advancing Canada’s next generation of healthcare
Foreword


This is the future of health care in Canada. Since 2001, Canada Health Infoway, along with its partners, has been working to deliver a safer and more efficient healthcare system through electronic health records (EHR). Considerable progress has been achieved since Infoway’s inception and promising advances are on the horizon. But Infoway’s funding is limited. Clearly, more needs to be done to provide a healthcare infostructure across all points of care.

Recognizing this, Infoway’s Board asked the organization to develop a comprehensive health IT strategy for Canada to guide further investment over the next 10 years. As part of this process, McKinsey & Company was commissioned to provide an independent fact-based analysis as an input to the development of the plan. More than 100 stakeholders from across Canada and from all areas of the healthcare sector were consulted. McKinsey heard from deputy ministers and health region executives, hospital CEOs and CIOs, clinicians, patients, health associations and government agencies.

What emerged as a result of this process was a comprehensive strategy – a vision – to guide the next 10 years of investment in healthcare information systems and identify areas benefiting from a pan-Canadian approach.

2015: Advancing the Next Generation of Health Care in Canada summarizes the key findings and conclusions from the strategic planning effort. More importantly, it serves as a roadmap for advancing Canada’s healthcare infostructure and forms the strategic framework to guide Infoway’s investments and priorities in the years ahead.
Introduction

Healthcare delivery in Canada is a large and diffuse operation. It involves numerous people and points of care – almost 400,000 general practitioners, local pharmacists, and nurses; more than 700 hospitals; and numerous community care centres.

These stakeholders increasingly recognize that successfully delivering care across all these settings requires managing not only the patient and expenditure flows but also the critical health information flow. And like all other $100-billion-plus enterprises, Canada’s healthcare system needs to operate with a strong information infrastructure to help ensure the delivery of quality care and to effectively manage the system’s performance through adequate oversight.

Looking at only one aspect of the system – the more than one billion appointments and tests requisitioned and tracked primarily through manual processes today – it is readily apparent that our healthcare system needs a new approach to help lower costs, speed up access, and lessen the incidence of inappropriate decisions stemming from a lack of “available” information.

In addition to the system’s “operators” and “managers,” patients and the public are increasingly demanding more information and support to help them navigate the system and, in many cases, to more proactively manage their own care. They expect more personalized care, better access to specialists and GPs, and more transparency on the status of their health and treatment plans – all of which would be facilitated by an information infrastructure.

In the future, the need to coordinate and manage information will become more crucial as:

- **Patient consumerism continues** to raise demand for transparency and timely delivery of health care, more self-care options, and alternative service delivery options (e.g., tailored solutions 24/7 at convenient locations, such as in the home).

- Canada’s aging population and Canadians’ health status drive an **increased incidence of chronic diseases** (e.g., diabetes) and an **increased need for ongoing cancer care**. By their nature, these types of conditions require managing a patient through many different care settings for extended periods of time, rather than just through “traditional” acute care interventions.

- **The shortage of general practitioners** creates a more sporadic pattern of care across multiple channels (e.g., walk-in clinics, acute care emergency settings, specialists) in which the system can no longer rely on the GP as a single point of integration to generate and manage a holistic view of the patient over time.
Care settings continue to **shift from acute to home care and other alternatives**, particularly for more complex and information-dependent treatment decisions such as chronic disease management. This will require further coordination across centres that traditionally lack information technology capabilities and the ability to request support as well as review the quality of care delivered.

**The rising costs of health care and continued funding and human resources constraints** demand significantly higher levels of performance management by the system to drive improvement and to ensure its sustainability.

“We’re not in the healthcare business; we’re in the information management business. We should start thinking as information managers dealing with healthcare information, and think about the tools we need to do it properly.”

– Health Region CEO

In light of these pressures, the stakeholders – deputy ministers, regional CEOs and CIOs, key hospital CEOs and CIOs, as well as physicians and nurses – strongly expressed their belief in building a **standardized electronic health record (EHR)** for patients. The electronic health record, containing **critical health information** and **linked across sources of care delivery within a jurisdiction**, is paramount to delivering healthcare today and in the future. They also believe that, while not sufficient, the electronic health record represents an important enabler for achieving the longer-term goals of:

- Delivering superior quality care across the system through timely access to accurate information and improved decision-making support
- Enhancing ongoing disease management for chronic and longer-term care by facilitating systematic follow-up, a higher level of patient involvement and education, and more guideline-compliant treatment
- Providing critical elements of the information required to manage wait times and improve patient access by triaging patients and scheduling according to urgency across the entire domain of qualified providers
- Ensuring the system’s long-term sustainability through enhanced performance management of cost, quality and access, as well as management of critical resources
- Enabling patient self-care and remote care
- Controlling system risks to the population from pandemics or other health issues.

These managers and providers also consistently believe that Canada, for the most part, is on the right path; that significant value has accrued from developing elements of the electronic health record solution at a pan-Canadian level; and that progress has been made in key areas (e.g., standards setting).
However, they have expressed concerns about a number of barriers that need to be overcome to achieve the vision and realize the full value of the health infostructure. These barriers are:

- Inconsistent and sometimes insufficient commitments over time by federal and some provincial jurisdictions to fund the completion of the health infostructure
- The lack of a truly compelling “story” (for politicians, physicians, and the public) about the urgent and crucial need to build the health infostructure
- The inability to fully illustrate the impact (although all believe the benefits are there) and provide proven case studies
- The challenges of driving implementation and user uptake, including redesigning basic processes to unlock the full value of the system investment and providing the resources to ensure successful implementation and change management.

Within this context, the Infoway effort has sought to develop a vision for a longer-term health infostructure for Canada that puts the creation of an electronic health record infostructure within the context of the broader health system demands and to identify the critical areas within that strategy where the continued development of a pan-Canadian approach may make sense.

Accordingly, the remainder of this document:

1 **Presents** a summary of the progress Canada has made in achieving its original objectives in developing a common health infostructure

2 **Sets a vision** for the integrated health infostructure required in Canada, based on the current and emerging health business needs

3 **Outlines five priorities** within this broader vision to focus on for 2015.
1. Current State Assessment

“We need this information. We can’t realize our goals without it.”
– Hospital CEO

In 2000, as part of the First Ministers’ Agreement, Canada’s political leaders identified as one of their top healthcare priorities the development of appropriate health information and communications technologies, including an interoperable electronic health record for use within and across jurisdictions. This commitment was subsequently reinforced in the 2003 Accord on Healthcare Renewal and the 2004 10-Year Plan to Strengthen Healthcare.

To address the healthinfostructure priority, the Government of Canada announced in September 2000 that it would “invest $500 million immediately in an independent not-for-profit corporation [Canada Health Infoway] mandated to accelerate the development and adoption of modern systems of information technology, such as electronic patient records, so as to provide better healthcare.” In 2003, an additional $600 million was allocated to Infoway followed by an additional $100 million in 2004 – for a total of $1.2 billion.

The remainder of this chapter describes Infoway’s mandate, approach, progress to date and benefits already accrued, and discusses the need for a next stage of development.

Canada Health Infoway’s Mandate

In 2000, Infoway was given a mandate to build the foundational elements of an interoperable electronic health record infostructure, with the direction to “accelerate the development and adoption of modern systems of health information and to define and promote standards governing the health infostructure to ensure interoperability” (Figure 1). This mandate was reinforced in 2003 with the addition of the $600 million toward the EHR core mission and telehealth. Infoway’s ability to work collaboratively with the jurisdictions was further recognized in 2004 through the $100 million provided for the development of a pan-Canadian public health surveillance system. Over time and with the support of its members, Infoway translated its initial mandate into the core objective of providing electronic health records to 50 per cent of the Canadian population by 2010.

The goal of the pan-Canadian approach is to:

- Ensure the electronic health record elements are built with consistent standards, thereby enabling future interoperability within and across jurisdictions and simplifying the movement of knowledge and people across jurisdictions
- Serve as a catalyst for new infostructure developments and ensure common platform quality across all jurisdictions
- Where possible, encourage cooperation, thereby eliminating redundancy and duplicative efforts in systems design, vendor negotiations, etc.
- Reduce long-term costs and implementation time by leveraging scale and cross-jurisdictional knowledge.
When complete, the electronic health record will facilitate the sharing of key clinical data across the continuum of care while protecting the privacy and confidentiality of the information. It will include patient and provider registries that allow for unique identification of and information on diagnostic images, laboratory test results, medication profiles, hospital clinical reports, immunization history, and infectious disease reports. The electronic health record will be accessible from various points within a jurisdiction – acute care hospitals, ambulatory clinics, community health centres, and physician offices – so that an individual care giver, at a minimum, will be able to view a patient’s record.

