Building on a number of existing, or foundational, provincial and health authority systems, the Framework identifies twenty-one EHR building blocks, eight of which can be constructed in phase one, over the next eighteen months.

The Framework also outlines existing in progress and planned initiatives in all building block areas in each health authority and maps B.C.'s approach against Canada Health Infoway's business plan for a pan-Canadian EHR. British Columbia's approach will evolve in light of the province's own experience and the lessons learned nationally and internationally from the approaches taken by other health care systems.

Success in building an EHR requires a common tactical direction, hard decisions about priorities and the coordination of activities. This Framework provides the basis of all three.

Introduction

This document is a framework for an EHR for British Columbians. It also represents British Columbia's contribution to the pan-Canadian effort to develop an EHR.

An Electronic Health Record (EHR) provides each British Columbian with a secure and private lifetime record of their key health history and care within the health system. The record is available electronically to authorized health care providers and the individual anywhere, anytime, in support of high-quality care.

The Health CIO Council is composed of the CIOs of the six health authorities and the CIO of the Ministries of Health Planning and Health Services.

This Framework flows from the recently released *"Information for Health"*, a strategic plan for health information management in British Columbia, developed by the Health Chief Information Officer (CIO) Council. It supports the vision guiding the plan*: "the right information in the right hands at the right time to support personal health, health care decision-making and health system sustainability"*.

This Framework is the centerpiece of goal one of the strategic plan: the sharing of caregiver information. It provides a blueprint for a future where health information is shared electronically to support health care decisions by caregivers. The Framework also supports the New Era health goal of high quality, patient-centred care. It focuses on information technology, only one aspect of major changes required to implement an EHR.

"Information for Health" outlines a vision for the future of health information management, identifies guiding principles and outlines six major goals:

- SHARING OF CAREGIVER INFORMATION
- PUBLIC ACCESS TO HEALTH INFORMATION
- PROVISION OF AGGREGATE HEALTH INFORMATION
- LEVERAGING OF TECHNOLOGY
- EFFICIENT USE OF PUBLIC RESOURCES
- ENHANCED KNOWLEDGE MANAGEMENT

Changes in organizational culture, practices and attitudes will also be necessary for success. It is essential that the change process be business driven and focused on the needs of health care users and providers. In the next year, the Health CIO Council undertakes to work with all stakeholders to design a change management strategy to complement this information technology framework.

The Council will also continue to review the experiences of other jurisdictions as its approach evolves.

Context

The EHR is the ultimate goal in the development of effective, client-focused, interoperable information systems for the British Columbia health care sector. Major benefits include improved clinical decision-making support for health care providers, better health care outcomes and enhanced privacy and security of patient records.

There are significant EHR efforts underway in a number of jurisdictions. Recent reports on health system reform include recommendations to develop an EHR, including the Advisory Committee on Health Infostructure's Tactical Plan for a pan-Canadian Health Infostructure, Saskatchewan's Fyke Report, Alberta's Mazankowski Report and, most recently, the Commission on the Future of Health Care in Canada. The United Kingdom has committed more than the equivalent of $2 billion CDN to EHR development.

The Fyke Report: "electronic health record (EHR) is the cornerstone of an efficient and responsive health care delivery system, quality improvement and accountability. Without it the prospects for a patient-friendly health system, optimal teamwork, and efficiency are dim."

Recommendation 8 of the Commission on the Future of Health Care in Canada: "(Enable the establishment of) a personal electronic health record for each Canadian that builds upon the work currently underway in provinces and territories."

Lessons learned from other jurisdictions include:

- no comprehensive EHR has yet been implemented;
- strategies to develop EHR can be "revolutionary" or "evolutionary";
- successful implementation requires the involvement of a broad group of health system stakeholders;
- significant changes to clinical and business practices are required; and
- what constitutes an EHR changes as technology evolves and experience is gained.

In June, 2002, the Premier's Technology Council hosted a day long e-Health Roundtable. Participants included some of B.C.'s leading health care providers and health educators. They recommended that the provincial government implement a common electronic health record.

British Columbia is well positioned as many foundation standards or systems are either in place or under development. The development of an EHR is a high priority for the provincial government and there is growing support within the health care community. The recent reduction in the number of health regions (from 52 to 6) aids the amalgamation of systems necessary to kick-start development. Finally, the capping of health care budgets requires creative partnerships to bring an EHR to fruition.

Health authorities and Ministries already have a number of foundation systems and networks, legislation and processes, and collaborative groups that will aid in EHR development. Province-wide systems include:

- SPAN/BC, the shared private network spanning the province and connecting all government ministries, pharmacies, educational institutions and health authorities;
- HNSecure, the Ministries of Health Planning and Health Services' free software that opens the way for doctors, pharmacies and labs to securely exchange data across the Internet;
- Health Registry, records and provides access to individual identification and location information and contains combined data and application standards that define how health providers assign Personal Health Numbers (PHNs);
- Provider Registry, a centralized electronic registry of health care provider data on all licensed service providers;
- PharmaNet, on-line claims adjudication, medication contraindication/interaction and longitudinal prescription system for pharmacists;
- HL7, a protocol for electronic data exchange between different health information systems covering areas such as admission, discharge, transfer information, order entry and results reporting, scheduling and referrals;

- ICD 10, an international classification of diseases; and
- ISO 17799, a security management standard for health information.

Foundation legislation and processes include:

- Provincial Freedom of Information and Protection of Privacy legislation (harmonized with federal privacy legislation);
- Data access agreements; and
- Privacy impact assessments for all applications involving personal health information.

Collaborative groups, in addition to the Health CIO Council, the Western Health Information Collaborative and Canada Health Infoway Inc., include:

- BC Health Information Standards Council
- Electronic Health Record Working Group
- Privacy and Security Working Group
- Telehealth Working Group
- Primary Care Working Group
- Medical Practitioners Working Group
- Technical Liaison Committee with the British Columbia Medical Association
- Consent and Access Codes of Practice (a collaborative model adopted to tackle consent and wide-area access that builds on ISO 17799)

Success in building an EHR requires Ministries and health authorities to build on the substantial foundation already constructed in systems and standards, legislation and mutual groups. Success also requires a common strategic (or tactical) direction, hard decisions about priorities and the coordination of activities. This Framework provides the basis for all three. The resources required to meet the expectations laid out in this Framework need to be found within existing health care budgets or from national funding sources.

Tactical Direction

British Columbia's tactical direction for the development of an EHR is based on nine principles. These principles complement each other and, taken together, provide a common strategic pathway to the future. Progress towards a comprehensive EHR will take time. When the foundation pieces are in place and key applications built, the critical mass necessary to show visible results will emerge.

Evolutionary

The province will use an incremental approach. By taking relatively small steps through a series of building block projects, risks will be minimized. This will make the project easier to manage and simpler to implement. Further, it will provide more options for contingencies and accommodate fast moving changes in technology. This approach also reflects financial realities and the ability of the health system to accommodate change. It will invest in parts of the EHR that have been evaluated and validated and integrate lessons learned as it proceeds.

Building block projects are the fundamental components, or pieces, of an EHR. There are twenty-one building block projects.

The approach will be divided into three phases. The first phase, spanning eighteen months, will concentrate on securing early wins. The second and third phases will consolidate the gains made in phase one and provide capacity and functionality.

