Ministry of Health and Long-Term Care and eHealth Ontario

Electronic Health Records' Implementation Status

1.0 Summary

The Ministry of Health and Long-Term Care (Ministry) began developing provincial technology infrastructure in 2002 with the creation of the Smart Systems for Health Agency. The functions of this agency, as well as a Ministry branch that previously worked on Electronic Health Record (EHR) application and clinical data management projects, were amalgamated into eHealth Ontario when it was created in 2008.

eHealth Ontario's mandate is to implement a system that, in addition to providing an EHR for every Ontarian, includes a data network that stores EHR data and makes it quickly and securely available to health-care providers.

An EHR is defined as a digital lifetime record of an individual's health and health-care history, updated in real time and available electronically to authorized health-care providers. An EHR system allows for the exchange of stored patient health information so that health-care professionals can quickly access patient data, thereby improving quality of care and creating efficiencies.

EHRs will replace physical records (on paper and x-ray film, for example) that are not always up to date or readily accessible to health-care providers, creating a potential for error and duplication.

In 2008, and again in 2010, the Ministry set 2015 as the target year for eHealth Ontario to implement a fully operational EHR system across Ontario. By then, although some EHR projects were up and partially running, a fully operational province-wide EHR system was not in place. The Ministry did not formally extend the 2015 deadline, but eHealth Ontario continued its work and expects to complete the remainder of its project-build work by March 2017. It is unclear when a fully operational EHR system will be available in Ontario.

We found that implementation of EHRs in Ontario has progressed over the last 14 years. For example, the Ontario Laboratories Information System contains a significant number of lab tests done in the province, and many community-based physicians have adopted Electronic Medical Records that replace patients' paper files.

While some individual systems have been developed to collect and provide specific types of patient health information, they do not have complete information and full functionalities, and there is still no provincially integrated system that allows easy and timely access to all this information.

This means that it is still not possible for all authorized health-care professionals to access complete health information (e.g., lab tests, drug information or x-rays) about a patient regardless of where in Ontario the patient received health

services. As well, not all physicians who have implemented Electronic Medical Record systems can connect to the provincial databases because of incompatible technology.

A fully operational EHR system depends on the participation of many health-sector organizations, including hospitals, community health agencies, community and hospital medical laboratories, and physicians in community practice, to input the necessary information for sharing. These organizations and professionals would each have invested in their local systems and, while some of these systems would exist even without the EHR initiative, many of these local systems contain health information needed for the provincial EHR systems. Without these local systems and the health information they contain, eHealth Ontario cannot achieve the goal of an EHR initiative.

While the Ministry has a good understanding of the spending on EHR projects managed directly by eHealth Ontario, it has not tracked the total spending on the EHR initiative incurred by other health-care organizations. Spending on projects not managed directly by eHealth Ontario includes, for example, systems used in hospitals and family doctors' offices that contain patient health information.

We used information that the Ministry maintains, along with data we gathered directly from a sample of health-care organizations, to estimate that the cost incurred so far (from 2002/03 to 2015/16) to enable the completion of EHRs across the province is approximately $8 billion.

Because the EHR initiative is still not complete, and lacks an overall strategy and budget (the Ministry only established a budget for eHealth Ontario's portion of the initiative), the Ministry does not know how much more public funding is still needed before the initiative is considered effectively implemented.

Given the continuing importance of having EHRs for the benefit of Ontarians and the health-care system, it is understood that a significant investment of taxpayer funding is needed to realize benefits to patients and health-care professionals from a provincially integrated EHR system. However, it is equally important that an overall strategy and related budget be in place to ensure that the EHR initiative is appropriately managed and that the intended benefits are achieved in a cost-effective and timely manner.

In addition to the need for a long-term strategy and budget for the remainder of the EHR initiative, it is very important to have full participation of and usage by health-care organizations and professionals because they create clinical information and rely on it to provide quality care to Ontarians. Because most of these organizations and professionals are not accountable to eHealth Ontario, the agency has been unable to fully persuade all parties to contribute clinical information to the EHR systems. As a result, some of the systems that were up and running as of March 2016 contained limited and/or incomplete patient information.

Our specific findings include:

- **More work is needed to enable a functional EHR supported by a province-wide network—**Although approximately $8 billion has been spent so far to enable a functional EHR, parts of the EHRs are still not completely in use and others are only partially functional. This spending covers a 14-year period between 2002/03 and 2015/16, and includes eHealth Ontario's project costs and EHR-related costs incurred in the broader health sector. eHealth Ontario and its predecessor agency spent $3 billion of the total, the Ministry and its funded agencies such as Cancer Care Ontario spent $1 billion, and provincially-funded local health-care organizations such as hospitals and Community Care Access Centres spent about $4 billion. The monies spent covered information technology, the accumulation of information and integrated services required in health-care organizations for sharing through the EHR systems.
- **No overall strategy and budget to guide the implementation of the entire EHR initiative—**In addition to seven eHealth Ontario

EHR projects (i.e., Ontario Laboratories Information System; Diagnostic Imaging; Integration Services; Drug Information System; Diabetes Registry; Client, Provider and User Consent Registries; and Client, Provider and User Portals), money is also spent on other projects in the EHR initiative by other health-care organizations through their annual budgets. These publicly funded health-care organizations include hospitals and Community Care Access Centres. The province has not established an overall strategy to guide the work of eHealth Ontario and all other health-sector organizations that must work together to enable a fully functioning EHR system in Ontario. As well, there is also no overall budget for all EHR projects and EHR-related activities undertaken in Ontario.