This represents a significant step forward. GPs, enabled with a computer, will be able to follow their patients’ care and alert hospital physicians of idiosyncratic patient characteristics. Care givers will be able to access crucial information at any time so that, for example, an emergency room physician will not have to rely on a severely sick patient’s recall of his or her drug regimen. Hospital throughput will be improved as several physicians in a hospital will be able to access a patient’s file and test results (e.g., a diagnostic image) simultaneously, eliminating an important bottleneck. And patients will be able to avoid duplicative tests and will no longer have to provide the details of their medical histories over and over again.

**Distinct Approach**

While Infoway was being formed and funded, many other countries were also recognizing the value in creating a shared electronic health record to exchange information across care settings. Accordingly, two basic architectures emerged: hub-and-spoke repository and point-to-point information exchange.

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**INFOWAY’S GOAL AND INVESTMENT PRIORITIES**

<table>
<thead>
<tr>
<th>Current priorities</th>
<th>Innovation and Adoption – $60 million</th>
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<tbody>
<tr>
<td>Telehealth</td>
<td>Public Health Surveillance – $100 million</td>
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<td>$120 million</td>
<td>$100 million</td>
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<td>Chronic Disease</td>
<td>Cancer</td>
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<td>Primary Care</td>
<td>Patient Safety</td>
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<td>Mental Health</td>
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<td>Laboratory Systems</td>
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<td>Etc.</td>
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<td>Infostructure</td>
<td>$32 million</td>
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**Infoway’s goal**

To have an interoperable electronic health record covering 50 per cent of Canadians by 2010

with

The elements of the solution in place across all jurisdictions

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Figure 1
Canada chose to create a series of **hub-and-spoke repository systems**. They collect and store copies of critical health information in jurisdictionally coordinated repositories. This enables a care giver (if enabled with a computer) to view and access consolidated, timely information easily. The United Kingdom, Norway and the U.S. Department of Veterans Affairs and Kaiser Permanente, a large American healthcare organization, have taken similar approaches.

Australia, Denmark and New Zealand chose a different approach to their architecture — a **point-to-point information exchange system**. Each provider maintains its own database and shares elements of information as requested. As a result, if a doctor wants to see a patient’s complete drug history, he or she makes a request to view the information to all the relevant care givers (e.g., GPs, specialists, acute care settings).

Both approaches have a common objective: to streamline the flow of health information to deliver higher quality care, improve services, and reduce costly errors and redundancies. Typically, the choice of architecture depended on the nature of the existing health infrastructure. For example, countries with a high penetration of electronic medical record (EMR) systems within their general practitioner and specialist populations – such as Denmark – had a natural starting point for developing a decentralized, point-to-point system. Other governments or systems with greater financial control over hospitals and acute care settings, and without a strong existing EMR infrastructure, tended to choose coordinated repositories for key health information.

These two system architectures will likely converge over time. The information exchange system is often much faster to roll out, faces...
significantly less resistance from general practitioners and care givers, and provides savings on administrative costs by eliminating paper transfers. However, it does not have the facility for longer term disease management and quality of care offered by a repository system, nor does it allow for on-demand accessing of integrated patient records.

Consequently, Australia and New Zealand, after starting with an information exchange system, are now investigating moving toward a repository model. Furthermore, Denmark, although celebrating its successes, is beginning a process to add in elements of the repository model for systematic disease management (e.g., a chronic disease registry). However, it is experiencing difficulties because it lacks a common approach and standards within the existing data.

Perhaps the most unique element of Canada’s approach to developing an EHR is the strategic investor role adopted to administer the allocation of the federal investment funds (Figure 2). Infoway’s “gated” approach ties funding to achieving specific implementation milestones. The case for investment is made upfront, and funding is allocated based on the potential for success and conformity with agreed-to standards.

Furthermore, Infoway uses a collaborative, jointly funded, and shared governance model with members including the deputy ministers of health from across the country.

This model offers a number of advantages over traditional funding approaches. It:

- Allows pan-Canadian priority setting in a “depoliticized” environment
- Creates a sense of urgency and competition for funds which can spur planning and investment in the jurisdictions and focuses on delivering value for money
- Facilitates jurisdictional participation in setting a pan-Canadian direction and helps ensure that jurisdictional strategies are aligned with wider priorities
- Helps facilitate coordination around procurement, knowledge sharing, and benefits assessment
- Ensures funding decisions are based on a rigorous assessment of project proposals, risk management approaches, jurisdictional readiness, and connection to overall pan-Canadian objectives, thereby reducing project risks and increasing overall public confidence in the success of these investments
- Sets and enforces clear jurisdictional accountability for delivery and adoption (i.e., release of funds depends on success potential).

Solid Progress to Date

"People who have never talked about an EHR in the past are talking about it now…the dialogue is active.”
– Regional CIO

In line with its mandate, Infoway and Canada have made solid progress toward building the core infrastructure of an interoperable electronic health record.

- By March 31, 2007, Infoway will have approved more than $1 billion, or 85 per cent of its total funding, across all its program areas, even though actual projected expenditures will come later because of the gated funding approach.
- Implementation will be well underway across the country, and while all jurisdictions will have benefited from having at least one element of the infrastructure in place, Canada will be stretched to achieve its goal of providing 50 per cent of Canadians with an interoperable electronic health record infrastructure by 2010. Only three of 13 jurisdictions will have the full interoperable EHR infrastructure in place by the end of 2010 (Figure 3) and managing implementation risks will remain critical.
By 2010, Alberta, Prince Edward Island, and the Northwest Territories (assuming progress continues at its current pace), should be on track to have all elements of the EHR basic infrastructure in place. Implementation in British Columbia and Quebec will likely extend further into 2010. This means that in these jurisdictions, a provider should have the ability to retrieve a unique health record for a patient within his or her region. That record would contain historical drug, lab, diagnostic imaging, some hospital clinical reports, and immunization data – no matter where the information originated. And the patients in these regions would no longer have to remember their drug histories or repeat lost or unavailable tests. Together, these five jurisdictions represent 47 per cent of Canada’s population.

The remaining jurisdictions fall into two groups. Ontario, Newfoundland, Manitoba, and Saskatchewan will require more time and more funding to complete implementation. However, they will be well on track with a number of the core systems, including registries and diagnostic imaging in place by 2010, and will begin to see benefits from these systems. New Brunswick, Nova Scotia, the Yukon, and Nunavut will require significantly more time and resources to complete the electronic health records infrastructure.

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**Figure 3**

### THREE JURISDICTIONS WILL BE COMPLETE BY 2010, BUT ALL WILL HAVE BENEFITED FROM IT INVESTMENT

<table>
<thead>
<tr>
<th>Domain</th>
<th>Jurisdiction</th>
<th>PHS</th>
<th>Client registry</th>
<th>Provider registry</th>
<th>DI</th>
<th>Drug</th>
<th>Lab</th>
<th>iEHR</th>
<th>% of Canadians</th>
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<td>On track to achieve goal but require additional time</td>
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**Goal 2010 (per cent of Canadians):**

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<th>95</th>
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<td>100</td>
<td>61</td>
<td>88</td>
<td>59</td>
<td>40</td>
<td>30</td>
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1 Assumes shared service agreements – NT with Capital Health
2 Is discussing a shared services arrangement with BC and/or AB
3 Assumes 50 per cent of BC’s and QC’s populations will have iEHRs in place by 2010

Source: Infoway; Infoway Jurisdictional Update, March 15, 2006; team analysis
Across all jurisdictions, stakeholders have identified a number of risks that will need to be carefully managed to ensure successful implementation. The availability of funds is often the most obvious, but additional funds alone will not be sufficient to meet the current mandate. Other bottlenecks are critical and potentially pose greater risk. They include the capacity of the system to implement the change given a perceived shortage of skilled healthcare IT workers and change leaders. There is also the need to balance the pace of change impacting the front-line clinicians.