Guided by Common Priorities

The Framework ranks initiatives and sets priorities in order to focus limited resources on key building block projects.

Collaborative

Collaboration with caregivers, professional colleges, educational institutions, other jurisdictions and the private sector is critical. The value of cross-authority partnerships is equally important. Health authorities and the Ministries intend to share resources and skills while concentrating on their core competencies. They will respect each other's program priorities. To ensure a coordinated approach, existing working groups that impact the development of an EHR will be brought under the Health CIO Council.

Based on Replicating Solutions

Collaboration across regional and provincial domains will yield results. Lessons learned in one health authority will be shared. Inter-jurisdictional groups like the Western Health Information Collaborative also foster the development of common solutions. Health authorities and the Ministries will leverage partnerships to federate solutions for all. This approach has already been used to great success with the Provider Registry.

Constructed on the Basis of a Convergence Strategy

An overall federated architecture between the health authorities and the Ministries will be considered. This will allow each agency the flexibility to work together through mechanisms such as mirrored clinical information, update or notification functions. Health authorities and Ministries can position their specific approaches within a common framework and determine which functions are internal to their local EHR alongside those that are external, or provincial, in scope. They can, as well, determine how their architectures will need to be similar in order to support networking.

Developed with Service-Oriented Architecture

The approach moves away from vertical application architecture to service-oriented systems architecture. A service-oriented architecture enables systems to be assembled from loosely coupled components; it stresses interoperability of components, dynamic discovery and binding of components. It is more scalable and highly configurable.

Rooted in a Standards-Based Approach

The approach is based on internationally recognized data and technology standards that enable systems interoperability and data transparency. The strategy must also be able to adapt to emerging standards.

Able to Use Common Tools

Common project management tools and templates will be used for all building block projects allowing for common reporting protocols, change and risk management approaches, and business case development.

Transparent

All projects stemming from this Framework will be managed in an open, transparent manner. A vibrant and free flow of information between health authorities and Ministries is welcomed. The Health CIO Council's website will be a key communication tool.

Functional Requirements

An EHR must be capable of supporting many different patient/caregiver relationships. The following are a few of these relationships:

- Long-term relationships of ongoing care where, for example, a family practitioner has a good understanding of patient history. Longitudinal health records are maintained typically in paper form and contain information provided by the practitioner, and by external sources such as labs, specialists and hospitals.

- Episodic relationships developed through periodic care by specialists and surgeons. In a hospital, this information is frequently maintained electronically. In specialists' offices it is usually kept in paper form and includes data provided by the referring caregiver and information related by the patient.

- Transitory relationships in hospital emergency departments where knowledge of a patient's history is limited. Caregivers here typically have little or no historical information about the patient. Most hospital emergency departments have access to their own hospital Electronic Patient Record (EPR), which in some cases may contain historical information on the patient. Most have access to PharmaNet.

The functional elements of an EHR include the following:

- easy, secure sign-on, supported by two-factor authentication, where necessary;
- highly visible flagging of patient-related alerts;

- core patient data, including demographics, allergies, immunizations, current medications, care providers, family history and consent and health encounter history; a list of health care encounters over time, summary information and also the ability to drill down for more information on each encounter (e.g., consultation notes, operation reports, medications, diagnostic test results, discharge summaries);
- longitudinal flowcharting of lab results and other values over time, showing related events such as the administration of medications;
- ordering, including lab tests, digital imaging, medications;
- clinical decision support tightly integrated with ordering, such that the clinical decision support rules can reason across the patient's entire longitudinal health record; and
- links to Internet medical references specific to the patient's condition.

Building Blocks

Each building block project of the EHR will be managed in a consistent fashion. Every project will:

- include full disclosure of project plans;
- outline a clear governance plan;
- contain a strong focus on change management;
- be prefaced by a communications plan to inform all stakeholders; and
- be evaluated and the evaluation published.

The number of building blocks, twenty-one in all, underlines the complexity and scope of the EHR. The building blocks are the fundamental components, or pieces, of a composite EHR (see Figure 1 – Electronic Health Record Building Blocks).

Figure 1 – Electronic Health Record Building Blocks

Network	**Client Registry Services**	**Provider Registry Services**
Location Registry Services	**Provincial Authentication Services**	**HA Clinical Systems**
Consent Service	**Medication Profile**	**Clinical Documentation**
Community Health Information Systems	**Clinical Decision Support**	**Telehealth Integration**
EMS Primary Health Care	**Lab Results**	**Automated Standardized Order Entry**
Electronic Access to Diagnostic Images	**Integration Services**	**Physician Medical Office Information System**
Citizen Access to their health information	**Document Management Capability**	**Clinical Event Broker**

In Progress and Planned Initiatives

Considerable work is underway, or planned, in many of the building block areas. Chart 1 – EHR Building Blocks in Progress and Planned, illustrates the extent of "in progress" (this year) and "planned" (2003-4) activity in each building block area. Projects are further categorized into phase one, two and three.

Chart 1 - EHR Building Blocks in Progress and Planned

✔ in progress (2002-3) ✔ planned (2003-4)

Phase One | Phase Two | Phase Three

Building Blocks	Vancouver Island Health Authority	Provincial Health Services Authority	Fraser Health Authority	Vancouver Coastal Health Authority	Interior Health Authority	Northern Health Authority	Ministry of Health Services
Network	✔	✔	✔	✔ ✔	✔	✔	✔ ✔
Client Registry Service	✔	✔	✔	✔ ✔	✔ ✔	✔	✔ ✔
Provider Registry Service	✔	✔	✔	✔ ✔	✔	✔	✔ ✔
HA Clinical Systems	✔	✔	✔	✔ ✔	✔	✔	✔ ✔
Medication Profile	✔	✔	✔	✔	✔ ✔	✔	✔ ✔
Lab Results	✔	✔	✔	✔	✔	✔	✔
Integration Services	✔	✔	✔	✔ ✔	✔	✔	✔ ✔
Provincial Authentication Services	✔	✔	✔	✔ ✔	✔	✔	✔
Consent Service	✔	✔	✔	✔ ✔	✔ ✔	✔ ✔	✔ ✔
Clinical Documentation	✔	✔	✔	✔	✔ ✔	✔ ✔	✔
EHS Primary Health Care							✔
Automated Standardized Order Entry	✔	✔	✔	✔ ✔	✔ ✔	✔	
Electronic Access to Diagnostic Images	✔	✔	✔	✔ ✔	✔ ✔	✔	✔ ✔
Physician Medical Office Information System	✔	✔	✔	✔	✔ ✔	✔	✔ ✔
Document Management Capability	✔	✔	✔ ✔	✔ ✔	✔	✔	
Clinical Event Broker		✔	✔	✔	✔		
Location Registry Service			✔		✔		✔
Community Health Information Systems	✔		✔	✔ ✔	✔ ✔	✔	✔
Clinical Decision Support	✔	✔	✔	✔		✔	✔
Telehealth Integration	✔	✔	✔	✔ ✔	✔	✔ ✔	
Citizen Access to their Health Information	✔	✔	✔	✔	✔	✔	✔ ✔

Health Authority Profiles

The significant amount of work that is planned or underway in each specific health authority in the building block areas is further delineated in Chart 2 – EHR Building Blocks and Progress to Date.

