Toward Patient-Centred Care: Digitizing Health Care Delivery

The CMA 5-year strategy for health information technology (HIT) investment in Canada

Health Care Transformation in Canada

CHANGE THAT WORKS. CARE THAT LASTS.
The Canadian Medical Association (CMA) is the national voice of Canadian physicians. Founded in 1867, CMA’s mission is to serve and unite the physicians of Canada and be the national advocate, in partnership with the people of Canada, for the highest standards of health and health care.

On behalf of its more than 72,000 members and the Canadian public, CMA performs a wide variety of functions. Key functions include advocating for health promotion and disease/injury prevention policies and strategies, advocating for access to quality health care, facilitating change within the medical profession, and providing leadership and guidance to physicians to help them influence, manage and adapt to changes in health care delivery.

The CMA is a voluntary professional organization representing the majority of Canada’s physicians and comprising 12 provincial and territorial associations and 51 national medical organizations.
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The following document outlines the CMA position and framework of activity for how a refocused 5-year health information technology (HIT) investment agenda in Canada could unfold to improve patient care and safety and address a number of pressing health issues.
To address Canada’s pressing health care and health system issues and achieve the benefits of health information technology (HIT) in a relatively short time frame requires a change in investment strategies. As the Auditor General of Canada and seven of her provincial counterparts noted in their recent reports on electronic health records in Canada, most provincial HIT programs have missed their target dates for implementation, exceeded their budgets, and failed to show clear benefits. Furthermore, the current inability to connect the frontline points of care is delaying the attractiveness and value for clinicians to adopt an electronic medical record (EMR) system.

The CMA believes that by refocusing HIT investments on frontline health care delivery and specific health issues, Canadians will see a number of immediate and tangible benefits in the pressing areas of chronic disease management, disease prevention and health promotion, medication management, patient involvement, continuity of care and public health.

Rationale for shifting the investment focus

To date, major HIT investments have not had much impact on the delivery of care in Canada, mainly because the current investment strategies do not mirror how care is provided. The top-down approach taken thus far focuses the majority of investment on large-scale HIT systems and architecture, with only a small portion targeted to supporting frontline points of care.

But health care is fundamentally a locally-delivered service. More than 85% of care occurs at the community level (Fig. ES-1) and very few individuals go outside their local catchment area to receive care.

To accelerate adoption of information technology in health care, we must focus on the patients and where they interact with the health care delivery system.

By automating and connecting ambulatory points of care (e.g., physician offices, labs, pharmacies and hospitals), we will more quickly deliver IT solutions that support clinicians, produce timely clinical value for patients and providers, and achieve savings in the shorter term (12–18 months) for the health care system. These are investments in low-risk and less costly infrastructure, which is an important consideration given the difficult financial situations facing all government jurisdictions. Also, the technology landscape has changed considerably since jurisdictions began making HIT investments 10–15 years ago, and it is now more practical, less expensive and more compelling to consider grassroots information exchange that does not rely on central information repositories.

Finally, by automating and connecting the points of care where the majority of patient data is generated and captured, we establish the foundation required to realize a broader pan-Canadian HIT agenda.

Setting clear goals and priorities

It is the CMA’s view that future HIT investments need to be directly tied to achieving specific goals. We need to provide clear evidence that we are making a difference. There are several areas where, by building on current investments, we can demonstrate value measured in terms of the return to patients (e.g., safer care, improved access, quality and outcomes).

Where can we realize the most benefit? The CMA has identified clinical and system priorities that can benefit from HIT investments over the next 3–5 years and that are measurable. These are: chronic disease management, prevention and health promotion, medication management, continuity of care (information flow, access and wait times), patient involvement and public health reporting.

The proposed investments are built around accomplishing 3 interim goals: (1) significant adoption of EMRs by primary care and specialist physicians in ambulatory settings; (2) accelerating the exchange of health information to support the majority of health care transactions; and (3) increasing the effective use of EMRs and related solutions to meet pressing health and system issues.

Figure ES-2 provides a framework of activity for the investment program that CMA is recommending.

**CMA 5-year strategy for HIT investment in Canada**

**Required investments**
The investments required to support this activity and achieve the 3 interim goals are outlined in Table ES-1.

**5-year timeline**
Table ES-2 identifies the recommended set of cash flow targets per year that will be required to move forward on all parts of the HIT investment strategy.

**Measuring success**
To evaluate whether the proposed investments have been successful in accelerating physician adoption of EMRs/HIT and are leading to improved outcomes and health benefits, there is a need to establish EMR performance measures (functional indicators) and EMR-related quality outcome indicators.

**EMR performance measures:** The establishment of a set of physician EMR performance measures (functional indicators) provides a means to report and evaluate the success of HIT investments in physician EMRs. The 2006 and 2009 Commonwealth Fund International Health Policy Survey of Primary Care Physicians provides an international set of benchmarks whereby physician EMR performance is measured according to 2 categories of functional indicators: (1) physician use of EMRs/HIT in their practices on a routine basis for “core tasks” and (2) computerized capacity to generate patient information.

**Going forward,** the CMA proposes that each jurisdiction, starting in 2011, undertake an annual survey based on this model to measure how primary care practices are progressing in EMR performance and use according to each of these functional indicators.

**EMR-related quality outcome indicators:** To determine whether progress is being made, a set of indicators needs to be defined that allows us to measure improvements and track progress over time, and compare Canadian results with other jurisdictions/countries.

The Canadian Institute of Health Information (CIHI) has developed a set of primary health care indicators that are used to compare and measure primary health care at multiple levels within jurisdictions across Canada; these are similar to those used in other jurisdictions.

**Going forward,** the CMA proposes that these indicators form the basis for the physician EMR quality outcome indicators used to assess the impact of HIT investments. The CMA further proposes that an open process involving all stakeholders be used to refine the CIHI primary care indicators to ensure that they meet the varying needs of each group. The physician EMR quality outcome indicators should be finalized by June 2011.

**Annual reporting:** As part of this 5-year undertaking, the CMA intends to prepare annual report cards on progress in terms of EMR adoption (measured as the number of physicians with EMRs), performance/use (measured through EMR functional indicators), and health benefits (measured using EMR-related outcome indicators). The CMA believes that the proposed investment strategy will indeed deliver results — it will help to accelerate physician adoption and use of EMRs/HIT, and deliver health benefits to all Canadians.
Toward patient-centred care: digitizing health care delivery

Fig. ES-2 Framework for activity (for HIT investment)

Table ES-1 Investments required to support HIT in Canada

| 1. To support significant adoption of EMRs by physicians in ambulatory care settings: |
|----------------------------------|-----------------|
| $410 M                           | Physician EMRs to help the 20,500 physicians not covered by existing provincial programs to adopt an EMR ($20,000 per physician in one-time costs) |
| $310 M                           | Transition support and change management for those 20,500 physicians ($15,000 per physician, based on existing programs/experience) |
| $10 M                            | Functional requirements for specialists that can be built into EMR products, the e-referral process, hospital interfaces, unique device integration and documentation requirements |
| $5 M                             | Data migration to offset the burden for physicians of having to switch EMR systems as the marketplace matures |

| 2. To increase effective use of EMRs and HIT solutions: |
|----------------------------------|-----------------|
| $20 M                            | Applied research on how best to integrate HIT into clinical processes and translate this information into learning modules for clinicians |
| $5 M                             | Consumer health research agenda to explore how best to leverage patient portals and online health tools to involve patients and improve care |
| $2 M                             | Decision support tools to develop readily available tools for preventive care and medication management and make these solutions available to all EMR vendors at no cost |
| $10 M                            | Natural language processing to examine the usefulness of these tools to convert unstructured data to standardized formats, and determine whether they could be made available to all EMR vendors at no cost |

| 3. To accelerate health information exchange: |
|----------------------------------|-----------------|
| $100 M                           | Regional interoperability solutions that will allow clinicians to share data at a local or regional level with colleagues, patients and regional management |
| $1 M                             | Interoperability standard (interim) to be issued by end of summer 2011 for use in regional interoperability solutions |
| $50 M                            | Telehealth to support the continued development of these networks across Canada |
Table ES-2 Recommended set of cash flow targets per year