While comparing progress across countries is difficult because systems vary, Canada appears to be on track to achieve its goals at a similar or faster pace than other countries profiled – from launch to full implementation of both diagnostic imaging and laboratory systems. Furthermore, from a cost per capita perspective, Canada will have invested significantly less than Kaiser, Veterans Affairs, and the United Kingdom. However, building out our current infrastructure to a system of comparable functionality – including additional decision support systems, order entry systems, scheduling, and patient portals – will bring the funding more in line with that of these other jurisdictions.

Case Remains Strong with Benefits Beginning to be Visible

As discussed, most stakeholders articulated the case for an interoperable electronic health record as a “cost of doing business” in today’s increasingly information-based, multi-site health delivery environment. This is consistent with the views of the leadership of various other countries and Canadian academic institutions that have demonstrated that the current generation of technology is viable and can be accepted by physicians once an initial learning curve has been mastered.

The Department of Veterans Affairs (VA) initiated a system-wide re-engineering, during which it developed its Veterans Affairs and Technology Architecture (VistA), with an EHR at its core. The EHR operates across all inpatient and outpatient locations. Laboratory, radiology, medication information, as well as physicians’ notes are simultaneously available. VA’s EHR is also the mechanism for optimizing and standardizing clinical practice, providing real-time error checking and clinical decision support, and supporting their preventive medicine programs for chronic disease patients.

VistA has led to significant benefits, notably patient compliance to pre-screening and treatment protocols, which is among the best in the United States. For instance, cholesterol screening following a heart attack is now at 94 per cent, a 10 per cent improvement and the leading rate in the US. These benefits, combined with fewer medical errors, have led to little increase in treatment cost per patient between 1995 and 2004, while the average cost of health care in the rest of the U.S. has risen by 40 per cent.

The EHR has also allowed VA to explore previously unforeseen avenues for care improvements and cost containment.

The EHR implementation has opened the door for second generation applications and benefits we had not thought of before. For instance, we have started to reduce our no-shows at the eye clinic by eight per cent through proactive tracking of patients, or even screening patients at remote locations.

– Clinician at the Roudebush Veteran Affairs Medical Center
While Infoway and the stakeholders have developed a benefits measurement framework, actual implementation and concrete measures are at least 12 to 24 months away. Still, there is a strong and shared belief that the case for implementing an interoperable electronic health record remains strong. For example:

• **Stakeholders perceive real value in building the baseline electronic health record.** The most significant value will come from improved patient care by enabling self-care, improving safety, and reducing drug interactions. They also believe that the EHR infrastructure will improve workflow, speed up patient services, and free up doctors to see more patients. And they expect increased administrative efficiencies through eliminating paper-based systems, lost results, and duplicative testing.

• **Real tangible benefits are emerging.** Other healthcare systems are also beginning to realize benefits. The Veterans Affairs’ VistA system (see sidebar on page 10), arguably the world’s most advanced large-scale EHR implementation, has shown significant improvement in all its prevention and treatment process metrics. And other organizations, such as the Cleveland Clinic, Partners Health, and Johns Hopkins, have conducted studies that consistently confirm the qualitative benefits for patient care.

• **Fraser Health**

Fraser Health has spearheaded physician enablement through the deployment of an integrated digital diagnostic imaging system in 11 hospitals across the health region. The system, using PACS technology, provides physicians with instant on-site and remote access to patient images, including x-rays, MRIs, CTs, etc., and currently processes more than 800,000 images annually.

This technology enables a physician to access patient images even before the patient has a chance to walk out of the exam room. The benefits to a patient’s health management are incalculable.

– Radiation technologist

Thus far, the system has led to significant cost savings and cost avoidance valued at more than $4.5 million, resulting from reduced film costs, increased productivity, and freed-up storage space.
Economic case remains sound.

While no complete economic cases have been fully documented and studied in Canada, preliminary estimates based on successes in similar healthcare environments suggest the business case remains sound. If the current mandate of implementing the basic elements of an electronic health record is achieved, Canada is estimated to be on track to realize $1 billion to $1.9 billion in annual benefits to the system through eliminating duplicative tests and, more importantly, reducing adverse drug events.1 At this rate, the investment will generate positive cumulative returns of nine to 10 years.2 These annual returns are in line with other jurisdictions’ achievements.

That said, the case should not be made on business assumptions alone. The benefits from this upfront investment in the baseline infrastructure have the potential to increase significantly, once the primary care providers are fully enabled (e.g., the integration of the GPs’ electronic medical records). In many instances, this investment will realize much greater benefits in patient self-care, proactive disease management, reduction in wait times and overall performance management. Furthermore, the health infrastructure will likely have much more impact when the front-line business processes are redesigned to capitalize on the investment.

1. Benefits were estimated by identifying economic drivers and triangulating estimates from a number of sources, including Infoway, Booz Allen Hamilton, international case studies, vendors, and the Canadian Medical Association. More information and detailed estimates are available upon request.

2. Payback includes all dollars spent since Infoway’s inception and projected annual maintenance costs and assumes full adoption by practitioners. Payback on the interoperable EHR will vary depending on whether it is deployed to 50 or 100 per cent of Canadians. Summaries of the analysis are available upon request.

netCare Capital Health

Capital Health has become a leader in healthcare with the deployment of its integrated EHR system across all acute care facilities. This EHR system, with more than 6,000 users, provides physicians with the ability to track their patients’ test results and medication histories within the health region, regardless of the location/facility where a given treatment has taken place (i.e., physicians can view patient test results and medication history). In addition, the EHR tracks case information to help improve chronic disease treatment, as well as provide decision support (both synchronous and asynchronous), such as drug-drug interactions and dosage alerts.

The EHR system has led to significant benefits including a 50 per cent reduction in lab requests within 18 months of implementation.

There’s no doubt in my mind, none whatsoever, that today, the medicine I do, the care that I deliver to my patients, is far superior than five years ago…

- Physician

The netCare system was first initiated five years ago as a stand-alone project and eventually developed into a full-fledged EHR system. Looking forward, Capital Health hopes to implement an enterprise-wide EMR.
Yet the Journey is Far from Complete

Despite this strong progress in building the baseline infrastructure, the shared understanding is that the healthcare IT journey is far from over. In particular, the country will need to pursue four initiatives.

1 Complete the baseline electronic health record and extend its functionality and reach. As discussed, although progress will have been made on providing 50 per cent of Canadians with an interoperable electronic health record by 2010, achieving the full goal will be unlikely within this time frame. In addition, the state of the infrastructure by jurisdiction will vary significantly.

Completing the baseline infrastructure will require extending the systems to cover 100 per cent of Canadians and extending and integrating (from view-only functionality) the EHR into the community care settings (e.g., general practitioner and specialist offices). This is where the majority of patient care is delivered today and where the patient expectations for change are greatest.

Completion will further entail extending the functionality to include order entry capabilities and other decision support elements. All stakeholders view these extensions as critical to achieving the desired results of improved quality and access and lower administrative costs.

2 Build a case for ongoing support and secure funding. While an electronic health record is viewed as a critical cost of doing business and a key managerial priority, politicians have not consistently articulated it as a specific policy priority.

3 Bring key stakeholders – the public and front-line practitioners in particular – on board. Long-term success requires building a strong demand for an electronic health record within both the public and the front-line practitioners. To date, the case for change has not been explicitly made or understood by these groups. Furthermore, thoughts on how to provide the information back to patients in an empowering way have been limited.

4 Selectively invest in IT to enable the next level of “business needs.” In addition to the investments required to complete the electronic health record infrastructure, other demands are being made – for example, for more extensive disease management and cancer care systems, enhanced pandemic and public health services, more extensive remote care, and shorter wait times.

The role an electronic health record plays in enabling or enhancing these additional business needs should be stressed and an approach developed to prioritize IT investments.
2. Integrated vision for health infrastructure in Canada

“We have a history of under-investing in healthcare IT in this country. We need to increase our investments so we can deliver the quality and service we aspire to. It’s what it takes to do business properly.”
– Regional CEO

Managing a complex, interdependent $100-billion-plus health business requires managing information flows, as well as patient and resource flows. Without an integrated IT infrastructure, Canada will struggle to meet the increasing demands of all its stakeholders to deliver superior care at a sustainable cost.