Chart 2 - EHR Building Blocks and Progress to Date

Phase One | Phase Two | Phase Three

VIHA = Vancouver Island Health Authority
FHA = Fraser Health Authority
IHA = Interior Health Authority
PHSA = Provincial Health Services Authority
VCHA = Vancouver Coastal Health Authority
NHA = Northern Health Authority

Network	VIHA	South Island: Regional Network build is in progress, completion by May 2003.	North/Centre Island: Regional Network build is in progress, completion by May 2003.
	PHSA	All sites connected.	
	FHA	All sites connected. Security components being implemented.	
	VCHA	Beginning to define architecture and design for integrated network.	
	IHA	All sites connected. Security components being implemented.	
	NHA	Network integration and expansion will be completed by early 2003.	
Client Registry Service	VIHA	South Island: Active interface to Client Registry Service by early 2003.	
	PHSA	Many sites connected to Client Registry. All sites using PHN as an identifier.	
	FHA	All acute and parts of mental health and continuing care integrated into CPI. Planning of FHA Master Patient Index (MPI) underway.	
	VCHA	Client Registry already in use at many VCHA sites. Will define a customer identity management strategy, and begin implementing initial components.	
	IHA	Integration of all MPIs in progress for E-MPI. This includes acute, mental health, home and community care, residential care. Excludes public health.	
	NHA	Replacement process for new clinical information system underway. A single integrated solution across the NHA is being developed.	

Provider Registry Service	VIHA	South Island: College of Physicians & Surgeons of B.C. in multiple systems.	North/Centre Island: College of Physicians & Surgeons of B.C. in multiple systems.
	PHSA	Implementing authority-wide integration with Provider Registry.	
	FHA	College of Physicians & Surgeons of B.C. installed in clinical systems.	
	VCHA	Early adopter of Provider Registry in early 2003.	
	IHA	Provider Registry standards definition in progress for IHA clinical systems. Links to provincial registry to be determined.	
	NHA	Working with CIO Council / other health authorities.	
HA Clinical Systems	VIHA	South Island: Cerner ADT, Rx, Rad, lab and clinics in most acute sites. OE planned by 2004.	North/Centre Island: Meditech ADT, lab in acute sites. Community, OR LTC planned 2003.
	PHSA	All sites implemented, various levels of clinical systems.	
	FHA	Lab, Rad, Pha, OE, Patient Doc in most acute sites and parts of the community.	
	VCHA	HIS, LIS, RIS, pharmacy, PACS, OR, community and mental health systems implemented to varying degrees across VCHA. Begin filling gaps at certain sites (e.g., RIS for Richmond Hospital), driven by business priorities.	
	IHA	Focus on three clinical systems Initiatives: 1) Integration of existing six regional Meditech Systems (ADT, Lab, Rad, Pha, Patient Care Inquiry, OE, and Patient Doc); 2) home and community care systems implementation; 3) Conversion and roll out of Meditech clinical to non-Meditech sites.	
	NHA	Replacement process for new clinical information system underway. A single integrated solution across the NHA is being developed.	
Medication Profile	VIHA	South Island: Currently building within Cerner, roll-out 2003/04.	North/Centre Island: Remain Eclipsys Legacy for foreseeable future.
	PHSA	All sites have some level of access. PharmaNet integration in progress.	
	FHA	All acute sites with limited access to PharmaNet.	
	VCHA	Implementing PharmaNet access at Vancouver General Hospital Pre-Admission Clinic. Begin implementing expanded PharmaNet access throughout acute and community sites.	
	IHA	All acute sites with limited access to PharmaNet. Acute medication profile will be integrated for IHA.	
	NHA	PharmaNet access is being expanded to all acute facilities.	

Lab Results	VIHA	South Island: Cerner lab results online at all acute sites. Moving out to most community and ambulatory sites by end 2003.	North/Centre Island: Meditech lab results online at all acute sites. Potentially moving out to most community and ambulatory sites by end 2004.
	PHSA	Some sites have complete lab history (internal and external) online. Planned implementation to remaining sites.	
	FHA	Lab results all online at acute sites.	
	VCHA	Piloting PathNET access at Vancouver General Hospital Emergency Department. Begin implementing PathNET access at Emergency Departments across VCHA.	
	IHA	Lab results all online at acute sites.	
	NHA	Interim online access to Lab results is being pursued. The integrated solution is part of the new clinical information system plan.	
Integration Services	VIHA	South Island: Not yet planned.	North/Centre Island: Not yet planned.
	PHSA	Information integrated within branch agencies.	
	FHA	Meditech system integrates across applications. Plan to create FHA integration underway.	
	VCHA	Interface engines support application interfaces at VHHSC and PHC. See CareConnect strategy – www.careconnect.ca.	
	IHA	Meditech Clinical Systems integration Initiative is in progress. Meditech will serve as EHR for IHA.	
	NHA	This project is part of the new clinical systems implementation plan.	
Provincial Authentication Services	VIHA	South Island: Single authentication planned late 2003.	North/Centre Island: Single authentication planned late 2003.
	PHSA	Project implementing single authentication across authority in progress.	
	FHA	Migrating to single authentication for the FHA.	
	VCHA	Piloting common two-factor authentication with PathNET, Telus and Soltrus/VeriSign.	
	IHA	Migrating to single authentication for the IHA.	
	NHA	This project is in the planning process.	
Consent Service	VIHA	South Island: Not yet planned.	North/Centre Island: Not yet planned.
	PHSA	Consent registry based on named relationships planned.	
	FHA		
	VCHA	Implementing common consent processes for access to PathNET and PharmaNet.	
	IHA		
	NHA		

Clinical Documentation	VIHA	South Island: Some pilots, but no substantive plans yet.	North/Centre Island: Not yet planned.
	PHSA	All clinical documentation online at some sites. Planned for remaining sites.	
	FHA	This is mainly being captured through the Meditech documentation modules.	
	VCHA	Captured in each hospital information system. Standardizing nursing documentation etc.	
	IHA	Acute, mental health, and residential care will utilize Meditech for clinical documentation. Nursing documentation is limited in acute and residential services. Community care will utilize a separate clinical documentation system.	
	NHA	This project is part of the new clinical systems implementation plan.	
EMS Primary Health Care	VIHA	South Island: First Primary Health Care implementation planned for late 2003.	North/Centre Island: Will build on South Island implementation in 2004.
	PHSA		
	FHA		
	VCHA	Work with Primary Health Care sites on how VCHA IMIS can support them.	
	IHA	IHA will participate in provincial initiative for EMS development and implementation as part of Primary Health Care.	
	NHA	Working with Primary Health Care Steering Committee and CIO Council.	
Automated Standardized Order Entry	VIHA	South Island: Not yet planned, forecasted for 2004+.	North/Central Island: Not yet planned.
	PHSA	In planning.	
	FHA	Meditech order entry is used in various acute care sites.	
	VCHA	Caregiver order entry (CGOE) implemented at PHC. Will produce overall CGOE strategy by first quarter 2003. Begin implementing CGOE strategy.	
	IHA	Meditech Nursing order entry is used in various acute care sites.	
	NHA	This project is part of the new clinical systems implementation plan.	