<table>
<thead>
<tr>
<th>5-year timeline for HIT investments</th>
<th>Investments by year, $millions</th>
<th>Total investment, $millions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year 1</td>
<td>Year 2</td>
</tr>
<tr>
<td>To support significant adoption of EMRs by primary care clinicians:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• EMRs*</td>
<td>40</td>
<td>100</td>
</tr>
<tr>
<td>• Transition support and change management†</td>
<td>30</td>
<td>80</td>
</tr>
<tr>
<td>• Functional requirements for specialists</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>• Data migration‡</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>To increase effective use of EMRs and HIT solutions:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Applied research§</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>• Consumer research</td>
<td>0.5</td>
<td>1.5</td>
</tr>
<tr>
<td>• EMR decision support tools</td>
<td>0.3</td>
<td>1.7</td>
</tr>
<tr>
<td>• Natural language processing</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>To accelerate health information exchange:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Regional interoperability solutions</td>
<td></td>
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</tr>
<tr>
<td>• Interoperability standard</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>• Telehealth</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>TOTAL, in $millions</td>
<td>88.1</td>
<td>237.5</td>
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</table>

* Some of the current provincial funding programs will be able to increase their capacity and speed up the rate of EMR implementation. However, the majority of physicians needing financial support will come from jurisdictions that currently do not have an EMR program. We anticipate that it will take until well into Year 2 before any new programs come online and move into the implementation phase. Therefore, expenditures will start to grow in the latter part of Year 2.
† Change management expenditures are directly tied to the speed of EMR implementations in clinics. A good portion of these expenditures will precede actual implementation in order to help clinics prepare for automation.
‡ Data migration costs will be driven by the rate at which physicians/clinics need to change vendors. Standards already exist that could be built into future EMR specifications; all that is required is agreement on one common standard.
§ The applied research agenda for IT and consumer health could be carried out by an organization such as Canadian Health Services Research Foundation or Canadian Institutes of Health Research.
Section 1. Introduction

Information is the life blood of Canada’s health care system. It is essential for teams of clinicians as they share their expertise and provide patient care to Canadians. It provides necessary support for governments in the management and operation of the health care system. And for researchers, information is the foundation that leads to medical discoveries and the creation of new knowledge.

Over the past decade, governments across Canada have been developing strategies that they hope will relieve mounting pressures within the health care sector. In all of these strategies, health information technology (HIT) has been viewed as a foundational component and critical enabler. Anticipated benefits of HIT — improved access, quality, safety, patient control and productivity — are pressing issues for the public, clinicians and governments.

But after 10–15 years of major effort and significant expenditures in HIT across Canada, how are we doing?

In recent reports, seven provincial Auditors General and the Auditor General of Canada all comment on the large HIT expenditures to date and the difficulty of measuring the benefits of these investments. The federal report noted that despite the goals stated by Canada Health Infoway — “By 2010, 50% of Canadians and, by 2016, 100% will have their electronic health record [EHR] available to their authorized health care professionals” — Infoway officials admitted that “having EHRs ‘available’ does not necessarily mean that they are being used or that they are compatible across the country.”

In 2009, according to the Commonwealth Fund the use of “basic” electronic medical records (EMRs) by Canadian primary care physicians was 37%, up from 23% in 2006. Compare that with 97% (up from 92%) in New Zealand and 95% (up from 79%) in Australia. Canada ranks in the lower half on every measure on the survey, and is most often near the bottom: electronic ordering of lab tests, 18%; electronic drug alerts, 20%; electronic prescribing, 27%; electronic entry of clinical notes, 30%; electronic access to test results, 41%.

More telling, figures for fully realized use of EMR by primary care physicians in Canada are lower still. Only 14% of Canadian primary care physicians report having at least 9 of the 14 clinical functions that signal advanced electronic capability. In this respect, Canada ranks last among the 11 countries surveyed, distantly trailing New Zealand (92%), Australia (91%) and the United Kingdom (89%).

In practical terms — with 29,434 primary care physicians in Canada, each with an average of 1,200 patients — this translates to only 4.9 million Canadians with a fully functional EMR footprint. For the majority of Canadians (28.8 million or more than 85%), their medical records are still kept in paper charts.

Why has Canada not yet realized the benefits of its major HIT investments? In large measure it is because the current investment strategies do not mirror how care is provided in this country. Infoway and almost all provincial/territorial jurisdictions have taken a top-down approach in which HIT investments focus on large-scale HIT systems and architecture, with only a small portion directed to support the frontline points of care. Some jurisdictions are trying to balance a top-down strategy with a bottom-up implementation, although much more needs to be done.

Health care is fundamentally a locally delivered service. More than 85% of care is provided at the community level by general practitioners and primary care teams, in long-term and home care facilities, and in local hospitals. Almost all prescriptions, requests for lab tests, and referrals are generated at this level. The majority of time, investment and energy in the current EHR agenda, however, is dedicated to that part of the system that does not deliver care.

The CMA believes that investments in HIT make sense. Evidence is building of their value in primary care groups and specialist offices, particularly in managing chronic disease and improving safety in medication management; in expanding telehealth services and smoothing the transition between silos in the health care system; and in allowing patients to become more involved in their own care.

Adoption of information technology in health care needs to be accelerated — but in a way that focuses on patients and where they interact with the health care delivery system, and that is driven by the desire to improve quality of care and patient safety. Therefore, there must be a clear, target-driven plan that meets the needs of Canadian physicians and their patients by putting HIT to work for them.

On behalf of Canadian physicians and their patients, the CMA believes that it is time to change the focus of HIT investment, time and energy. We have a solid foundation to build on: HIT investments to date have established the core infrastructure needed to support a bottom-up approach to implementation of information technology in health care.
Now we need to move away from a top-down line of attack to one that focuses on the front lines of primary care delivery and identifies local and regional solutions that deliver tangible benefits in the short term.

By focusing HIT investments on automating and connecting ambulatory points of care (GP and specialist physician offices, labs, pharmacies and hospitals), we will more quickly deliver IT solutions that support clinicians, produce timely clinical value for patients and providers, and provide savings in the shorter term (12–18 months) for the health care system. These are investments in low-risk and less costly infrastructure, which is an important consideration given the difficult financial situations facing all government jurisdictions. And by shifting our investment focus to the front lines of care, where the majority of patient data is generated and captured, we will establish the foundation required to realize a broader pan-Canadian HIT agenda.

### Section 2. Health issues affecting Canadians

Chronic disease in Canada is on the rise. Recent reports warn that Canada is facing a “perfect storm” of heart disease and an “economic tsunami” of diabetes. With growing numbers of both younger and older Canadians at risk, managing chronic disease is one of our most pressing health challenges.

Two-thirds of deaths in Canada are the result of chronic disease and the number of people living with chronic conditions is expected to rise as the result of lifestyle factors (e.g., poor diet, inactivity, and smoking) and changing demographics, especially our aging population. Most disturbing is that chronic disease is on the rise among Canadian children and young adults, largely due to the increasing prevalence of childhood obesity. More than one-half of Canadian adults (61% or 13.2 million) and one-quarter of Canadian children aged 6–19 years (26% or 4.1 million) are overweight or obese, leading to shorter life expectancies than those of their parents. Table 1 illustrates some of the impacts of chronic disease in Canada.

### What can be done to better manage the health of Canadians?

Pressing health issues that would immediately benefit from the application of information technology include chronic disease and medication management, preventive care, continuity of care, patient involvement and public health. From the perspective of Canadian patients and their physicians, many of these issues overlap.

Table 2 represents health intervention strategies that are key to preventing and managing chronic conditions and promoting a healthy population, but without the proper tools and resources (e.g., HIT), we currently struggle to deliver these in an effective, comprehensive and systematic way. For more detailed analysis on the health issues and challenges facing Canadian patients, providers and governments, see Appendix 1.