While it is difficult to estimate the actual spending on health IT in Canada, given its diffuse nature, estimates suggest that annual spending on building and maintaining the health infrastructure lags that of other countries and other information-intensive sectors. It also varies considerably across Canada – from an estimated low of one to 1.5 per cent of total hospital budget in some parts of Atlantic Canada, to 1.5 to 2.5 per cent of total budget in Ontario hospitals, to a high of four to five per cent in the Calgary Health Region, which has developed and maintains an electronic health record for 6,000 users (Figure 4).

Furthermore, concerns have surfaced that much of the total spending may not be optimal. For example, in jurisdictions without a strong regional infrastructure, the costs of development
and maintenance may be duplicated in many subscale operations across hospitals, doctors’ offices, and other care settings. As well, non-standardized legacy environments, such as the incompatible electronic medical record systems in many physicians’ offices and incompatible hospital clinical systems, require costly custom integration to work with the electronic health record infrastructure. This additional cost could have been avoided with upfront planning, coordination, and investment, which are less challenging than attempting a later integration.

Consequently, stakeholders voiced a strong need to create an integrated plan to guide investments in the future. This plan would need to strike a balance between creating the “ultimate solution,” which runs a high risk of failure, and pursuing a decentralized, incremental approach, which would fall short in delivering the required technical standards and visible progress against goals. At the same time, the integrated plan would require flexibility to manage jurisdictional priorities.

“‐It’s important to have an integrated vision. We haven’t had one in the past, and we’re suffering for it now. We’re spending a lot of money to get our systems talking to each other – we could have avoided this.” – Regional CIO

Emerging Health Infrastructure Vision

With the goal of simplifying the discussion yet creating a comprehensive view, the stakeholders developed an integrated plan to achieve Canada’s health IT vision (Figure 5). The infrastructure can be categorized under three headings:

1. Foundational elements
2. Additional elements

Figure 5

VISION FOR HEALTH IT IN CANADA

Overall business goals:
Better quality and safe patient care
Greater, more consistent access
More efficient use of health system resources

Additional elements

A. Manage health system risks and crises (e.g., pandemics)
B. Improve patient safety
C. Deliver proactive chronic and episodic disease management
D. Facilitate consistent access to patient care with reduced wait times
E. Enable advanced patient self-care and personal health promotion
F. Enable health system performance management to ensure sustainable patient care

Foundation for improving access, quality of care, and system productivity

Complete baseline EHR infrastructure at a jurisdictional health region level (DI, drug, lab, registries, and iEHR) for 100 per cent of Canadians
Integrate primary care settings (EMRs in GP and specialist offices, and community and home care)
Enable advanced order entry and decision support in acute care settings (clinical information systems)
Empower patients to become more active partners in their own care through patient portals

Key enablers

- Common data and communication standards
- Secure systems
- Privacy and consent legislation
- Regulatory harmonization
- Redesigned supporting business processes, including education and training
This integrated IT vision is critical to enabling the system to make significant progress against its three main business goals: 1) continued enhancement of patient safety by eliminating errors caused by misinformation or delayed information and by encouraging greater communication across the continuum of care; 2) greater and more consistent access to health services by streamlining processes and freeing up capacity to reinvest in patient care; and 3) improved overall system sustainability by driving performance management and lowering cost of care.

1. Foundational Elements

While strong progress will have been made on building elements of the baseline EHR infrastructure throughout the country and on providing 50 per cent of Canadians with an interoperable EHR by the end of 2010, achieving the full goal is unlikely. In addition, the state of the EHR infrastructure in the jurisdictions will vary significantly.

Furthermore, completing the foundational infrastructure will require extending and integrating (from view-only functionality) the EHR into regional community care settings (e.g., general practitioners), extending the functionality to include order entry capabilities and other decision-support elements in the acute care settings, and beginning to enable patient self-care.

The foundational next steps include:

- **Completing the baseline electronic health record infrastructure at a jurisdictional level for 100 per cent of Canadians.** This would entail establishing the base systems across the remaining jurisdictions (beyond the five jurisdictions on track for completion by 2010); capturing the key patient information to enable providers to understand care history; and extending the systems to cover Aboriginal Canadians and other federally provided healthcare settings (e.g., the military).

- **Enabling seamless communication across the continuum of care and into community-based settings.** This would include integrating primary care physicians, specialists, and community care facilities (i.e., through EMRs).

- **Extending functionality to include order entry and other decision support elements in acute care settings to support the delivery of high-quality care.** This would help physicians stay on top of an ever-growing flow of medical knowledge by providing patient-specific information, including diagnostic and prognostic details, and particularly therapeutic suggestions and alerts with high sensitivity and specificity (e.g., drug interactions or special efficacy in ethnic groups). In addition, it would include pharmacy systems to improve the execution of drug prescribing and reduce medical errors and adverse drug events.

- **Empowering patients to manage their own care.** Even though this is not necessarily a significant driver of near-term returns to the system, stakeholders believe it is critical to begin now to engage the public and create demand for change. This would start with creating patient portals with self-care tools and basic EHR information where available.

All stakeholders consider these four elements “foundational” and the highest priority as they will:

- **Drive significant benefits to the system** by improving access and service through more coordinated communication and workflows across care settings, enhancing quality through reducing errors and adverse drug events, and making it easier for providers to practice proactive medicine. The foundational elements will also enable managers to control system resources and performance by lowering unit costs (e.g., through reducing films and repeated lab tests), freeing capacity, and making information available that can facilitate greater human resources flexibility and improved overall management.
Create the foundation that enhances the system’s ability to pursue the business needs. While the foundation on its own is not sufficient to address the entire slate of business needs (or always a pre-requisite for making more immediate progress against them), its elements are critical to capturing the full value associated with them. For example, while simple on-line case management tools can help chronically ill patients develop individual care plans, these tools are much more powerful when properly integrated with various systems. This includes integration with drug systems that notify specialists of any potential co-morbidities with drugs prescribed by other physicians, with lab systems that enable all providers to view patients’ latest results, and with GP scheduling systems that alert an office to follow up with patients to support them and ensure compliance.

2. Additional Elements

The six additional elements address key public and provider demands and build on, or are strengthened by, the foundational elements.

They are:

- Ensure health system preparedness to manage public risk. This would involve data warehouses, immunization, vaccine, outbreak and disease surveillance, and alerts as well as workload management tools that help carry out faster, more coordinated responses to potential epidemics.

- Continuously enhance patient safety. This would include the advanced decision support elements in the clinical information systems and the electronic medical record e-prescribing tools described in the foundational elements, the data collection and research analysis tools enabled by the foundational elements, and the monitoring and reporting tools included in the performance management module. Together, these systems would enhance the quality of care and patient safety by reducing errors and adverse drug events through advanced decision support, more standardized treatment protocols, and more active performance management.

- Provide chronic disease management. This would extend the functionality resident within the electronic health record to ensure more proactive treatment and compliance with chronic diseases guidelines; faster, more efficient diagnoses through enhanced decision support systems; optimized treatment outcomes from using more standardized approaches, better screening, and remote care tools; and improved execution of therapeutic plans.

- Facilitate access to patient care with reduced wait times. This would create regional and provincial scheduling systems for online management and booking of care, registries to enable prioritization, increased 24/7 care through telehealth and online channels, logistical systems in acute care settings, and access to GPs and specialists to streamline referral processes.

- Enable patient self-care and personal health promotion. This would address the increasing need for patients to proactively manage their own health. Patients would move from passive care recipients to drivers of care provision. They would have access to advanced self-monitoring and self-treatments, including advanced telehealth applications, and would be able to track their own progress and educate themselves.

- Ensure sustainability of the healthcare system through superior performance management. This would include the key infrastructure to track process and outcome metrics (cost, quality, and access) as well as resource management and purchasing management tools.
3. System Enablers

The final components of the vision are the system enablers:

- Establishing common data and communication standards
- Applying an appropriate privacy and consent legislative framework
- And, most importantly, redesigning the key business processes to realize the value from the IT investment, along with the supporting education and training.