Electronic Access to Diagnostic Images	VIHA	South Island: PACS at all acute sites.	North/Central Island: PACS at all acute sites by end 2002.
	PHSA	Authority-wide access using single image management system in progress. System interfaced to many external sources.	
	FHA	Enterprise image management system is being planned. PACS is in the forefront of this project.	
	VCHA	PACS implemented at VGH, UBCH and PHC. Regional diagnostic imaging strategy to be defined by First Quarter 2003. Begin implementing regional diagnostic imaging strategy, covering scheduling, access to images, etc.	
	IHA	Fuji PACS is implemented in parts of IHA. Further rollouts planned post system evaluation.	
	NHA	PGRH is filmless. Plan to further expand PACS services through out the NHA is underway.	
Physician Medical Office Information System	VIHA	South Island: Not yet planned.	North/Central Island: Not yet planned.
	PHSA	Planned integration via clinical broker.	
	FHA	Numerous physicians access the FHA captured patient information via a medical summary application in Meditech.	
	VCHA	Work with Primary Health Care sites on how VCHA IMIS can support them.	
	IHA	Electronic transfer of data from IHA clinical systems to physician medical office systems is being explored. Upgrades for remote access by physicians to IHA EHR are underway.	
	NHA	Fibre optic infrastructure is well underway. Prince George will have 100% access for physician offices by winter 2002. This project will expand to other NHA communities.	
Document Management Capability	VIHA		
	PHSA	All clinical documents available online at some sites. Planned expansion to remaining sites.	
	FHA	Document image capture is used in part of the health records function.	
	VCHA	Transcribed reports automatically loaded into HISs. Various approaches to incorporating external documents – some manually re-entered into HIS.	
	IHA	Evaluating document management technologies to support EHR.	
	NHA	Currently working with Xerox XBS group.	
Clinical Event Broker	VIHA	South Island: Enterprise imaging under assessment early 2003.	
	PHSA	In production for BC Cancer. Integration in progress at remaining sites.	
	FHA		
	VCHA	Future EMPI will probably include clinical encounters/events.	
	IHA	Not required for IHA clinical systems/EHR.	
	NHA	Working with other Health Authorities/CIO Council.	

Location Registry Service	VIHA	South Island: Integrated lookup available.	North/Central Island: Integrated lookup available.
	PHSA	Standardizing code tables across Authority.	
	FHA	Meditech provides an integrated location lookup.	
	VCHA		
	IHA	Location registry standards for IHA are developed. Meditech provides an integrated location lookup.	
	NHA	This project is part of the new clinical systems implementation plan.	
Community Health Information Systems	VIHA	South Island: Cerner Procall scheduling and operational support system 2003/04.	
	PHSA	N/A	
	FHA	Meditech used in certain community care settings.	
	VCHA	In4tek PARIS rollout continues within Vancouver/Richmond.	
	IHA	Implementation of a clinical documentation system, including InterRAI/MDS assessment is in progress. Implementation of continuing care information management system replacement is in progress.	
	NHA	This project is part of the new clinical systems implementation plan.	
Clinical Decision Support	VIHA	South Island: Cerner planned, possibly starting in 2004.	North/Central Island:
	PHSA		
	FHA		
	VCHA	Will produce overall CGOE strategy, including clinical decision support, by 1Q 2003. Begin implementing CGOE/ clinical decision support strategy.	
	IHA	Integration of the Patient Care Inquiry (view to EHR) is underway. This includes remote access from physician offices.	
		Exploring point of care decision support and strategies related to physician order entry.	
	NHA	This project is part of the new clinical systems implementation plan.	
Telehealth Integration	VIHA	South Island: Teleradiology, Telepsychiatry to some sites.	North/Central Island: Teleradiology, Telepsychiatry to some sites.
	PHSA	Extensive use of Telehealth in oncology, pediatrics and psychiatry.	
	FHA	Some telehealth applications with DI and wound management (Webmed).	
	VCHA	Telehealth support for Cranbrook and Terrace.	
	IHA	Some telehealth applications trauma, maternal/child, mental health in place.	
	NHA	Telehealth tactical plan developed.	

Citizen Access to their Health Information	VIHA	
	PHSA	
	FHA	
	VCHA	
	IHA	
	NHA	E-Northernhealth.ca portal project – this project is in the planning stages with input from care-providers.

Priorities

Not everything can be done at once. Taking into account the considerable amount of work already underway in each health authority, the Health CIO Council has established priorities for their joint efforts. The following four factors were used to set priorities for building block projects. Is the project –

- capable of producing early wins (within an 18-month timeframe)?
- critical to the development of an EHR?
- contributing to knowledge development and learning?
- demonstrating health authority collaboration?

(Note: An assumption has been made that funding is in place or funding from other sources, such as Canada Health Infoway Inc., is likely.)

The building block projects were evaluated against the above noted factors. The results are presented in Chart 3 – EHR Building Blocks and Priority Factors.

Chart 3 – EHR Building Blocks and Priority Factors

Building Blocks	Capable of Producing Early Wins Within an 18-month timeframe	Critical to the development of a provincial EHR	Contributes to knowledge development and learning	Demonstrates collaboration
Network	Y	Y	Y	Y
Client Registry Service	Y	Y	Y	Y
Provider Registry Service	Y	Y	Y	Y
HA Clinical Systems	Y	Y	Y	Y
Medication Profile	Y	Y	Y	Y
Lab Results	Y	Y	Y	Y
Integration Services	Y	Y	Y	Y
Provincial Authentication Service	Y	Y	Y	Y
Consent Service	N	Y	Y	Y
Clinical Documentation	N	Y	Y	Y
EMS Primary Health Care	Y	N	Y	Y
Automated Standardized Order Entry	N	Y	Y	Y
Electronic Access to Diagnostic Images	N	Y	Y	Y
Physician Medical Office Information System	N	Y	Y	Y
Document Management Capability	N	Y	Y	Y
Clinical Event Broker	N	Y	Y	Y
Location Registry Service	N	Y	N	Y
Community Health Information Systems	N	Y	Y	N
Clinical Decision Support	N	N	Y	Y
Telehealth Integration	N	N	Y	Y
Citizen Access to their Health Records	N	N	Y	Y