### Table 1 Impacts of chronic disease in Canada

<table>
<thead>
<tr>
<th>Impacts of chronic diseases in Canada*</th>
<th>Annual cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>$12.2 billion</td>
</tr>
<tr>
<td>Heart disease</td>
<td>$22 billion</td>
</tr>
<tr>
<td>Hypertension (High blood pressure)</td>
<td>$2.4 billion</td>
</tr>
<tr>
<td>Asthma</td>
<td>$600 million</td>
</tr>
<tr>
<td>Mental illness</td>
<td>$14.4 billion</td>
</tr>
<tr>
<td>Cancer</td>
<td>$14.2 billion†</td>
</tr>
</tbody>
</table>

* See Appendix 1 for sources.
† 1998 figure
**Table 2 Key health intervention strategies and challenges***

<table>
<thead>
<tr>
<th>Intervention strategy</th>
<th>Current challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevention — Targets disease prevention and health promotion, using both routine (e.g., screening, vaccination) and guideline-based (periodic health exams, preventive care checklists) interventions</td>
<td>Only about 30% of Canadian physicians are able to generate routine reminders for preventive health care, screening and guideline-based interventions that are the cornerstones of primary care delivery.</td>
</tr>
<tr>
<td>Medication management — Essential for managing disease, preventing adverse clinical events, and ensuring patient compliance</td>
<td>Adverse events, prescription errors and patient non-compliance are ongoing concerns, and prescribing practices vary widely across Canada. U.S. studies show that nearly 40% of handwritten prescriptions have errors, up to 50% of patients do not take medications properly, and 20% of prescriptions are never filled.</td>
</tr>
</tbody>
</table>
| Continuity of care, access and wait times — Ensures effective coordination of health care services delivered over time, and in different points of care, to individual patients. | At least one-third of Canadians are unhappy with:  
• continuity of care involving multiple providers, different interventions  
• timely access to GPs, specialists, diagnostic tests  
• wait times for referrals, treatments |
| Patient involvement — Requires the right information and resources to support patients and their providers. | Patients, particularly those with chronic conditions, need to be partners in their medical care, but according to the College of Family Physicians, appropriate evidence-based tools to inform patients about lifestyle, medication and treatments are lacking. |
| Public health — Plays a critical role in keeping Canadians healthy and preventing the spread of infection and infectious diseases (e.g., SARS, influenza, H1N1). | Lack of real-time information on outbreaks prevents public health officials from fully understanding the incidence and prevalence of illness, as well as the effectiveness of interventions. |

* See Appendix 1 for sources

**Section 3. Benefits of HIT investment for these health issues**

Investment in health information technology is imperative — not only to help individual Canadians prevent illness and manage disease, but also to ensure a healthy and productive population and a sustainable health care system.

By digitizing health information and integrating the points of care, EMRs and other health IT solutions will ensure that the necessary information is available to guide treatment decisions on the front lines. They will also improve coordination among physician offices, labs and hospitals; improve public health reporting; facilitate rapid response to threats and emergencies; and promote more robust system analysis and increased consumer choice.

The short-, medium- and long-term benefits of HIT investment to Canadians include better care, better service, greater involvement of patients in their own care, improved safety, and a health care system that is more patient-centred and easier to navigate. Health IT solutions (e.g., electronic charting, prescribing, ordering tests and receiving results, referrals and patient-provider portals) will make it possible to provide comprehensive population and preventive health, improved medication and chronic disease management, standardized treatment, self- and distance monitoring, online access, and virtual consultations, among many other benefits.

**What role do EMRs play?**

> Until the percentage of doctors using electronic medical records (EMRs) increases significantly, the potential benefits offered by EHRs will not be fully realized.

— Auditor General of British Columbia, 2010 report

The use of electronic medical records (EMRs) instead of paper charts promises to transform the delivery of health care. A fully realized EMR system used by ambulatory care physicians (GPs and specialists) in Canada is expected to improve...
patient outcomes, system efficiency and accountability, and save billions of dollars annually.\textsuperscript{20}

It is widely accepted that many care improvements can be realized because of the capabilities of EMR systems, including improved chart legibility; embedded clinical practice guidelines, drug interaction databases and patient health risk calculators; alerts and reminders; comprehensive patient chart searches within and across patient records; tracking and summaries; display and storage of digitized images; and generation of custom information for patients (e.g., handouts, graphs).

That EMRs will lead to improved health outcomes is evident from their key features (listed in Table 3), and international surveys have established a benchmark for fully realized EMR systems that involves 14 clinical functions.* Most if not all physician office EMR systems being used in Canada can perform these functions; however, limited connectivity with other point-of-care systems (labs, pharmacies, specialist offices, local hospitals) hinders their optimal use.

### Physicians’ experience with EMRs

Case studies on EMR use among ambulatory physician practices across Canada provide further evidence of their benefits in terms of improved care, safety and efficiency.\textsuperscript{22–24} When fully utilized in physician practices, EMRs were found to improve efficiency through faster access to and better organized patient data; faster and easier referrals; printed prescriptions and simplified renewals; electronic test results; electronic faxing; reliable message tracking; elimination of paper chart handling; and easily structured and prioritized workflow.

They were found to improve patient care and safety through easier access to better organized patient data during encounters, as well as their ability to capture rich amounts of data, graph and track results; access to patient education materials; ability to involve patients in their own care through electronic display of test results/information; integrated clinical decision support tools; drug lists; allergy and abnormal results alerts; alerts for drug recalls; automated follow-up and callback reminders; and auditing functions to ensure protection of patient information.

EMR systems also made it easier to manage practice populations (i.e., all patients in the practice) for a multitude of purposes, including patient callbacks and reminders, screening and vaccinations, disease reporting, and practice/performance audits. EMRs allow for remote access to patient records, helping physicians better serve patients in rural and remote areas. EMRs similarly facilitate collaborative care among teams of providers, whether in the same location or across several locations. EMRs make it far easier for physicians to look after their colleagues’ patients (e.g., vacations, locums); they aid in the implementation of clinical standards across a practice; and EMRs assist management of large amounts of data for patients with chronic conditions.

Based on a systematic review of just one EMR feature — electronic reminders delivered to physicians during their routine test ordering and charting activities — U.S. researchers concluded that EMRs could be expected to improve the processes and outcomes of care.\textsuperscript{25}

### How will HIT investments benefit Canadians?

The CMA believes that by refocusing HIT investments on frontline health care delivery and key health issues, Canadians

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\*“Advanced electronic health information capacity in primary care practices involves 14 clinical functions: electronic medical record; electronic prescribing and ordering of tests, Rx alerts, clinical notes; computerized system for tracking lab tests, guidelines, alerts to provide patients with test results, preventive/follow-up care reminders; and computerized list of patients by diagnosis, medications due for tests or preventive care.”\textsuperscript{11}
can derive a number of immediate and tangible health benefits in the pressing areas of chronic disease management, disease prevention and health promotion, medication management, patient involvement, continuity of care and public health.

**Chronic disease** — Effective management of chronic disease hinges on effective use of HIT, not only during the patient encounter using the physician’s EMR system, but also between office visits through an increasing variety of web-based patient tools, self-monitoring programs and mobile devices. (The latter are addressed in detail under the heading Patient Involvement.)

Patients with chronic health conditions, such as diabetes, heart disease or hypertension, can benefit from electronic monitoring and management. Physician EMR systems facilitate this in many ways, most notably by providing physicians with built-in reminders, decision aids and the ability to track health indicators.

While these technologies are relatively new, improved outcomes have been well documented. In addition to first-hand physician accounts and qualitative studies, randomized controlled trials and other research have quantified the benefits of electronic decision support in diabetes management. And EMR-enabled management of heart failure — which provides more effective and comprehensive monitoring of the numerous health indicators necessary for the proper management of this condition — has been shown to decrease incidences of hospitalization.

The Heart and Stroke Foundation of Canada recently recommended that governments implement chronic disease prevention and management models to meet the cardiovascular needs of Canadians with multiple risk factors and improve access to high-quality, appropriate, coordinated cardiovascular care.

The federal government’s own Heart Health Strategy and Action Plan also recommends the creation of more robust chronic disease prevention and management programs and identifies targets to help Canadians lead healthier lives. These targets include increasing the number of Canadians who are physically active and have healthier diets, and decreasing the number who smoke, are obese or overweight, or who have high blood pressure. Most if not all of these recommendations can be supported by increased use of the electronic monitoring and management capacities of physician EMRs and patient-focused HIT tools.

A recent Conference Board report suggests that if these targets are met, Canada will achieve a significant reduction in cardiac events by 2020, amounting to a cumulative cost saving of $76.4 billion from 2005 to 2020, or about $5 billion per year.