While progress has been strong in some areas (e.g., standards), it has been inconsistent in others (e.g., privacy legislation). However, the biggest gaps are in business redesign and change management – both of which are critical to avoid “automating problems” and not resolving underlying process issues in parallel with systems implementation. The stakeholders are enthusiastic about developing a more systematic and coordinated approach for these enablers.

Figure 6

<table>
<thead>
<tr>
<th>INCREMENTAL INVESTMENT TO COMPLETE THE VISION</th>
<th>Incremental capital costs $ Billions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Foundational elements</strong></td>
<td></td>
</tr>
<tr>
<td>Complete baseline EHR</td>
<td>2.2-2.6</td>
</tr>
<tr>
<td>EMR to GPs/specialists</td>
<td>1.6-2.0</td>
</tr>
<tr>
<td>Patient portal</td>
<td>0.1</td>
</tr>
<tr>
<td>CIS</td>
<td>2.5-3.1</td>
</tr>
<tr>
<td><strong>Total foundational elements</strong></td>
<td><strong>6.4-7.8</strong></td>
</tr>
<tr>
<td><strong>Additional elements</strong></td>
<td></td>
</tr>
<tr>
<td>Public health</td>
<td>-0.1</td>
</tr>
<tr>
<td>Patient safety*</td>
<td>0.0</td>
</tr>
<tr>
<td>Chronic disease</td>
<td>0.2-0.4</td>
</tr>
<tr>
<td>Access/wait times</td>
<td>2.0-2.5</td>
</tr>
<tr>
<td>Self-care</td>
<td>0.9-1.1</td>
</tr>
<tr>
<td>Performance management</td>
<td>2.0-2.5</td>
</tr>
<tr>
<td>Overlap**</td>
<td>-(1.6-2.4)</td>
</tr>
<tr>
<td><strong>Total business needs</strong></td>
<td><strong>3.6-4.2</strong></td>
</tr>
<tr>
<td><strong>TOTAL VISION</strong></td>
<td><strong>10.0-12.0</strong></td>
</tr>
</tbody>
</table>

Note: Costs are incremental, therefore, foundational costs already incurred by Infoway and the jurisdictions are not included. Costs are inclusive of change management but do not include: annual operating costs ($1.5 billion-$1.7 billion); community care enablement (~$3.7 billion), and business process redesign.

* Costs are incurred as part of foundational elements (EMR and CIS), public health (research), and performance management (monitoring and reporting).

** Costs overlap as some systems deliver multiple business needs but are only counted once in total costs.
Case for the Full, Integrated Vision

The total incremental cost of this integrated vision over the next 10 years is estimated to be between $10 billion and $12 billion in additional capital, and between $1.5 billion and $1.7 billion in annual operating costs (Figure 6). This does not include the additional ~$3.5 billion to $4 billion cost to provide integrated systems to allied health professionals and the broader community care environment (e.g., all long-term care facilities, home care, public health, and mental health).

3. Costs were estimated by identifying the systems required to enable each element of the vision and include initial systems acquisition and change management costs. They were derived and triangulated from a number of sources, including Infoway, Booz Allen Hamilton, Canadian Healthcare Technology, CIHI, international research, vendor RFP responses, and management consultancy benchmarks. Detailed estimates are available upon request.

Spread over 10 years, these investments represent a total incremental IT spending of approximately two per cent per year on Canada’s roughly $100 billion of public spending on healthcare. When combined with existing annual investment levels (estimated at 1.5 to 2.5 per cent), Canada will only be slightly below the average IT spending by other information-intensive industries (e.g., banks, which typically spend more than five per cent of revenue on IT). Furthermore, on a per capita basis, this represents approximately $350 for the full vision, in line with investments in comparable systems in the UK ($280) and at VA ($350) and Kaiser Permanente ($570) (Figure 7).

<table>
<thead>
<tr>
<th>Description of System Functionality</th>
<th>Current Mandate</th>
<th>Implementation of Vision</th>
<th>Veterans Affairs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Collection</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Simple systems that provide a site-specific solution to access clinical data, imported through scanning or other forms of aggregation</td>
<td>133</td>
<td>-280</td>
<td>-350</td>
</tr>
<tr>
<td><strong>Documentation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basic systems that clinicians use at the point of care to adequately document rather than merely access clinical data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Helping</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Systems that include episodic and encounter data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Use decision support tools to assist clinicians</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Are functional in both ambulatory and inpatient settings</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mentoring</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complex and fully integrated systems that provide all previous capabilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Are a main source of decision support in guiding patient care for both clinicians and consumers</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Partnership</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Advanced systems that provide more decision support capabilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Are operational and accessible across the continuum of care</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Provide sufficient credibility to become the patient’s legal medical record</td>
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</tbody>
</table>

Note: Canada’s current mandate point represents the country’s estimated position as of 2009, the UK’s in 2009; the second Canadian flag is Canada in 2015, VA in 2004, and Kaiser in 2005. Source: Gartner; team analysis.
The following sections highlight the infrastructure’s financial and other benefits, as well as the risks of non-investment.

1. Financial Benefits

This IT-enabled healthcare environment of the future promises a number of tangible benefits. These include real savings from eliminating duplicative or unnecessary tests and “paper” costs (e.g., radiology films and storage). They also include recouping future investment costs by freeing up capacity through improved process efficiency (e.g., reducing no-show rates for physician visits through scheduling systems).

The integrated benefits to the entire system are estimated to be $6 billion to $7.6 billion annually (in 2006 dollars), when all elements are in place. Roughly $5.2 billion to $6.2 billion will accrue from better resource utilization and $0.8 billion to $1.4 billion from a reduced unit cost. This level of savings should provide a payback of between eight and 10 years, based on estimated rollout schedules and in line with the experiences at Veterans Affairs and Kaiser.

If fully captured and reinvested in the system, the benefits would also help slow the growth of overall systems costs and ensure the system’s sustainability. For example, if the system were fully implemented today, the total annual benefits of $6 billion to $7.6 billion would have offset the average annual rate of growth in dollars over the same period.

2. Additional Benefits

In addition to having a solid business case, these investments will facilitate a number of additional benefits, including:

- Improving the patient care experience through a new sense of empowerment (e.g., full insight into one’s own medical data through a patient portal) and service (e.g., reducing the need for duplicated information)
- Helping enable greater human resources flexibility and satisfaction by freeing up clinical and administrative time to devote to patient care and by making it easier, through standardized IT and business systems, for clinicians to work across different provider settings
- Speeding the development of evidence-based medicine through analyzing drug treatments and therapies, which can help contain the growth in pharmaceutical expenditures and improve patient outcomes.

Furthermore, the benefits for Canadians in pursuing this path will reach beyond healthcare. Leadership in the still-emerging healthcare IT industry will bring intellectual capital and associated high-skilled jobs. In addition, a rich combination of large-scale, standardized health data and the right research-oriented privacy guidelines could position Canada to shape medical thinking and clinical guidelines and, subsequently, attract the best medical and research talent worldwide.

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4 Two types of quantifiable benefits were estimated: cost reduction, where real dollar savings can be captured (e.g., fewer laboratory tests, reduced film costs), and capacity creation, where productivity improvements can lead to treating more patients with the same resources (e.g., fewer hospitalizations because of adverse events). More information and detailed estimates are available upon request.
3. Risks Associated with Not Investing

As well as severely constraining the health system’s ability to address the critical business goals identified, there are also additional risks associated with failing to make the needed investments or continuing to delay them. Specifically:

- Government will ultimately need to spend more money on IT if jurisdictions and providers make uncoordinated investments in building and upgrading or replacing non-compatible systems. It will also incur higher investments in front-line staff to maintain manual processes.

- Exposure to legal or ethical risks associated with medical errors resulting from a lack of accurate and timely information will increase. This could seriously undermine the public’s confidence in the health system. Today, this breakdown in health information (e.g., drug interactions) is believed to contribute to up to 24,000 deaths in Canada each year – and this will be exacerbated as the number and nature of care hand-offs increases and the population requires more ongoing chronic care.

- Human resource challenges in rural areas and less IT-enabled jurisdictions will be further heightened, particularly as younger clinicians increasingly expect to work in computerized environments and will demand change or gravitate to centres that can provide these advantages.