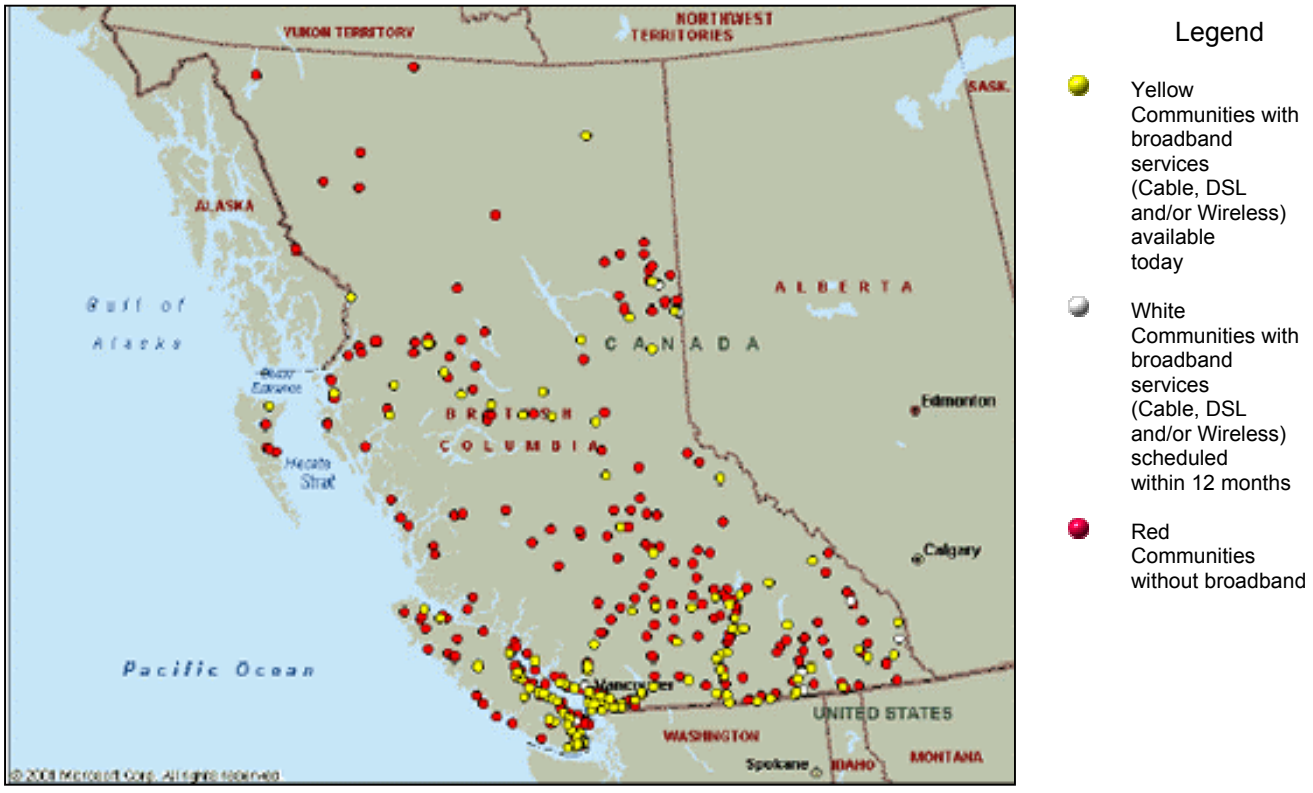
Y = Yes, e.g., the building block is critical to the development to an EHR
N = No, e.g., the building block is not critical to the development of an EHR

This Framework focuses primarily on phase one building block projects: the eight building block projects receiving the highest positive ratings with respect to all four criteria. Phase one includes network, client registry service, provider registry service, health authority clinical systems, medication profile, lab results, integration services and provincial authentication service. A further eight building block projects were ranked as being feasible for development in the second phase (receiving positive ratings in three out of four factors).

Building Block: Network

A robust, secure, harmonized and complete broadband network is a basic building block of an EHR. Such a network would allow for the protected, uninterrupted flow of health care information between caregivers across British Columbia. While the situation is improving many small, isolated, rural communities still lack broadband access (see Figure 2 – Broadband Coverage in British Columbia).

Figure 2 – Broadband Coverage in British Columbia



In addition to access issues, harmonizing existing health networks and ensuring adequate security is also a challenge. The Ministries and health authorities are working together to solve these issues by sharing the workload and/or leading specific projects. Projects that are part of this building block and the associated leads include:

- Extranet Access Management (Ministries of Health Services/Planning)
- Firewall standardization (Interior Health Authority)
- VPN standardization (Interior Health Authority)
- Wireless security (Fraser Health Authority)
- Secure messaging (Provincial Health Services Authority)
- Strong authentication (Vancouver Coastal Health Authority)
- Network project (Ministries of Health Services/Planning)

The Premier's Technology Council in its quarterly reports has identified barriers to broadband access and devised workable strategies to expand broadband across the province – such as aggregating demand, making greater use of SPAN/BC, reforming procurement policies and soliciting innovative ideas through an RFI – to overcome these barriers.

The Northern Health Authority (NHA) is implementing a physician network project that will provide access to care providers across the NHA using local community based high-speed fibre-optic/wireless backbone to connect to acute facilities across the region.

Health authorities need to link major health care sites and increase caregiver access to applications, file, print and email services to complete this fundamental building block.

Building Block: Health Authority Clinical Systems

Health authorities are integrating their existing clinical systems to create a unified electronic patient record or EPR. A unified EPR can act as an authority-wide foundation for an EHR. Authorities are currently implementing migration strategies for authority-wide master patient indexes, patient documentation, physician portals, and medical summaries. The current mix of health authorities' legacy systems underlines the complexity of this task.

The Fraser Health Authority is integrating electronic patient records across the three former regions that make up the new authority. The project includes a single authority-wide master patient index, an integrated clinical system, patient documentation, order entry, nursing documentation, medical summary and physician portal.

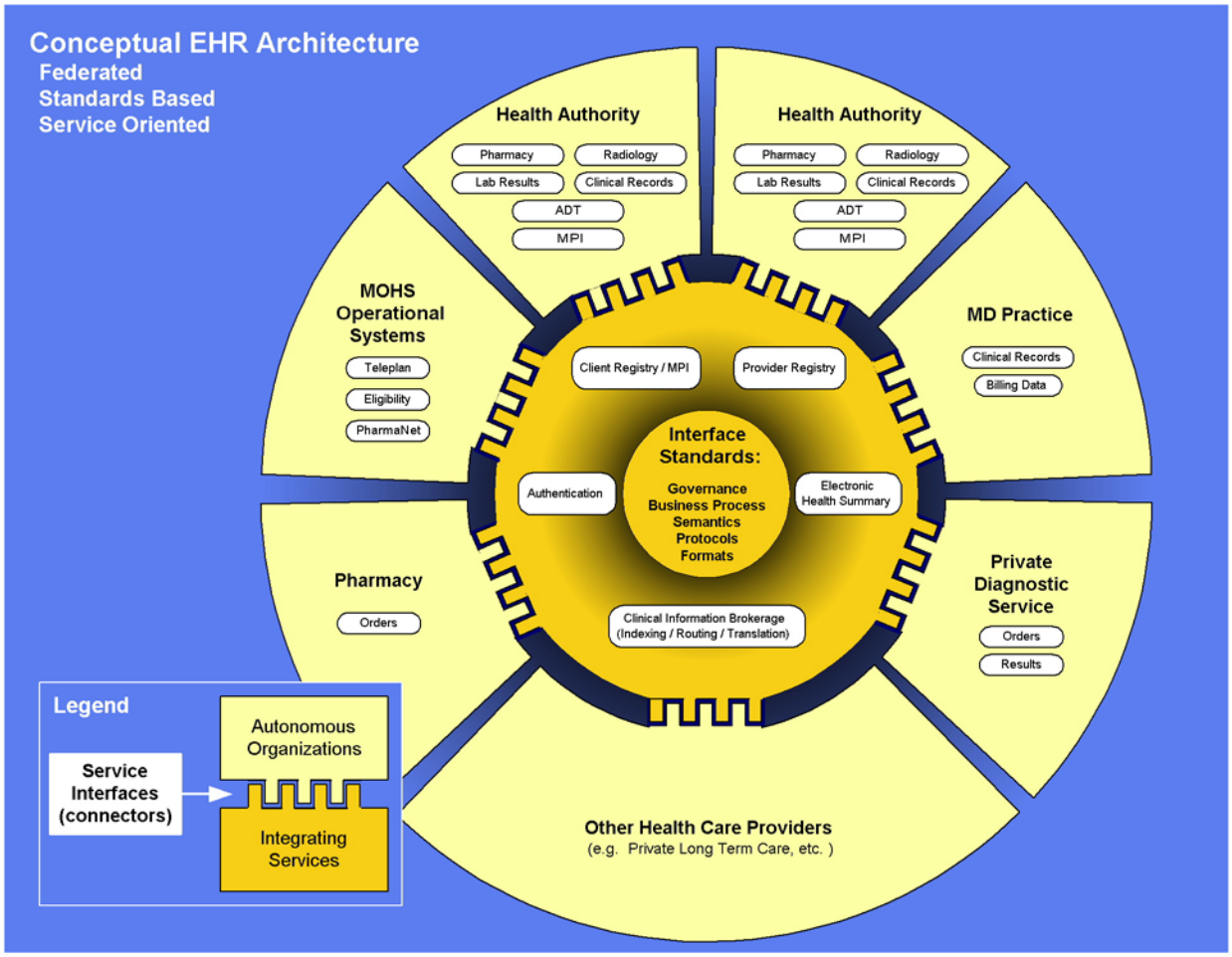
The Vancouver Coastal Health Authority is using an active and replicated data integration approach. The CareConnect project will further integrate the authority's information assets by providing caregivers with improved access to clinical information and making it easier to access data in an integrated way as well as enabling off-site access to information. The project will use active and replicated data integration but will also use standard-based visual integration (HL7 CCOW) as an "integrator of integrators" for caregiver access.