Documented evidence of the benefits of HIT for chronic disease management is starting to emerge in countries where most primary care physicians have been using EMRs for a number of years. In the United Kingdom, 90% of primary care physicians use EMRs in their practices to document encounters, print prescriptions, refer patients to specialists, review and archive test images, supply performance statistics and meet care targets. Over the past 5 years, “particular gains” have been made in chronic disease management that are attributed to EMR tools that assist clinicians with patient interventions and treatment. Thanks to these tools, improvements in quality care indicators for blood pressure and cholesterol have been noted, and significant reductions in mortality for these illnesses are expected over the next 10 years.

**Prevention** — More than 30 Canadian organizations recently formed partnerships to conduct $15.5 million worth of initiatives designed to prevent chronic disease. Of these, a number are aimed at harnessing EMR systems and evidence-based approaches to increase prevention and screening for heart disease, diabetes and cancer in family doctors’ offices.

Physician EMRs offer a reliable and immediate mechanism for delivering comprehensive health prevention and promotion to Canadians that is more effective and far quicker than “system-wide” approaches such as building large-scale provincial and national disease registries. The EMR in a physician’s office can facilitate the delivery of preventive interventions in two principal ways: during patient–physician encounters and between office visits.

Built-in reminders alert physicians about what needs to be done whenever a patient presents, including Preventive Care Checklists, Periodic Health Examination and other
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evidence-based preventive care interventions recommended by the Canadian Task Force on Preventive Health Care. The ability to embed preventive care reminders and alerts into a physician’s EMR increases the likelihood that these interventions will be delivered during the patient encounter, even when the patient is in for other treatment. A systematic review of electronic reminders in EMR systems determined that “EMR systems offer the opportunity to improve practice by delivering reminders to clinicians at the point of care; such reminders range from simple prescribing alerts to more sophisticated support for decision-making.”

Large-scale provincial projects such as British Columbia’s Chronic Disease Management (CDM) Toolkit for Practitioners also provide web-based preventive care tools that can be used by physicians without an EMR, or integrated with the EMR systems of those who do.

Physician EMR systems also generate reminders about patients who are due for routine preventive interventions between office visits, such as screening or vaccination (often referred to as “population health”). Lists of qualifying patients generated by the EMR are used to bring individuals into the office, with the direct result that more preventive tasks are completed on schedule, important health indicators are more closely monitored, and, ultimately, lives are saved.

The ability to search the EMR database and single out individuals or specific groups of patients not only allows physicians to identify those who need routine screening or preventive interventions. It also helps physicians meet clinical targets set by provincial governments, and provide more accurate and timely patient follow-up over longer periods of time (e.g., ensuring that a follow-up colonoscopy recommended by a specialist is performed 5 years out — a next-to-impossible task for a physician relying on paper charts).

Most physicians also use their EMR system to help educate patients, which has a positive impact on patient adherence to treatment plans. The ability to graph results over time allows physicians to visually demonstrate to patients their progress and the effects of different behaviors or medications on their health status. Most EMR systems also allow physicians to generate patient handouts on medical conditions and treatments, and some offer patients access to reputable health resources through patient portals or patient health records.

Preventive care interventions embedded in physician EMRs give clinicians the tools they need to conduct more comprehensive immunization and screening programs, such as influenza and childhood vaccinations, or cervical, prostate and colorectal screening. In addition, there are numerous disease prevention and control guidelines that can be embedded in physician EMR systems. By helping physicians do more, and more comprehensive, prevention and health promotion with their patients, we move care further upstream and lessen the burden of disease and illness on the Canadian health care system.

Embedding preventive care and clinical decision support within EMRs will also have the effect of standardizing the care that patients receive and introduce a higher standard of care that will keep people healthier longer and out of emergency departments, busy clinics, and overstretched medical offices.

**Medication management** — Electronic prescribing has the potential to dramatically improve drug therapy. Electronic prescribing and medication management features of physician EMR systems deliver point-of-care drug interaction alerts and decision support, show comprehensive patient medication profiles, generate reminders, and create legible, accurate and complete prescriptions that are ready to be printed or electronically faxed/emailed to the pharmacy. These EMR prescribing features reduce errors, improve safety and assist with patient compliance, which promises not only to significantly improve medication management in the community settings where most prescriptions are written but also to decrease inappropriate prescribing patterns and adverse clinical events.

A recent U.S. study found that health care providers using an electronic system to write prescriptions were 7 times less likely to make errors than those writing their prescriptions by hand, concluding that EMRs may “significantly improve ambulatory medication safety.” A Canadian study found that primary care physicians believe integrated electronic prescribing and drug management systems will improve continuity of care; they also were more likely to use these systems for patients with more complex, fragmented care.

EMRs simplify identification and reporting of adverse drug events. A recent Pfizer study indicated that nearly 60% of U.S. physician respondents said adverse event reporting through an EMR system would improve patient care. EMRs were found to improve the likelihood of physician-reported adverse events — a key component to improving patient safety. EMRs can be leveraged to increase both the number and quality of reports in a manner that is “unobtrusive” and converge-
nient for physicians: during the 5-month study, physicians submitted “hundreds of detailed reports [to the U.S. Food and Drug Administration]” whereas most had submitted none over the previous year using “traditional” and far more time-consuming (up to 40 minutes) paper reporting.

In Ontario, medication management solutions are expected to help prevent 217,000 adverse drug events, 20,000 hospitalizations and 2,200 deaths per year, and save the province $350 million in health care costs.47

Continuity of care, access and wait times — A recent report from the College of Family Physicians of Canada (CFPC) highlighted physician office EMRs as central facilitators of continuity of care,48 and Canadian studies have validated the role of IT in preventing avoidable hospitalizations.49

Further examples of the EMR’s ability to facilitate continuity of care can be found in the experiences of large U.S. health organization-led EMR projects, such as Kaiser Permanente, Veterans Affairs (VA) and the Cleveland Clinic. Kaiser found that an integrated and comprehensive EMR shifts the pattern of ambulatory care toward more efficient contacts for patients and providers, while maintaining quality of care and patient satisfaction.50 The VA approach to continuity of care uses a broadly deployed EMR as its foundation, and pilot programs have demonstrated improved patient satisfaction and improved physical and mental health functional status for patients.51

EMR systems also maintain continuity of care by enabling remote access,23,52 a capability that has particular promise for rural and remote locations across Canada.53 The ability to more efficiently manage patient populations and care interventions through the use of physician EMR systems offers significant potential for improving access across the ambulatory care setting. In Ontario, EMRs have helped some physicians take on more patients; coupled with the move to team-based practice models, the adoption of EMR systems is improving access to primary care physicians for an estimated 2.5 million Ontarians.54

EMRs also help to better manage the referral process and improve wait times. The Primary Care Wait Time Partnership report states that templates for referrals and consultation advice could improve the referral process, and electronic medical records and communication tools must be in place in primary care before reasonable wait time targets can be established and effectively used.55 A European Union study of EMRs in Denmark estimated the cost saving of electronic patient referrals (compared to manual/paper referrals) to be £3.5 million per year. Based on this, Alberta estimated its potential savings on electronic patient referrals alone would be $3.8 million.1 For Canada as a whole this would translate to a savings of $35 million a year.

Patient involvement — Faced with a growing burden of chronic disease and illness in Canada, it is imperative that patients become more actively involved in managing their own care. Health IT solutions such as physician EMRs and a growing variety of web-based tools, self-monitoring programs, support groups and mobile applications have a critical role to play in supporting and facilitating patient involvement.