- Providing health services, particularly complex medical treatments, to rural regions will become increasingly difficult if they are isolated from centres of specialization and do not have access to telehealth functionality.

- A continued lack of critical information to drive true performance management within a $100 billion business will further constrain the managers of the system in making the right tradeoffs and assessments.

- Canada risks stranding investments made in critical infrastructure to date (e.g., in registries) as well as losing valuable knowledge and lessons learned from existing experience.
3. Emerging priorities for 2015

“We can’t stay static. We need to ensure that the dialogue and momentum continue… and that we have a repository of expertise so we can share best practices across the country.”

– Deputy Minister

While considerable progress has been made to implement the electronic health record infrastructure, much remains to be done. In this chapter, we describe the continuing support for the pan-Canadian approach, explain how the priorities for 2015 were determined and outline each priority. We then summarize each one’s anticipated progress by 2015.

Strong Support for Pan-Canadian Approach

Across this integrated vision, all stakeholders in the system consistently articulated a strong desire for a continued pan-Canadian leadership role, citing particular advantages in continuing the cross-jurisdictional dialogue and maintaining an integrated view of the desired end state and priorities. These advantages include:

- Accelerating the health infrastructure dialogue
- Ensuring and following consistent standards in building the infrastructure’s foundational elements, enabling future interoperability within and across jurisdictions, and simplifying the movement of knowledge and people across jurisdictions
- Serving as a catalyst for new infrastructure developments and ensuring consistent platform quality across all jurisdictions
- Where possible, encouraging cooperation, thereby eliminating redundancy and duplicative efforts in systems design, vendor negotiations, etc.
- Reducing long-term costs and implementation time by leveraging scale and cross-jurisdictional knowledge.

Need for Priority Setting

While the integrated health infrastructure vision is compelling and the benefits are likely substantial, it is unrealistic to believe Canada can achieve full implementation by 2015 given:

- **Cost constraints.** The required investment may be perceived as prohibitively high compared to Canada’s historical average IT spending of 1.5 to two per cent of total hospital budget. In addition, many other healthcare priorities are competing for funds – such as investments in more front-line staff and medical devices – and other resources. Political tradeoffs may tend to favour these more visible items.
- **Different starting points and priorities by jurisdiction.** While some jurisdictions like Alberta are well advanced and can be expected to make significant progress against many of the business needs by 2015, others have only just started to implement the systems covered by the **Infoway** mandate. And some territories like the Yukon and Nunavut may not have made significant progress by 2010. Even if these jurisdictions were able to accelerate implementation by leveraging best practices from other jurisdictions, it is still extremely unlikely that the full vision could be implemented and funded across Canada by 2015. In addition, the lack of a common strategy beyond the electronic health record will result in jurisdictions pursuing other priorities, both IT- and non-IT related, that may not contribute to reaching the vision by 2015.
• **Natural project sequencing.** Implementing the systems that enable the vision can only partially be done in parallel (e.g., physician and clinical systems can be implemented at the same time). Most will need to follow a natural sequence. For example, building extensive performance management systems in the absence of a solid clinical information system or integrated remote monitoring tools without an electronic medical record makes only limited sense and will expose investments to potentially costly retrofits and integrations. Even with sufficient funding, the ability to accelerate the implementation will be limited by the duration of existing projects.

• **Resource limitations.** Progress in some jurisdictions is already limited by the inability to find sufficient skilled and experienced healthcare IT specialists. These jurisdictions will need to focus their resources on completing the current mandate before taking on additional projects.

• **Change management requires time.** The front-line capacity to absorb change is limited, and adopting new practices takes time. For instance, when netCare was introduced in Alberta, physicians were reluctant to share data beyond a narrowly defined circle of trust, particularly because of their concerns about interference with their patterns of practice (e.g., evaluation of guideline compliance). Several years later, the physicians’ resistance dropped significantly and the next step in implementation could be taken.

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**Figure 8**

**FIVE PRIORITIES EMERGED FOR 2015**

1. **Ensure baseline EHR and public health infrastructure are in place across the country**
   - Elements:
     - Extend EHR to 100 per cent of Canadians, with ability to bridge across continuum of care through a viewer functionality

2. **Unlock additional quality and safety benefits by enabling decision support and communication across the care continuum**
   - Elements:
     - Link primary/ambulatory care, starting with EMRs in physician offices (GPs and specialists)
     - Install advanced clinical information systems to enable enhanced decision support

3. **Enable public visibility into wait times**
   - Elements:
     - Enable each jurisdiction to report and manage aggregated wait times by location, procedure (e.g., diagnostics, surgeries, specialist care), and provider

4. **Facilitate improvements in patient self-care**
   - Elements:
     - Create patient portals with access to EHR and other basic information and self-care tools

5. **Trial more advanced functionality to meet high-priority system needs**
   - A) Create an integrated triaged scheduling and referral model solution with a case management priority assessment across the care continuum in one to two jurisdictions
   - B) Create a model solution that demonstrates proactive approaches to chronic disease

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**Rationale**

- Significant value will be unlocked by pursuing these priorities
- Stakeholders consistently articulate these as the highest priorities
- Some jurisdictions will be able to start on these elements soon (and in some cases already have) and create compelling examples of improved care delivery

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Given these constraints, it was essential to determine which of the vision’s critical elements should be implemented by 2015 and where the pan-Canadian approach will create the greatest value. The elements were analyzed and prioritized based on specific criteria to determine which ones:

- Offer the greatest return through a pan-Canadian level (e.g., the systems’ effectiveness depends on having a highly interoperable system across the country)
- Offer the highest economic returns for the health system (e.g., creating real savings in cost, increased quality, or improved access)
- Support a recognized political priority (e.g., wait times and access)
- Are critical to enabling other benefits (e.g., there are technology interdependencies where future priorities require investment in foundational systems, such as enabling GPs to allow for chronic disease management).

Five Key Priorities

From this analysis and through dialogue with the system stakeholders, five priorities were identified to enable Canada to make significant progress over the next 10 years. These priorities do not preclude individual jurisdictions and/or providers from pursuing additional initiatives. However, they are considered essential elements of an e-health strategy to 2015 and need to be commonly committed to across the jurisdictions (Figure 8).

Priority 1: Ensure baseline electronic health record and public health infrastructure are in place across the country

Stakeholders view these elements as the most critical for two reasons. First, they are the foundation for achieving many of the other business needs; they are required either to enable the business needs or to strengthen the benefits from the business systems. And, second, they are key to achieving pan-Canadian interoperable solutions.

- As stated earlier, a baseline electronic health record for 100 per cent of Canadians, containing registries, diagnostic imaging, laboratory, medication, hospital clinical reports, and immunization data, is a foundational element for unlocking most of the benefits articulated in the overall vision. However, by 2010 less than 50 per cent of Canadians will be included. Increasing the coverage to 100 per cent by completing work in the remaining jurisdictions and extending the mandate to include Aboriginal populations and federally managed healthcare recipients makes sense. This will enable capturing all the benefits, require a relatively small incremental investment (many electronic health records component systems – e.g., registries – are already or will be in place for 100 per cent of Canadians), and provide a strong payback for “finishing what we started.”
The total incremental capital costs for extending the baseline electronic health record to cover 100 per cent of our population is estimated at $2.2 billion to $2.6 billion. This figure includes the jurisdictional and hospital integration costs. When complete, the system will begin to reap benefits by improving patient safety through greater access to patient drug histories; increasing service by streamlining activities and speeding the return of test results; and reducing costs through elimination of DI film and paper storage expenses.

More importantly, a baseline electronic health record for 100 per cent of Canadians will create the critical elements required to support patient self-care and chronic disease management, as well as further patient safety actions, and speed progress in improving access.

- **Completing the public health surveillance system** entails a relatively minor cost (and is included in the electronic health record estimate). While this is not a high public priority, prudent planning suggests that this moderate “insurance premium” to help identify outbreaks, communicate protocols, and manage critical drug flows will be key to avoiding the challenges the system experienced during the SARS outbreak. Furthermore, as noted by all stakeholders, it is the most critical system to be designed and implemented at a pan-Canadian level.