The Provincial Health Services Authority Cancer Agency Information System (CAIS) is a tightly integrated set of clinical applications that support the delivery of cancer care in British Columbia. This system will provide the basis for this authority's EHR.

Building Block: Integration Services

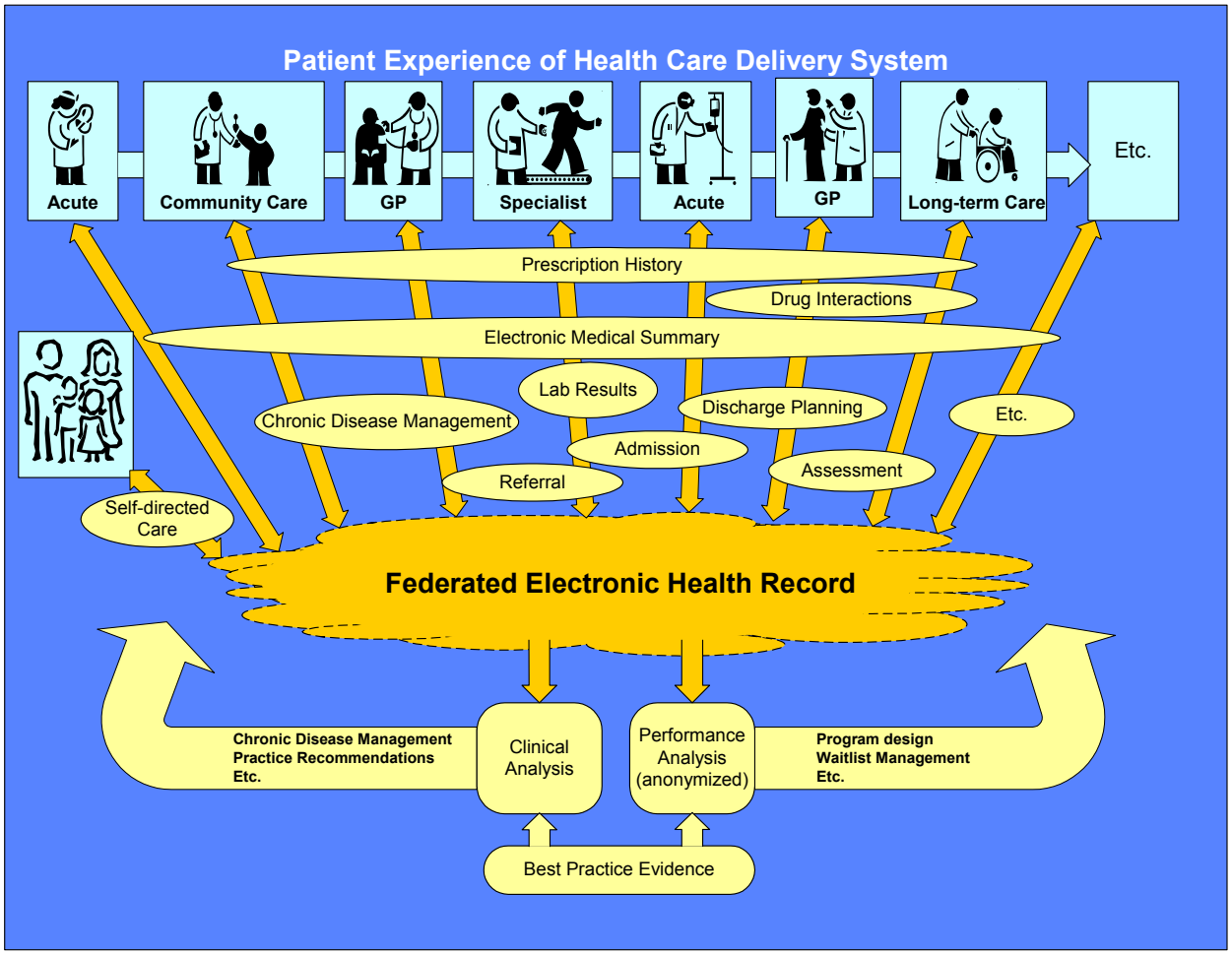
To create a province-wide electronic health record it will be necessary to move beyond each health authority's integration strategy towards an overall federated architecture between all six health authorities and the Ministries. Work has begun on a high-level electronic health record architecture based on the conceptual model outlined in Figure 3. The architecture that is adopted will be open, scalable, secure and reliable. It will be capable of supporting multiple access methods, be organized to support care and be available anytime, anywhere in British Columbia. It will need to be flexible to accommodate different rates of adoption and different base feeder systems in health authorities.

Figure 3 – Conceptual EHR Architecture



Viewed from the perspective of a British Columbian accessing the health care system, the integration of clinical, diagnostic, pharmaceutical and other information through a federated electronic health record will provide critical information at each gateway to the province's health care system. Over time, each acute, general practitioner, specialist and community care provider will be able to access information across health authority borders to support a person's care.

Figure 4 – Individual View of Electronic Health Record



Integration services require basic infrastructure services to allow them to function as a fledgling EHR. Two are included in phase one: Client Registry Service and Provider Registry Service. For an EHR you need to accurately and consistently identify who is the patient and who provided the care.

Building Block: Client Registry Service

A client registry service enables the accurate, consistent, unique identification of clients. It includes client identifiers, master patient indices to address multiple identifiers, standards for messaging, authentication, matching data and links to local and regional registries. British Columbia has extensive operational experience with client registries and the challenges of implementing standards for a single province-wide identifier. This experience includes integrating health eligibility information with vital statistics and with patient information in operational systems using web interfaces, bulk data matching and operational application interfaces.