Part of the health consumerism trend and “patient-centred” care, online health tools help individuals maintain healthier lifestyles (e.g., health risk assessments and education), modify behavior (e.g., smoking cessation, alcohol abuse, stress management) and prevent and manage illness (e.g., symptom trackers for asthma, diabetes, blood pressure, weight). These tools hold “tremendous potential” for improving outcomes related to a variety of medical conditions and lifestyle issues — including diabetes, mental health disorders, medication adherence, smoking, diet and physical activity — and early research indicates they can “effectively engage consumers, enhance traditional clinical interventions, and improve both intermediate and clinical health outcomes.”56,26

Successful programs include online diabetes management, which has shown significant results for improved triglyceride levels, lower HbA1c and increased patient satisfaction;57 and online cognitive behavioral therapy, which not only has proven particularly effective in treating depression but also promises to broaden access to treatment for patients in rural or remote areas and help lead more people with depression to seek treatment “discreetly.”58,59,26

Many online tools and programs encourage physician—patient communication and shared decision-making, which contributes to their impact on clinical outcomes.26 This is of significant value considering the cost burden of these health issues and their impact on workplace productivity. Growing numbers of employers now include online health tools in their employee assistance programs to help keep employees healthy and “boost productivity by reducing absenteeism, sick days and disability claims.”560,61 There also are numerous e-health tools targeted at youth, such as Health Canada’s interactive web program Quit 4 Life62 and the
highly successful U.S.-based childhood asthma site Boston Breathes. Patients’ access to their own health information through patient portals or personal health records (PHRs) supports a more active role for patients in managing their own health care, especially when tied to a physician or health organization EMR. Kaiser is one well-known example of a successful PHR (My Health Manager) “tethered” to an EMR (KP Health Connect); together they offer secure access to records and email with health care providers, online health tools (e.g., weight management, pain management, smoking cessation) and healthy lifestyle programs (e.g., for diabetes, depression, insomnia and back pain) to more than 8.6 million Kaiser Permanente patients.64,65

Similar arrangements exist and are gaining ground in Canada. Examples include Sunnybrook Hospital’s MyChart;66 McGill University Health Centre’s Unani;67 and the Canadian Medical Association’s mydoctor.ca Health Portal.32 Currently used by 5,000 patients, the latter offers a variety of interactive patient tools including blood pressure, asthma, weight and exercise trackers; secure access to records and messaging with physicians; and an extensive library of patient education resources.

Mobile applications offer to “make it much easier for people to keep track of behavior that poses a risk to their health”60 such as allowing physicians to send reminders, test results and other health information securely to their patients’ mobile devices.68

Online networks and support groups also play a role in helping patients manage their health, especially the chronically ill.69 Patient networking sites cover a broad spectrum of disease communities and offer a wealth of disease-specific experience, such as PatientsLikeMe (e.g., ALS, multiple sclerosis, Parkinson’s disease) and Diabetes Connect.

Further development and use of these online health tools, along with physician EMRs, is essential for getting patients more involved and responsible for managing their own health, helping Canadians stay productive and enjoy an optimal quality of life.

Public health — Not only can physician EMR systems easily identify patients who have been screened for reportable diseases or who are affected by drug or device recalls; the EMR also can act as a real-time surveillance tool to mitigate the negative impact of outbreaks such as influenza, H1N1 and SARS.

In 2009 the Public Health Agency of Canada (PHAC) embarked on a demonstration project in conjunction with clinicians and industry that uses primary care EMRs to enhance influenza surveillance efforts throughout Canada. It provides a unique opportunity to protect the health of Canadians while demonstrating the power of the EMR as a rapid and reliable source of public health information.70,71

“Surveillance is a critical element of Canada’s pandemic plan… Currently, PHAC is exploring with frontline physicians and national partners a pilot surveillance project to track in real time shifts in pandemic influenza severity and associated risk factors with the help of non-identifying surveillance information from electronic medical records at sentinel sites. This sentinel surveillance tool will be used to inform the public health response to the current H1N1 influenza pandemic to help reduce the impact of this outbreak.”

— Public Health Agency of Canada, 200972

Automated searches programmed into the physician’s EMR system allow clinics to extract relevant public health information with minimal disruption. Through this channel public health authorities can gather up-to-date information on vaccine uptake and efficacy, as well as the nature of illness while an outbreak is underway.

The real power of the EMR for public health lies in its ability to do near real-time disease surveillance and rapidly implement surveillance and intervention guidance from public health officials. The type of data provided by EMRs (e.g., rich, rapid, real-time) also permits officials to rapidly determine if their interventions are effective. This will change the relationship between primary care providers and public health officials, and allow them to work together to protect patients in a much more effective manner.
Section 4. Different path, same destination

eHealth should be an essential component of any plans and strategies for health system reform in the 21st century
—World Health Organization, 2010

What needs to change

Bringing a concerted focus to address Canada’s pressing health care and health system issues, and achieving the benefits in a relatively short time frame, requires a change in investment strategies. The goal now needs to be “speed up information liquidity.”

Canada Health Infoway was created in early 2001 to foster and accelerate the development and adoption of pan-Canadian electronic health information systems. In spring 2003 Infoway published an Electronic Health Record Solutions (EHRS) Blueprint that has guided provincial and regional eHealth strategies and agendas for much of the past decade. Two basic HIT architectures emerged early in the design of the current HIT investment strategy: the hub-and-spoke repository, a top-down architecture approach that collects and stores critical health information in large jurisdictionally coordinated repositories, and point-to-point information exchange, a bottom-up architecture approach wherein each provider maintains his/her own database and shares elements of information as requested. The centralized hub-and-spoke repository was the preferred approach adopted by Infoway and most provincial jurisdictions.

While the Infoway architectural framework offers many benefits (e.g., standards, client and provider registries), its top-down implementation approach requires the development and deployment of many large-scale core components, such as the Health Information Access Layer (HIAL) and Shared Health Record (SHR) repository, before the exchange of health information can occur.

Since referral patterns show that most patients typically access health care services and organizations that are located in a relatively small geographic area, the CMA proposes shifting the emphasis of the HIT agenda to a more bottom-up approach that exploits the information-sharing needs in local referral areas and accelerates the realization of benefits from HIT investments made to date.

Can it be done?

The current centralized, top-down EHR approach scores high in cost and risk of failure, and low in short- to medium-term return-on-value as measured by health care improvements for Canadians. One-third of all IT projects fail because they are cancelled or do not deliver the value that was promised. The probability of failure increases for larger projects. As the Auditors General noted in their reports, all provincial HIT programs have missed their target dates for implementation, exceeded their estimated budgets, and failed to show clear benefits.

The arguments against changing to a more grassroots, bottom-up agenda have been the need to ensure interoperability between the component pieces and to better manage the overall costs. As Infoway stated in its 2015 vision document, the two system architectures will likely converge over time. The bottom-up approach (information exchange system) is faster to roll out, faces significantly less resistance from clinicians, and delivers savings on administrative costs by eliminating paper transfers. The good news is that through the efforts of the Infoway Standards Collaborative, standards now have been developed that allow for effective regional solutions that eventually can be linked to province-wide systems.

Our current inability to connect the frontline points of care is delaying the attractiveness and value for clinicians to adopt an EMR. Investing now in local and regional solutions will allow clinicians to share data with colleagues, patients, other health care providers and regional management, and help accelerate adoption.

The technology landscape has changed considerably since the Infoway EHRS Blueprint was developed. Nearly everyone today uses a computer in some aspect of their personal or work life; 10 years ago, iTunes was just hitting the market and neither Facebook nor Twitter existed. Computer processing power and memory has increased approximately sixfold, while disk storage prices have plummeted. Client/server computing models, particularly in the EMR market, are giving way to “peer-to-peer” and “cloud” computing models. Today it is more practical, less expensive and more compelling to consider grassroots information exchange that does not rely on central information repositories than it was 10 years ago.
To date we have not seen major HIT investments having much impact on the delivery of care in Canada, mainly because the current investment strategies do not mirror how care is provided. The top-down approach taken thus far by Infoway and most jurisdictions focuses the majority of investment on large-scale HIT systems and architecture, with only a small portion targeted to supporting frontline points of care.

But health care is fundamentally a locally-delivered service. More than 85% of care occurs at the community level (Fig. 1) and very few individuals go outside their local catchment area to receive care.\textsuperscript{12,13}

To accelerate adoption of information technology in health care, we must focus on the patients and where they interact with the health care delivery system. There is a solid foundation to build on; HIT investments to date have established the core infrastructure necessary to support a more bottom-up or grassroots approach — one that focuses on the front lines of primary care delivery and identifies local and regional solutions that deliver tangible benefits in the short term.

By automating and connecting ambulatory points of care (e.g., physician offices, labs, pharmacies and hospitals), we will more quickly deliver IT solutions that support clinicians, produce timely clinical value for patients and providers, and achieve savings in the shorter term (12–18 months) for the health care system. These are investments in low-risk and less costly infrastructure, which is an important consideration given the difficult financial situations facing all government jurisdictions. Finally, by automating and connecting the points of care where the majority of patient data is generated and captured, we establish the foundation required to realize a broader pan-Canadian HIT agenda.