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**Priority 2: Unlock additional quality and safety benefits by enabling decision support and communication across the care continuum**

Stakeholders view these elements as critical to unlocking the value of electronic health records (estimated at an additional $2.7 billion to $3.3 billion in annual benefits, in addition to those accruing from putting the baseline electronic health record in place). In addition, the stakeholders consider these elements the most important next steps to manage the system and drive improvements in patient safety, quality care, and access.

- **Enabling the physician and specialist offices with electronic medical records** was universally seen as the next highest priority for three reasons. First, an estimated 80 per cent of all patient encounters happen in this care setting. Second, Canada has a disproportionately low prevalence of technology applications within this setting relative to other countries. And, third, this element is key to pursuing broader goals such as enabling patient care, scheduling full wait times and access, and managing chronic diseases.

Enabling all GPs and specialists in Canada with an electronic medical record solution will cost an estimated $1.6 billion to $2 billion but will generate an additional $1.6 billion to $2 billion in annual benefits. The benefits are most likely to come from reducing adverse drug events and the number of lab tests, and increasing generic drug substitutions. However, given the challenges in instituting change management, 100 per cent adoption among physicians will be unlikely within the next 10 years.
Completing the IT infrastructure for hospitals will require implementing clinical information systems to provide advanced decision support and integrate the information stored in the EHR and the interactive workflow support (e.g., order entry) into the clinical systems. This step is essential for driving adoption and usage. It will also require implementing pharmacy systems, which will help reduce errors in the delivery of drug prescriptions, improving quality and reducing costs (e.g., through shorter hospital stays).

Full implementation of this element is estimated to require $2.5 billion to $3.1 billion in incremental cost, and it will generate $1.1 billion to $1.3 billion in additional annual benefits. As with electronic medical records, these benefits are driven primarily by reductions in adverse drug events and lab tests and increases in generic drug prescriptions.

Together, Priorities 1 and 2 represent the bulk of expenditures and activities, as well as the change management challenges, required to make significant progress in realizing the integrated vision. However, in addition to these priorities, stakeholders strongly believe that progress needs to be seeded in other areas to address core business and public needs and to unlock the additional value from investments in existing IT infrastructure. Priorities 3, 4, and 5 are described in the next sections.

**Priority 3: Enable public visibility into wait times**

While completing the full vision of improving access and wait times requires a number of systems – including patient logistics systems, advanced scheduling solutions, and in-hospital tools – many of which hinge on enabling the GP community with at least basic computer functionality, beginning to address the current priority of wait times and enabling care guarantees must begin long before electronic medical records are in place. A short-term win can be achieved by creating a common approach to transparency into wait times through simple monitoring, prioritizing, and reporting tools that enable jurisdictions to
report aggregated wait times by location, procedure, and provider. Providers can then take steps that do not depend on technology, such as process redesign and capacity reallocation, to increase access to care.

Again, while individual efforts are underway in many jurisdictions today, stakeholders believe a pan-Canadian approach can add value in several ways. First, by ensuring consistent processes are in place to measure wait times, this approach can help guarantee fairness and equity in access to care, and enable patients to move to other regions or jurisdictions if they choose. Second are the scale benefits to developing a common IT system. Third, this approach can help facilitate the transfer of “lessons learned” from those jurisdictions leading in developing wait times reporting today (e.g., Saskatchewan, Ontario) to other parts of the country.

Total costs for these types of systems are estimated to be $60 million to $80 million (excluding the cost of placing computer technology within the GP and specialist offices included in electronic medical record costs). The benefits generated in the short term may be difficult to ascribe directly to IT investments alone (as they are often tied to funding increases and process improvements). However, as Saskatchewan’s experience has demonstrated, when coupled with a number of other changes (e.g., front-line investments, performance management), IT has contributed to an increase in surgeries and a 30 per cent decrease in the number of people waiting more than 18 months for surgery.

Priority 4: Begin to facilitate patient self-care and empowerment

Achieving the full vision of patient self-care and empowerment requires having a number of other systems in place, as well as developing remote monitoring technology. Even so, we can begin now by creating portals that provide patients with access to their own health information stored in the electronic health record, as well as to other basic information and self-care tools that will enable them to see the potential benefits of e-health.

My CARE Source

Grand River Hospital is at the forefront of patient self-care and empowerment with the creation of a patient portal for cancer patients. The portal, with more than 500 users, allows patients to schedule their appointments, view test results, follow up on treatments and potential side effects, and participate in discussion groups and maintain a personal journal. The portal itself is centred on the patient, i.e., it is the patient who grants access to external viewers, ensuring patient privacy and confidentiality.

The portal is generating significant benefits, including enhanced patient confidence through self-monitoring of treatment/side effects, greater patient compliance with treatments through increased transparency, and increased operational efficiency from online scheduling. Aside from these benefits, the patient portal also allows clinicians who join an existing care team to quickly get up to speed on local practices and patients.

“All patients say: ‘This is easy to use and navigate. I would use it again. I would recommend it to somebody else…’”

– Director of My CARE Source Project

The portal was developed in partnership with a vendor, at a total estimated cost of $1 million. However, the content was developed by Grand River itself. This has allowed it to sell the content to third parties interested in developing their own portals, and will help fund initiatives to expand the portal’s functionality.
While this will encourage patients to be more involved in their care and drive some quality benefits, a patient portal will also have secondary benefits. For example, a consumer educated on the benefits of electronic health records will help drive adoption with community and acute care providers and continue to provide political backing for further investment. However, the patient portal must be created cautiously to ensure that the content is viewed as beneficial to the public and not simply linking the elements already available in the electronic health infrastructure.

Because a number of efforts are underway to create patient portals, including the My CARE Source Project at the Grand River Hospital in Ontario (see sidebar on page 27), Canada risks incurring significant costs to build and maintain these many separate sites. Therefore, the stakeholders believe that building a national patient portal infrastructure that could be tailored to local needs would be an effective and efficient way to make progress in this area.

The total cost to build the patient portal infrastructure is estimated at $100 million, although creating and maintaining the content will require additional funds.

**Priority 5: Trial and perfect more advanced functionalities in wait times and chronic disease management**

These are high priorities for meeting system needs. However, they will be difficult to implement in the short term at a pan-Canadian level because of financial, technical, and capacity constraints — particularly managing change within the GP offices and redesigning the business systems required to achieve success.

The pan-Canadian goal, therefore, should be to demonstrate in one or two health regions or jurisdictions the elements of the reference solution to be built; to develop a sound business case, and to test the appropriate implementation and change management techniques. Once the baseline electronic health record infrastructure and enablement of GPs are in place across Canada, the other jurisdictions can opt to adopt the reference solution, thereby speeding the rollout timing. (Note: If the reference solution is highly successful, there may be ways to speed rollout even more by coupling these solution elements to the electronic medical record implementation and/or leading with these solutions and basic computer technology.)

These reference solutions will entail:

- **Trialling a reference solution for integrated triaged scheduling and electronic referrals to further improve wait times management and access** in one or two regions or jurisdictions. This includes case management and common referral and priority assessment tools across the care continuum — from GPs to specialists through to hospital operating rooms and community and home care environments. This would need to be coupled with significant process re-engineering to ensure the full value is captured. The estimated cost for the case management and priority assessment tools in one large jurisdiction is $40 million to $60 million and $140 million to $160 million for all jurisdictions.

- **Trialling a reference solution for proactive chronic disease management** in one or two regions or jurisdictions. Disease management is a high priority and would accrue economic and quality benefits. However, its dependency on a full rollout of the electronic health record and electronic medical records means complete implementation across the country will extend beyond the 2015 horizon. The estimated cost for the screening and case management systems to enable this for one jurisdiction is $15 million to $25 million and $180 million to $220 million for all jurisdictions.
Remaining Elements

Setting priorities within the integrated vision means that certain elements will likely not be pursued at a pan-Canadian level over the next five to 10 years.

- **Advanced patient self-care functionality.**
  The most critical elements of self-care that can be pursued now (e.g., patient portal) have already been included in the foundational elements. The more complex patient self-care tools will require completion of the electronic health record, electronic medical record, and disease management elements before they can be put in place. Nor will they offer the same benefit return as some of the other elements. Furthermore, many of the advanced patient self-care functionalities (e.g., in-home monitoring devices for diabetes) can be pursued by private providers (e.g., telecom, insurance or drug companies) in a patient or employer/insurance fee-for-service model.