British Columbia proposes to develop the next generation client registry by harmonizing client and provider registries to set the stage for integrating other potential building block registries. Underlying this approach will be a client linkage strategy (enterprise master person index), paralleling and building on the Provider Registry approach and protecting existing investments in clinical information systems. Harmonization will include tool kits for collaboration: need analysis, testing, application code, business models, data technology structures and national health standards, including HL7.

Building Block: Provider Registry Service

Enhancement and further implementation of the provider registry, which contains a centralized electronic registry of health care provider data on all licensed service providers, is another building block. The registry facilitates the transmittal of health information between organizations and authorized providers. It supports the electronic transmittal of patient information by identifying the source of information and caregivers who are able to access it. This is a western provinces and territories initiative led by British Columbia. Implementation of phase one was completed in October 2003.

The registry will be designed and built once but have the potential to be replicated by another province or territory, and even expanded as a model for national data standards. Each participating province – British Columbia, Alberta, Saskatchewan and Manitoba – will implement their own provider registry within their existing technical infrastructure, initially populating it with data from their respective colleges. Through direct linkages with practitioner colleges and associations, the registry will be regularly updated.

British Columbia is proposing to proceed to phase two of the provider registry project. This phase would include HL7 messaging standards (currently XML) and would allow for the deployment of health care settings across Canada and increase interoperability. Phase two would also add more health care providers, covering a wider spectrum of care, and include additional provider credentials.

Building Block: Provincial Authentication Service

Technologies for verifying user identity and for sending information in encoded formats readable only by intended recipients will be key in the construction of an EHR. They will work hand-in-hand with the Provider Registry to correctly identify the creator of a record and caregivers who access the record, thereby increasing the security of personal health information held in electronic form. A provincial authentication service would utilize technologies such as digital signatures, encryption and standard protocols for transmission of information over the Internet to control creation, modification and access to electronic health records.

Building Block: Medication Profile

This phase one building block project leverages B.C.'s strategic investment in PharmaNet by expanding caregiver access to hospitals, pre-admission clinics and physician's offices in primary care practices. The two main sources of medication data (PharmaNet and hospital-based systems) will be integrated to create a comprehensive medication profile.

PharmaNet and the order entry component and functions of Alberta Pharmacy Information Network Order Entry system will be combined to allow:

- electronic prescription creation by authorized health care professionals;
- tracking of patients through the system;
- initiation of alerts through the system;
- guidelines for choosing appropriate therapies;
- electronic retrieval of prescriptions by pharmacists; and
- connections to other information exchanges such as lab tests and results, diagnosis/discharge information as well as provider and client registry services.

Building Block: Lab Results

Laboratory information is a vital element of diagnosis, intervention, treatment and ongoing care. The first step to integrating laboratory information into an EHR is the adoption of a lab test standard by health authorities. The exchange of data between caregivers is accomplished through messaging—the rules that allow different health care software applications to speak to each other. The BC Lab Test Standard defines the business and technical requirements for the electronic exchange of lab test data. The standard goes beyond the traditional point-to-point exchange of information to include **all** exchanges from the time an order is issued to the final result. The standard is currently used by the BC Centre for Disease Control, BC Cancer Agency and by PathNet, a private sector initiative to deliver lab results from private community labs electronically to physician offices. Widening the implementation of this standard in all health authorities is a phase one goal.

The standard has the potential to be nationally adopted and is the first step in sharing laboratory test data.

(Note: Through the Western Health Information Collaborative, four provinces are ready to collaborate on designing and developing standards-based order and results repositories and

linking these repositories with clinical data, public health repositories and eventually the EHR. They are currently establishing a common vision, business model and business case.)

Building Blocks: Phase Two

This Framework focuses primarily on phase one building block projects. Using the priority factors noted earlier the following eight building block projects were ranked as being feasible for development in the second phase (receiving positive ratings in three out of four factors):

- Physician Medical Office Information Systems
- Clinical Documentation
- Electronic Access to Diagnostic Images
- Clinical Event Registry
- Automated, Standardized Order Entry
- Document Management Capability
- Consent Service
- Primary Health Care Electronic Medical Summaries

What differentiates the eight second phase projects from the first eight is that there is not currently the same capacity for early wins within an 18-month timeframe. All sixteen building blocks are, however, critical to the development of an EHR and will contribute to knowledge development and demonstrate health authority collaboration.

Reporting

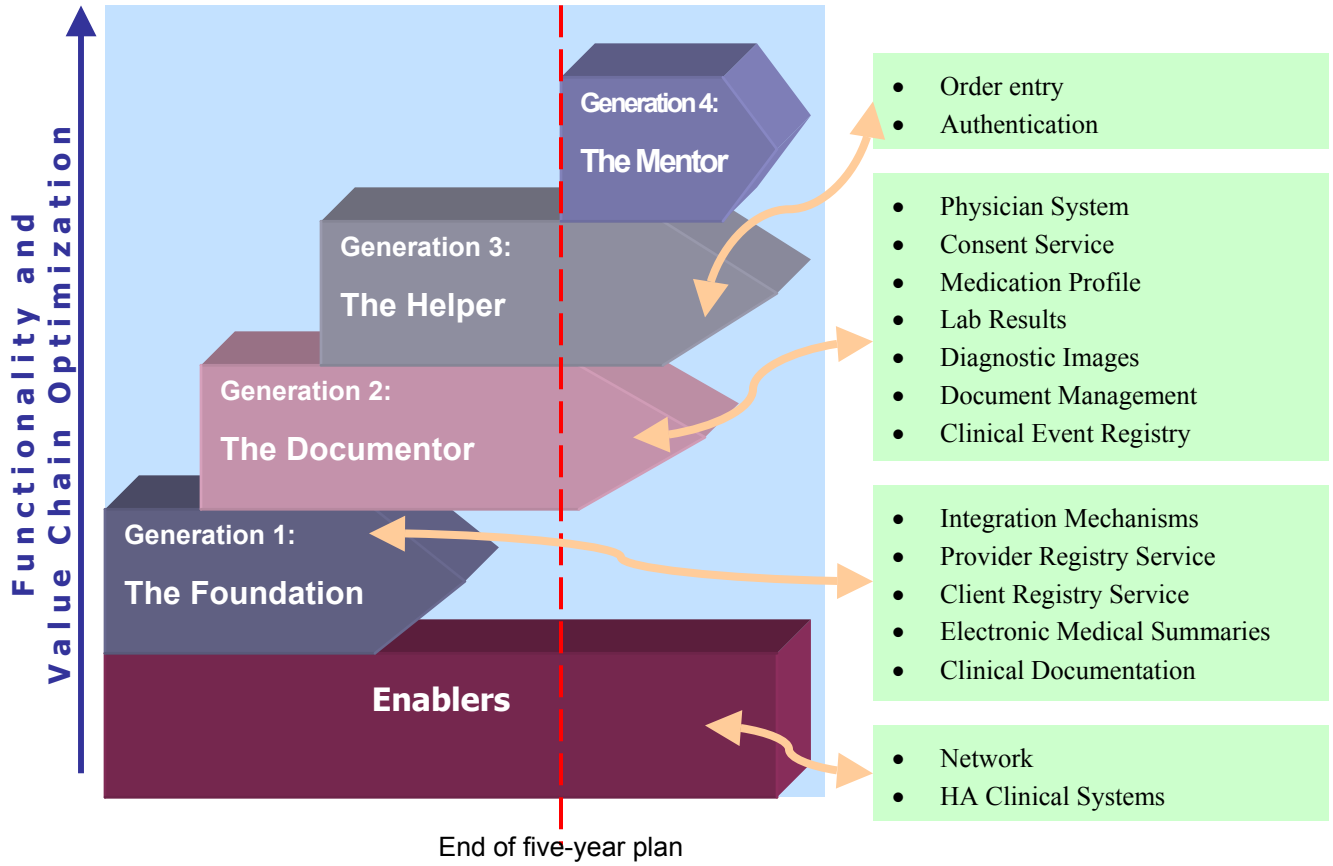
Members of the Health CIO Council will report periodically through the CIO website on their progress in each of the major building block areas. A comprehensive report on phase one projects is scheduled for June 2004 to mark the eighteen-month anniversary of this Framework and the completion of the first phase of construction.