**Section 5. Proposed HIT investment strategy**

**Rationale**

To date we have not seen major HIT investments having much impact on the delivery of care in Canada, mainly because the current investment strategies do not mirror how care is provided. The top-down approach taken thus far by Infoway and most jurisdictions focuses the majority of investment on large-scale HIT systems and architecture, with only a small portion targeted to supporting frontline points of care.

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**Setting priorities and goals**

It is the CMA’s view that future HIT investments need to be directly tied to achieving specific goals. We need to provide clear evidence that we are making a difference. There are several areas where, by building on current investments, we can demonstrate value measured in terms of the return to patients (e.g., safer care, improved access, quality and outcomes).

In analyzing the pressures on governments, CMA has identified **clinical and system priorities** that can benefit from HIT investment over the next 3–5 years and that are measurable. These are listed in Table 4.

The proposed investments are built around accomplishing **3 interim goals** to guide activity:

1. Significant adoption of EMRs by primary care and specialist physicians in ambulatory settings.
2. Accelerating the exchange of health information to support the majority of health care transactions.
3. Increasing the effective use of EMRs and related solutions to meet pressing health and system issues.

**Proposed framework of activity**

Figure 2 provides a framework of activity for the investment program that CMA is recommending.

**Table 4 Clinical and system priorities for HIT investment in Canada**

<table>
<thead>
<tr>
<th>Priorities</th>
<th>Benefit of HIT investment/activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic disease management (diabetes, heart failure etc.)</td>
<td>Effective/comprehensive monitoring and management of chronic disease through physician EMRs, web-based patient tools and mobile devices</td>
</tr>
<tr>
<td>Prevention</td>
<td>Embed best practices into EMRs to support preventive care</td>
</tr>
<tr>
<td>Medication management</td>
<td>Embed medication management/decision support tools in all EMRs</td>
</tr>
<tr>
<td>Continuity of care</td>
<td>• Improved information liquidity (digital information flows with patient)</td>
</tr>
<tr>
<td></td>
<td>• Improved access (increased ability of physicians to take on more patients)</td>
</tr>
<tr>
<td></td>
<td>• Reduced wait times (electronic management of referral process, templates to facilitate information exchange, and better reporting on wait time targets)</td>
</tr>
<tr>
<td>Patient involvement</td>
<td>Electronic access to their own health information, combined with online resources and tools (ideally “tethered” to the physician EMR) will enable patients to be more active in managing their health care</td>
</tr>
<tr>
<td>Public health reporting (e.g., influenza, SARS, H1N1)</td>
<td>Near real-time data collection and reporting by frontline physician EMRs (e.g., Public Health Agency of Canada EMR demonstration pilot project)</td>
</tr>
</tbody>
</table>

**Fig. 2 Framework for activity (for HIT investment)**

**Required investments**

To support this framework of activity and achieve our 3 interim goals, Table 5 lists the investments in HIT that are required.
### Table 5 Required investments in HIT

<table>
<thead>
<tr>
<th>Amount</th>
<th>Description</th>
</tr>
</thead>
</table>
| **$410M** | To support significant adoption of EMRs by physicians in ambulatory care settings:  
EMRs — Approximately 49,200 physicians* (GPs and specialists) in Canada have a clinic outside of an acute care setting. Of those, an estimated 18,200† already have an EMR. A further 10,500 will be covered by the current programs in 5 provinces‡ that fund physicians to acquire an EMR (program estimates up to 2014). This leaves an unmet need of approximately 20,500 physicians who will need funding to acquire an EMR. Helping these physicians adopt EMRs would require an investment of approximately $20,000 per physician.§ |
| **$310M** | Transition support and change management — Experience has shown that a strong transition support and change management program is required to ensure the effective use of EMRs in clinical settings and address transition problems. The estimated cost per physician for a well-developed change management program is equal to the hardware and software purchase cost of $15,000 per physician; To support the 20,500 physicians who still need an EMR requires an estimated investment of $310 million. |
| **$10M** | Functional requirements for specialists — Community-based specialists and surgeons have unique workflow and technology requirements that need to be addressed to increase EMR adoption. Building on work already done by the Physician Information Technology Office (PITO) program in B.C., this investment would be used to identify functional requirements for specialists that should be included in EMR product design, the e-referral process, hospital interfaces, unique device integration and documentation requirements. |
| **$5M** | Data migration — The EMR marketplace in Canada is still immature and within 5 years only 4 or 5 vendors are expected to dominate. This means that over the next 5 years many physicians will need to migrate to different EMR products as vendors go out of business, consolidate, are excluded from government funding, etc. Investment is required to finalize a data migration standard that should be built into all future specifications for any EMR in Canada to ease the data migration process. |
| **$20M** | Applied research — The introduction of IT into the health sector has been based on the belief that health care delivery effectiveness can be achieved and that cost efficiencies can be realized. While there are many anecdotal examples where these goals have been achieved, there is very little evidence-based (applied) research. The objective of this investment ($20 million over 5 years) would be to build a body of knowledge on how to integrate IT into clinical processes in order to improve care, improve safety and avoid unnecessary costs (both financial and time), then translate this information into learning modules for clinicians. |
| **$5M** | Consumer health — The experiences to date of physicians who have been working with their patients through online portals and/or patient health records suggests that there are many opportunities to leverage these tools to communicate, share information and involve patients to improve care. We recommend setting up an applied research agenda to explore what works and what does not. |
| **$2M** | EMR decision support tools — EMRs can address the majority of issues associated with medication management and, in addition, support physicians in meeting preventive care guidelines. The review of the 20 EMR case studies§ has shown that physicians with an EMR and appropriate decision support tools can take significant steps toward reducing medication errors and helping patients follow guidelines for preventive care. The uneven nature and application of these solutions is the challenge. The CMA believes that Infoway should fund the development by a group such as the Canadian Agency for Drugs and Technologies in Health (CADTH) of readily available clinical decision tools for preventive care and medication management, to be made available to all EMR vendors at no cost. |
| **$10M** | Natural language processing — Three major stakeholder groups have an interest in using the personal health information that is captured during the care encounter: clinicians, system managers (e.g., deputy ministers, executive officers of health authorities) and health researchers. Each group needs information in different structures and levels of detail. We need to examine alternative ways to structure and extract patient encounter data that do not require additional work or administrative processes from clinicians at the point of care. There now are several solutions in the marketplace that use natural language processing to create structured data sets. The CMA believes that Infoway should fund an initiative to examine the usefulness of tools that would convert unstructured data to standardized formats, and determine whether such a solution could be made available to all EMR vendors at no cost. |
| **$100M** | Regional interoperability solutions — Health care is very localized and the best information suggests that at least 85% (if not more) of care processes could be supported by a local interoperability solution. Investing now in local and regional solutions will allow clinicians to share data with their colleagues, patients, and regional management. From a cost perspective, this approach is far less costly and much quicker than building the centralized hub-and-spoke architecture. |
| **$1M** | Interoperability standard — To facilitate the investment in regional interoperability solutions we need to issue an interoperability standard. The Standard Collaborative’s top priority should be to issue an interim standard based on work completed to date. This standard needs to be issued by the end of summer 2011 at the latest. A Working Group of government representatives, industry and clinicians should be established as soon as possible. |
| **$50M** | Telehealth — The ability for patients and clinicians to engage in remote or distance consultations provides a means to address issues associated with access to health care. CMA supports further investment in telehealth networks across Canada. |

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* National Physician Survey (NPS) 2007 data  
† Commonwealth Fund International Health Policy Survey of Primary Care Physicians, 2009 results  
‡ British Columbia, Alberta, Saskatchewan, Ontario and Nova Scotia  
§ Based on one-time costs to acquire and implement an EMR in a clinic; does not include ongoing funding to maintain/operate an EMR-supported clinic  
¶ Based on existing programs in B.C., Alberta and Ontario and Kaiser Permanente’s experience in the U.S.
Section 6. Setting the 5-year timeline for HIT investments

The CMA proposes that the investment strategy outlined in the previous section be executed over the next 5 years. Two key components will be the integration of EMRs into point-of-care settings, and the introduction of regional interoperability solutions in local catchment areas where patients receive the majority of their care. The ability to move forward with these investments will be governed by EMR vendor capacity to meet demand, and by the development of an interoperability standard that is mandatory in any regional interoperability solutions.