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**Figure 9**

**IMPLEMENTATION PROGRESS BY 2015**

**A. Public health**
- 100% of current and additional mandate completed

**B. Patient safety**
- Reference model completed in one jurisdiction with full benefits being realized

**C. Disease management**
- Reference model completed in one jurisdiction and expanded to 60% of the country

**D. Wait times**
- Wait times monitoring and reporting complete in all jurisdictions
- Reference model expanded to 80% of the country

**E. Advanced patient self-care**
- 100% of Canadians have access to a patient portal

**F. Health system performance management**
- Reference model expanded to 80% of the country

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2015 - base case

**Foundation**
- Baseline EHR
  - 100% of Canadians with EHR, with all systems complete
- Physician EMR
  - ~60% complete
  - 2-5 year from 100% completion
- CIS
  - ~60% complete
  - 7-9 years required for 100% completion
- Patient portal
  - 100% of Canadians have access to a patient portal

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2015 - aggressive case

**Foundation**
- Baseline EHR
  - 100% of Canadians with EHR, with all systems complete
- Physician EMR
  - 95% complete (AB, BC);
  - 75% complete elsewhere
- CIS
  - ~100% completion in 300+ bed hospitals
- Patient portal
  - 100% of Canadians have access to a patient portal

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Aggressive scenario will require
- $900 million to $1,000 million in additional funds
- Greater front-line implementation capacity
- More aggressive rollout of physician office EMRs (for wait times and CDM)

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* Element rolls-out as part of EMR and CIS

**Note:** Please refer to the Appendix for assumptions

**Source:** Infoway; team analysis
- **Health system performance management.** While these systems are likely to be extremely valuable to enable health managers (e.g., deputy ministers, health region and hospital CEOs) to drive quality, access, and productivity in the system, it was felt that the most critical elements to be addressed at a pan-Canadian level were already covered in the five priorities – namely, the collection of standardized health information through the electronic health record and electronic medical record and the need for a pan-Canadian coordinating mechanism for wait times. Furthermore, the Canadian Institute for Health Information (CIHI) was seen as a more natural owner to determine pan-Canadian performance standard, and, given the politically sensitive nature of the remaining elements, performance standards were more likely to be developed at a jurisdictional level.

- **Electronic medical records in broader community and long-term care settings.** Managing long-term healthcare costs will require extending the electronic health record and EMR decision support systems beyond the acute care and GP and specialist offices over time. Extending the continuum of care to the long-term care settings was not included as a medium-term priority for several reasons: the high cost of including the broader community and long-term care settings ($3.7 billion); the less robust business case; the priority placed on completing the GP and specialist settings, and the ability of the system to absorb change. However, it is critical to note that even without the full functionality, these settings would be able to access the electronic health record through the viewer if enabled with computer technology.

- **Hospital-level logistics, scheduling, and bed-tracking systems.** Hospital-level logistic systems are also costly and are more appropriately implemented at a health region or hospital level to ensure compatibility with existing systems and processes.

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**Figure 10**

### SUMMARY OF COSTS AND BENEFITS BY SCENARIO

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Baseline EHR and public health</th>
<th>Additional quality and safety benefits</th>
<th>Wait times</th>
<th>Patient self-care</th>
<th>High-priority system needs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EHR and public health</td>
<td>EMR, CIS</td>
<td>Jurisdictional reporting</td>
<td>Patient portal</td>
<td>Wait time reference solution, Chronic disease management reference solution</td>
</tr>
<tr>
<td></td>
<td>2,200-2,600</td>
<td>900-1,000, 1,200-1,300</td>
<td>60-80</td>
<td>80-120</td>
<td>40-60, 15-25</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>1,300-1,400</td>
<td>60-80</td>
<td>80-120</td>
<td>110-130</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,500-3,100</td>
<td>60-80</td>
<td>80-120</td>
<td>110-130</td>
</tr>
<tr>
<td></td>
<td>TOTAL INCREMENTAL COSTS</td>
<td>4,495-5,185</td>
<td>6,360-7,560</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ANNUAL BENEFITS</td>
<td>2,800-3,400</td>
<td>3,700-4,500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: EHR costs are incremental only, analysis includes all benefits from installing EHR.

- An additional $0.4 billion to $0.7 billion in costs will be required to complete the 5 priorities
- This will generate an additional $2.2 billion to $2.8 billion in annual benefits once systems are fully implemented

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ADVANCING CANADA’S NEXT GENERATION OF HEALTHCARE
Progress Level Achieved by 2010 and End State by 2015
The progress against these five priorities will vary by jurisdiction, given different starting points and momentum for implementation. However, a first-cut rollout plan has been developed in two phases:

- **Phase 1: Completing the foundation (to 2010)** will focus on completing the electronic health record beyond 50 per cent of Canadians and the health preparedness system (i.e., containing communicable disease outbreaks and mitigating the incidence of illness and death); beginning the electronic medical record and clinical information system infrastructure in advanced jurisdictions; and ensuring quick-win patient elements are in place (e.g., portals, wait time registries) or underway (e.g., reference solutions for disease management and wait time solutions).

- **Phase 2: Extending the benefits (to 2015)** will focus on continuing deployment and enablement of primary care settings; rolling out the advanced decision support systems in the acute settings across Canada; and beginning broader rollout of reference solutions for disease management and advanced scheduling and wait times solutions.

Rollout in the second phase could advance more quickly if Phase 1 implementation proceeded at or slightly ahead of plan; if the appropriate financing was in place, and if adequate jurisdiction-level and front-line implementation capacity existed. Therefore, two scenario rollout plans – base case and aggressive – were developed. The scenarios impact the deployment speed for Priority 2 and Priority 5.

For each priority, progress should be made as described below (Figures 9 and 10):

- **Priority 1. The baseline electronic health record for 100 per cent of Canadians and public health surveillance infrastructure** will be completed across the country by 2012, with almost 50 per cent of Canadians included by 2010.

- **Priority 2. Unlocking additional quality and safety benefits.** The base case assumes the system will likely only be implemented in half the hospitals (~45 per cent of large hospitals) and physicians’ offices by 2015, with significant differences in jurisdictions. While some jurisdictions like Alberta, which already has initiated electronic medical record implementation, can be expected to reach close to 100 per cent penetration by 2015, others will lag significantly.

While these base case timelines may appear lengthy, the delay in achieving the goal will be driven by the time and capacity required to complete existing projects and the complexity of front-line change management associated with implementing electronic medical records in small physicians’ offices.

Given these constraints, the more aggressive rollout scenario would see Canada achieve ~75 per cent of physicians’ offices and 100 per cent of large hospital settings by 2015. However, it is critical not to underestimate the change management challenge.
• **Priority 3. A simple registry and reporting system for wait times** can be implemented quickly. The bottleneck is likely to be political alignment rather than technical rollout. Again, a full implementation should be possible within the next three to five years.

• **Priority 4. Patient self-care** can be a quick win with implementation limited mainly by the progress on the electronic health record, because electronic health record data is a key content component for patient portals and is needed to tailor the information to the visiting patient. The first edition of the portal (ongoing development) should be available upon completion of the baseline electronic health record in 2010 (or earlier in some jurisdictions) but will become more valuable with the rollout of electronic medical records.

• **Priority 5. Reference solutions** can be accelerated based on the state of the chosen pilot region or jurisdiction.

The **base case model** assumes 35 per cent of Canadians will have access to an advanced wait times system by 2015, costing $40 million to $60 million and creating ~$25 million to $35 million in yearly benefits. A chronic disease management would be available for 10 per cent of Canadians, costing $15 million to $25 million with annual benefits of $5 million to $10 million.

There is potential, however, to pursue **more aggressive rollout** timelines based on the reference solution test results. This could be done by coupling the rollout with the EMR or by looking at short-term enablement of GP offices (e.g., enabling web access only). By 2015, this would provide 80 per cent of Canadians with an advanced wait times system, costing ~$110 million to $130 million and creating ~$60 million to $80 million in yearly benefits. A chronic disease management would be available for 60 per cent of Canadians, costing $110 million to $130 million and creating annual benefits of $30 million to $40 million.

Canadians from across the healthcare sector were involved in the development of the 2015 vision.
Tell us what you think of the healthcare vision for Canada:

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