Links to Pan-Canadian Efforts

As British Columbia builds its EHR, it will continue to leverage its partnerships with the four western provinces through WHIC and contribute to pan-Canadian efforts through Canada Health Infoway Inc.

To illustrate the fit between the B.C. building block approach and the CHI Inc. approach to the EHR, B.C.'s sixteen phase one and phase two projects have been mapped against the CHI Inc. Business Plan model (see Figure 5 – CHI and B.C. Building Blocks). B.C.'s solution will contribute to national progress in three of the four CHI Inc. generations (Foundation, Helper, and Documentor).

Figure 5 – CHI and B.C. Building Blocks



Conclusion

This tactical framework outlined a common strategic direction for British Columbia's EHR. It set priorities for future action and demonstrated the alliances formed to realize the EHR vision.

The Health CIO Council believes this Framework provides a concrete plan for achieving goal one of their Strategic Plan, the sharing of caregiver information. By focusing on information technology this framework provides for one aspect of the major changes required to implement an EHR. It represents the first step in a complex, evolutionary journey that must eventually include cultural, attitudinal and business practices changes. In eighteen months, after the completion of phase one, the Health CIO Council will report its progress on constructing the first major building blocks to support a lifetime health record for each British Columbian.

Glossary

Term	Explanation
Active Data Integration	A process where all clinical systems store their data in the same database.
Architecture	1. In reference to computers, software or networks, the overall design of a computing system and the logical and physical interrelationships between its components. The architecture specifies the hardware, software, access methods and protocols used throughout the system. 2. A framework and set of guidelines to build new systems. IT architecture is a series of principles, guidelines or rules used by an enterprise to direct the process of acquiring, building, modifying and interfacing IT resources throughout the enterprise. These resources can include equipment, software, communications, development methodologies, modeling tools and organizational structures.
Authentication	The processes of requesting user names, passwords and other unique identifiers to ensure only authorized users have access to a system.
CHI Inc. or Canada Health Infoway Inc.	CHI Inc. or Canada Health Infoway Inc. is a non-profit corporation created at the national level and endowed with $500 million in federal funding. The corporation's primary focus is accelerating the development of electronic health information systems for Canadians.
CIO	Chief Information Officer – CIO The person responsible for planning, choosing, buying and installing an organization's computer and information-processing operation. CIOs develop the information technology (IT) vision for the organization. They oversee the development of corporate standards, technology architecture, technology evaluation and transfer; sponsor the business

	technology planning process; manage client relations; align IT with the business; and develop IT financial management systems. They also oversee plans to reinvest in the IT infrastructure, as well as in business and technology professionals. They are responsible for leading the development of an IT governance framework that will define the working relationships and sharing of IT components among various IT groups within the organization.
Clinical Event Broker	Enables processes and information that are unaware of each other, to be linked based on topic or content of a clinical event.
Digital Imaging or DIACOM	Digital Imaging and Communication in Medicine – a protocol for the transmission of medical images and ancillary information. Supports a wide range of medical images across the fields of radiology, cardiology and pathology.
EHR	An Electronic Health Record (EHR) provides each British Columbian with a secure and private lifetime record of their key health history and care within the health system. The record is available electronically to authorized health care providers and the individual anywhere, anytime, in support of high-quality care.
Extranet	A private network that uses the Internet to securely share part of an organization's or business's information or operation with other organizations, partners, suppliers, vendors or customers.
Facility	A data standard where "facility" is defined as a combination of physical, financial and/or human resources that are used to receive or provide health-related services.

Firewall	A set of related programs located at a network gateway server that protects the resources of a private network from users from other networks. It prevents outsiders accessing private data.
Health Authorities	The six health authorities (Vancouver Coastal, Interior, Fraser, North, Vancouver Island and the Provincial Health Services) that are responsible for the health services provided within their respective areas.
Health CIO Council	A council composed of the Chief Information Officers of the six health authorities and the CIO of the Ministries of Health Planning and Health Services.
HL7	A protocol for electronic data exchange between different health information systems covering such areas as admission, discharge, transfer information, order entry and results reporting, scheduling and referrals.
Infostructure	A multitude of information system components being developed at local, regional, provincial/territorial, national and even international levels. In order for information to be shared between these systems and to ensure that our data are reliable and comparable no matter when or where they are collected, consistent data and technical standards are required.

IM	Information Management – the discipline that analyzes information as an organizational resource. It covers the definitions, uses, values and distribution of all data and information within an organization whether processed by computer or not. It evaluates the kinds of data/ information an organization requires in order to function and progress effectively.
Interoperable	The capacity that ensures heterogeneous solutions and systems are compatible via common standards and interfaces
IT	Information Technology – the common term for the entire spectrum of technologies for information processing, including software, hardware, communications technologies and related services.
PHN	Personal Health Number is the unique identifier that is used by the British Columbia health system.
Privacy	The right of individuals to determine when, how, and to what extent information about themselves is shared with others.
Premier's Technology Council	The Premier's Technology Council (PTC) is composed of leading members of the B.C. technology community and academia. The PTC's mandate is to provide advice to the Premier on all technology-related issues facing British Columbia and its citizens.
Provider Registry	The Provider Registry is a standards-based repository of core provider data that is supplied by regulatory or recognized health care organizations and made available to authorized consumers to facilitate the authorized exchange of health information. The provider registry is currently under development.

Replicated Data Integration	A process whereby clinical systems replicate data into an integrated clinical data repository.
Telehealth	The uses of communications and information technology to deliver health services and transmit health information over both long and short distances. Teleradiology is using this capacity for radiology services. Telepsychiatry is using this capacity for psychiatric services.
VPN or Virtual Private Network	VPN or Virtual Private Network uses the Internet to provide remote offices or individual users with secure access to their organization's network.
WHIC	WHIC or Western Health Information Collaborative is a group of jurisdictions that have agreed to collaborate on health information infrastructure initiatives to reduce the overall cost to the public. The jurisdictions include Manitoba, Saskatchewan, Alberta, British Columbia, the Northwest Territories, Nunavut and the Yukon.
Wireless	A term used to describe telecommunications in which electromagnetic waves (rather than some form of wire) carry a signal over all or part of the communication path.