Representatives from all of the current provincial funding programs for EMRs were consulted to identify any challenges that will influence the rate at which physician EMR implementations can occur. This information then was used to develop a timeline for the overall HIT investment program. Table 6 identifies the recommended set of cash flow targets per year that will be required to move forward on all parts of the HIT investment strategy.

Table 6 Recommended set of cash flow targets per year

<table>
<thead>
<tr>
<th>5-year timeline for HIT investments</th>
<th>Investments by year, $m</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Total investment, $m</th>
</tr>
</thead>
<tbody>
<tr>
<td>To support significant adoption of EMRs by primary care clinicians:</td>
<td></td>
<td>40</td>
<td>100</td>
<td>100</td>
<td>120</td>
<td>50</td>
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<td>• EMRs*</td>
<td>30</td>
<td>80</td>
<td>90</td>
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<td>35</td>
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<td></td>
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<tr>
<td>• Transition support and change management†</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
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<td>• Functional requirements for specialists</td>
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<td>2</td>
<td>2</td>
<td>2</td>
<td>10</td>
<td></td>
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<tr>
<td>• Data migration‡</td>
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<td>2</td>
<td>2</td>
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<td></td>
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<tr>
<td>To increase effective use of EMRs and HIT solutions:</td>
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<td>46</td>
<td>48</td>
<td>50</td>
<td>52</td>
<td>206</td>
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<tr>
<td>• Applied research§</td>
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<td>5</td>
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<td>6</td>
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<tr>
<td>• Consumer research</td>
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<td></td>
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<td>• EMR decision support tools</td>
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<tr>
<td>• Natural language processing</td>
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<td>2</td>
<td>2</td>
<td>10</td>
<td></td>
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<td>To accelerate health information exchange:</td>
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<td>• Regional interoperability solutions</td>
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<tr>
<td>• Interoperability standard</td>
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<td>20</td>
<td>20</td>
<td></td>
<td></td>
<td>50</td>
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</tr>
<tr>
<td>TOTAL, in $m</td>
<td>88.1</td>
<td>237.5</td>
<td>263.4</td>
<td>229</td>
<td>105</td>
<td>923</td>
<td></td>
</tr>
</tbody>
</table>

* Some of the current provincial funding programs will be able to increase their capacity and speed up the rate of EMR implementation. However, the majority of physicians needing financial support will come from jurisdictions that currently do not have an EMR program. We anticipate that it will take until well into Year 2 before any new programs come online and move into the implementation phase. Therefore, expenditures will start to grow in the latter part of Year 2.

† Change management expenditures are directly tied to the speed of EMR implementations in clinics. A good portion of these expenditures will precede actual implementation in order to help clinics prepare for automation.

‡ Data migration costs will be driven by the rate at which physicians/clinics need to change vendors. Standards already exist that could be built into future EMR specifications; all that is required is agreement on one common standard.

§ The applied research agenda for IT and consumer health could be carried out by an organization such as Canadian Health Services Research Foundation or Canadian Institutes of Health Research.
Section 7. How do we measure success?

Three key objectives of primary care: (1) Providing care and treatment when people are ill; (2) Helping people stay healthy; (3) Reaching out to those groups in the community who have poor health or who are missing out on primary health care.

To evaluate whether frontline IT investments designed to accelerate physician use of EMRs/HIT have been successful and are leading to improved outcomes and health benefits, there is a need to establish EMR performance measures (functional indicators) and EMR-related quality outcome indicators.

Physician–EMR functional performance measures

The establishment of a set of physician EMR performance measures (functional indicators) provides a means to report and evaluate the success of HIT investments in physician EMRs. The 2006 and 2009 Commonwealth Fund International Health Policy Survey of Primary Care Physicians provides an international set of benchmarks for EMR/IT use.

In this model, physician EMR performance is measured according to 2 categories of functional indicators. First, physician use of EMRs/HIT in their practices on a routine basis for “core tasks” (e.g., electronic ordering of laboratory tests; electronic access to patients’ test results; electronic prescribing of medication; electronic alerts/prompts about a potential problem with drug dose/interaction; and electronic entry of clinical notes); and second, computerized capacity to generate patient information (e.g., list of patients by diagnosis; list of patients by lab result; list of patients who are due or overdue for tests/preventive care; list of all medications taken by an individual patient).

Going forward, the CMA proposes that starting in 2011 each jurisdiction (e.g., as part of their EMR funding program) undertake an annual survey based on this model to measure how primary care practices are progressing in EMR performance and use according to each of these functional indicators.

Physician EMR-related quality outcome indicators

Targeted investment in frontline HIT solutions is expected to generate improvements in health outcomes. To determine whether progress is being made, a set of indicators needs to be defined that allows us to measure improvements and track progress over time. Optimally this would permit comparison of Canadian results with other jurisdictions/countries.

The Canadian Institute of Health Information (CIHI) has developed a set of primary health care indicators that are used to compare and measure primary health care at multiple levels within jurisdictions across Canada. A subset of these primary health care indicators was identified for physician EMR systems (primary health care indicators, EMR data set) and organized into 3 categories: primary and secondary prevention, patient safety, and outcomes. The EMR quality outcome indicators for primary and secondary prevention include: health risk screening; cervical cancer screening; influenza immunization 65+; pneumococcal immunization 65+; screening for modifiable risk factors in adults with coronary artery disease; screening for modifiable risk factors in adults with hypertension; and screening for modifiable risk factors in adults with diabetes. The patient safety indicators include antidepressant monitoring. The outcome (chronic disease management) indicators include: glycemic control for diabetes; blood pressure control for hypertension; treatment of dyslipidemia; and treatment of depression.

The CIHI primary health care indicators are similar to indicators used in other jurisdictions, including Alberta, Manitoba, the United States, New Zealand, and the United Kingdom. In particular, all of these jurisdictions employ indicators to assess and monitor outcomes related to the health challenges identified earlier in this document.

Going forward, specific measures will need to be determined for each indicator. The CMA proposes that CIHI primary health care indicators form the basis for the physician EMR quality outcome indicators used to assess the impact of HIT investments. The CMA further proposes that an open process involving all stakeholders be used to refine the CIHI primary care indicators to ensure that they meet the varying needs of each group. These indicators should be finalized by June 2011.
Appendix 1. Detailed analysis of health issues and challenges facing Canadians

Between 1994 and 2005, rates of high blood pressure among Canadians skyrocketed by 77%, diabetes by 45% and obesity by 18% — affecting both younger and older Canadians. Moreover, even younger age groups are experiencing increases in risk: among those 35 to 49 years of age, for example, the prevalence of high blood pressure increased 127%, diabetes by 64% and obesity by 20% — all major risk factors for heart disease.

— Heart and Stroke Foundation, 2010

Canadians are increasingly at risk for major health issues associated with lifestyle choices and changing demographics. In the case of many chronic medical conditions, targeted investments in frontline EMRs and IT-enabled health care solutions — such as patient portals, web-based tools and mobile self-monitoring devices — can offer significant, real-time benefits to patients and health care providers.

Pressing health issues that would immediately benefit from the application of information technology include chronic disease and medication management, preventive care, continuity of care, patient involvement and public health. Access to care would be improved by EMR capacity in physicians’ offices augmented by local connectivity with other frontline health care services, and wait times would be reduced by electronic referrals and standardized information templates. From the perspective of Canadian patients and their physicians, many of these issues overlap.

What is the scope of the problem?

**Chronic disease** — Chronic disease in Canada is on the rise. Recent reports warn that Canada is facing a “perfect storm” of heart disease and an “economic tsunami” of diabetes. With growing numbers of both younger and older Canadians at risk, managing chronic disease is one of our most pressing health challenges.

The sheer number of Canadians affected by “high-impact, high-prevalence” chronic conditions is striking. Two-thirds of deaths in Canada are the result of chronic disease and the number of people living with chronic conditions is expected to rise as the result of lifestyle factors (e.g., poor diet, inactivity, and smoking) and changing demographics, especially our aging population. Most disturbing is that chronic disease is on the rise among Canadian children and young adults, largely due to the increasing prevalence of childhood obesity. More than one-half of Canadian adults (61% or 13.2 million) and one-quarter of Canadian children aged 6–19 years (26% or 4.1 million) are overweight or obese, leading to shorter life expectancies than those of their parents.

The need for better chronic disease management has never been greater and is identified by the Canadian Institute for Health Information as the area that requires the most improvement.

**Diabetes** is a contributing factor in the deaths of about 41,500 Canadians each year and a leading cause of heart disease, kidney disease, blindness and amputation. Canada now has the third highest rate of mortality due to diabetes among major developed countries, and this rate is rising steadily. Today 2.5 million Canadians live with diabetes, at a direct cost of $12.2 billion per year; by 2020 this figure is expected to reach 3.7 million, or 1 in 10 Canadians, and cost $16.9 billion.

**Heart disease** is Canada’s number one health problem and the leading cause of death, hospital admissions and drug costs in the country. Heart disease (or cardiovascular disease) refers to diseases that involve the heart or blood vessels and covers a range of conditions, including, heart failure, stroke and coronary artery disease, and costs the country $22 billion each year. Major risk factors include high blood pressure, diabetes, smoking and obesity — with 1 in 5 Canadian adults aged 50–64 already having 2 or more of these risk factors “right now.” An estimated 400,000 Canadians live with heart failure, a number that will continue to rise as people with damaged hearts are living longer and become more susceptible to complications.

**Hypertension** (high blood pressure) increases the risk for heart disease, kidney disease, heart attack and stroke, and represents an estimated $2.4 billion per year in direct costs. At least 1 in 5 Canadians over the age of 20 is aware they have this condition, but the actual number of Canadians affected could be much higher. Between 1994 and 2005, rates of high blood pressure among Canadians skyrocketed by 77%; today there are more than 250,000 young Canadians in their 20s and 30s with high blood pressure. According to experts, “the real tragedy is that this is largely preventable.”
Asthma is another major chronic health issue, affecting an estimated 3 million Canadians, among whom a staggering 60% do not have control of their disease and risk severe, life-threatening attacks and permanent lung damage. Asthma is most common during childhood and a major cause of hospitalization of children, but prevalence among adults has been increasing steadily over the last 2 decades. Direct costs of asthma are estimated at $600 million per year and per patient costs are directly associated with how well the condition is managed (poorly managed asthma is 4 times more costly).

Almost 1.5 million Canadians suffer from serious depression at any point in time, but less than one-third seek medical help. Mental illness is the second leading cause of disability and premature death and 1 of every 5 Canadians will be affected during their lifetime. Mental health is among the costliest chronic conditions in Canada, with direct and indirect costs estimated at $14.4 billion; lost productivity alone accounts for $6 billion.

Cancer remains the leading cause of premature death in Canada. An estimated 171,000 new cases and 75,300 deaths were expected to occur in Canada in 2009, with increases in the number of new cases primarily due to a growing and aging population. Three types of cancer account for the majority of these cases: lung and colorectal cancer are the first and second leading causes of cancer deaths in both men and women, followed in third place by breast cancer (women) and prostate cancer (men). The total cost of cancer in Canada was estimated to be $14.2 billion in 1998; the direct cost of health care services (mainly hospital) was $2.5 billion, and indirect cost due to deaths and lost productivity was $11.8 billion. It is well documented that modifiable risk factors exist for many common cancers (including breast, colon, kidney, lung and prostate), and an estimated 30% to 40% of all cancer cases could be prevented over time by a combination of properly managed diet, activity and weight.

Prevention — With chronic disease affecting growing numbers of Canadians young and old, preventing and managing disease has never been more critical. Preventive health care is one of the cornerstones of primary care delivery and targets both disease prevention and health promotion. Preventive care involves both routine population health interventions (e.g., screening and vaccination) and encounter-driven guideline-based interventions that occur when a patient presents for treatment (e.g., periodic health exams and preventive care checklists). Currently we lack the ability to deliver preventive care in a systematic and comprehensive manner. In 2009 only 27% of primary care physicians reported receiving routine reminders (paper or electronic) to perform screening or guideline-based interventions, and only 31% reported routinely sending patients reminders for preventive or follow-up care.

Medication management — Another critical health issue facing Canadians and their physicians is medication management. With chronic disease on the rise and multiple chronic conditions affecting the elderly, safe and effective medication management is essential for managing disease and preventing adverse clinical events. Because the majority of prescriptions are written in community settings, adverse events and prescription errors are a significant threat to patient safety, as are a lack of patient understanding and compliance.

Recent studies in the U.S. found that nearly 2 in 5 handwritten prescriptions in community practices had errors, most resulting in callbacks and lost time; one-third to one-half of all patients do not take their medications properly; and 1 in 5 prescriptions are never filled, even among patients with chronic conditions where non-adherence can have serious health consequences. In 2007 the Health Council of Canada reported that “under-, over- and misuse of medications are ongoing concerns” and “prescribing practices vary widely” across the country. Effective medication management requires more robust and systematic mechanisms to deal with adverse events, prescription errors and patient non-compliance.

Continuity of care, access and wait times — At least one-third of Canadians are unhappy with the “continuity” aspect of their care. Continuity of care involves the coordination of health care services delivered over time. In large part this is a function of how well information flows with patients as they move through and interact with different points of care (e.g., GPs, specialists, labs, pharmacies, local hospitals, home care facilities). Continuity of care becomes increasingly important as the toll of chronic disease rises, since chronic conditions increase the likelihood that a patient’s care will involve multiple providers and interventions. A 2009 study of primary care in Canada found “gaps” in the management of patients with chronic conditions; 40% had no long-term treatment plan and fewer than 25% received written instructions on how to manage their disease.
Often described as “system” issues, both access to care and lengthy wait times are continuity issues. Currently 5 million Canadians do not have a family doctor.\cite{107} Of those who do, many remain concerned about lack of timely access to see their family physician, undergo diagnostic tests, or see a specialist. Canada ranked last among 8 countries surveyed in 2008 on access to a physician for patients with chronic conditions — only 26% of patients reported access to a same-day appointment; 34% reported waiting 6+ days or were never able to get an appointment.\cite{108} In 2009, fewer than half of Canadian primary care practices reported that they had arrangements for patients to receive after-hours care.\cite{11} And in 2007 the Health Council of Canada reported long waits for primary care and “high use” of emergency departments for conditions that could have been treated by the patient’s regular physician.\cite{103}

Long wait times for referrals to specialists exacerbate many of the health problems facing Canadians. In 2009 three-quarters (75%) of Canadian physicians reported their patients often face long waits to see a specialist, compared to 28% of U.S. physicians; and nearly one-half (47%) of Canadian physicians reported their patients often have difficulty getting specialized diagnostic tests.\cite{11} Long waits to see specialists and undergo diagnostic tests and/or treatment contributes to the burden of disease and illness in Canada. Many efforts have been made to reduce wait times, but the Canadian health care system continues to struggle with this.

**Patient involvement** — With chronic (not acute) disease the primary cause of illness, patients have become “a partner in the process” and no longer remain “inexperienced and passive recipients.”\cite{109} Self-management or patient involvement is crucial for people living with chronic conditions, and a recent report from the College of Family Physicians of Canada (CFPC) indicates that the appropriate tools to support and encourage patients are lacking.\cite{110} Most patients have difficulty remembering everything they are told about their diagnosis or treatment during an encounter. Compliance with medication and other treatment regimens, particularly those requiring behavior changes (e.g., smoking cessation, dietary restrictions, exercise regimens, stress management) are far from optimal. In 2009, fewer than 20% of Canadian primary care physicians reported that they routinely give chronically ill patients written instructions on managing care at home, or that they give patients written lists of all their medications.\cite{11} The Health Council of Canada notes that chronic illness is “far from being truly patient-centred” and advised governments to invest in strategies that “engage people in managing their own chronic health conditions.”\cite{110}

**Public health** — Public health plays a critical role in keeping Canadians healthy and preventing the spread of infection, disease and pandemics; however, public health reporting and surveillance in Canada today faces numerous challenges that affect governments, health care providers and patients. Lack of real-time information on outbreaks and epidemics (such as the H1N1 pandemic in 2009–2010) prevents public health officials from fully understanding the incidence and prevalence of illness in the community. It also limits their ability to determine the effectiveness of interventions such as the costly H1N1 vaccination program. The information gap on disease burden in the community and the impact of interventions also means that public health is not in a position to get valuable information back out to frontline providers and patients.
References