- **As of March 2016, a year after its deadline passed, seven core projects managed by eHealth Ontario were still within budget but only about 80% complete—**In a June 2010 mandate letter, the government assigned eHealth Ontario 12 EHR projects to be completed by 2015, including seven regarded as core. The government officially approved about $1 billion for the seven core EHR projects under the responsibility of eHealth Ontario, and required the projects to be completed by 2015 (with the exception of the drug information system, which had a 2016 deadline). The actual spending on these seven projects at the time of our audit was within budget. However, in March 2016, eHealth Ontario estimated that it had completed 77% of the seven core assignments. That percentage rises to 81% after taking into account that the scope of some projects changed since 2010 while others were cancelled or reassigned. eHealth Ontario says it expects to fully complete its work within budget to build the EHR systems by March 2017.
- **eHealth Ontario lacks the authority to require all health-care providers to upload data and the Ministry has not used its authority to require it—**Many factors account for eHealth Ontario's difficulty in completing projects on time. One significant factor is that it has no control over what most health-care organizations do with their own data systems. In effect, eHealth Ontario is mandated to connect these systems, but it has not been given the authority to require organizations to upload necessary clinical information into its EHR systems. As well, the Ministry has not required health-care organizations to participate in the EHR initiative.
- **eHealth Ontario-managed projects contain incomplete data—**Four specific eHealth Ontario projects that we reviewed that were available for use as of March 2016 still lacked some promised features and contained incomplete data. For example:
  - The **Ontario Laboratories Information System**, a database designed to include lab tests done in hospitals, community labs and public health labs, did not have three of the five promised functionalities working at the time of our audit. As a result, health-care professionals were not able to electronically order lab tests for patients, retrieve lab orders, or refer lab tests to other sites or labs if the receiving lab could not conduct the tests. In addition, the database did not contain about 40 million tests, including some conducted either in physician offices or labs in certain hospitals and the community that were not yet contributing to the database, and all those not paid for by the Ontario Health Insurance Plan.
  - The EHR system includes four regional **Diagnostic Imaging databases** across the province to store images such as x-rays and CT scans, and related reports. However, 60% of privately owned imaging clinics do not use digital equipment and so were

unable to upload the 5.4 million patient images they create each year. In addition, health-care professionals can only access the imaging database in the region where they practise.

- **$71 million spent on a Diabetes Registry (one of the seven core projects) that was then cancelled—**As part of the EHR project, eHealth Ontario and the Ministry spent $71 million on a province-wide Diabetes Registry, which was to contain information to help treat the growing number of Ontarians with diabetes. However, eHealth Ontario terminated the project in 2012 before it was complete. In our 2012 audit of the Diabetes Management Strategy, we indicated that factors contributing to the cancellation included delays in procuring a vendor and quality issues in the Registry. The $71-million total includes costs associated with an arbitration award to the company developing the Registry after both parties agreed to arbitration.
- **A fully-functional Drug Information System (one of the seven core projects) is not available and is four years away from completion—**The drug information system is used to track dispensed and prescribed medications of all Ontarians. eHealth Ontario was originally responsible for this project, but did not complete it. The Ministry assumed direct responsibility for the project in 2015. By March 2015, the Ministry and eHealth Ontario had spent a combined $50 million on the project. The Ministry has since redesigned the project and expects to complete it by March 2020. It plans to spend an additional $20 million on the first phase, but has given no cost estimate to complete the entire project. As of March 2016, the drug database did not contain information for about 60% of the Ontario population.
- **Utilization of clinical information by health-care professionals below expected levels and measurement of system usage was inconsistent—**eHealth Ontario reports that many of its systems that have gone online are being actively used, but its definition of "active" was less than stringent. We therefore question whether the utilization rate was actually satisfactory. For example, only 13% of registered users in the Greater Toronto Area accessed lab results and diagnostic images from a web-based viewer in April 2016, compared to a target of 20%. Different systems and databases were subject to different definitions of active use—in some cases, eHealth Ontario reported as "active" someone who used the system once every six months.

Subsequent to our audit, Canada Health Infoway (an organization composed of deputy ministers of health from across Canada) issued a report on October 7, 2016, done at the request of the Ontario Ministry of Health and Long-Term Care, which had asked for an assessment of Ontario's progress on digital health's availability, use and benefits, and how Ontario compares to other provinces and territories.

The report concluded that Ontario is well positioned relative to its peers in terms of availability, use and benefits from investments in digital health solutions. The report also estimated that in 2015, the benefit to Ontario from selected digital health projects was $900 million. The benefits estimate was, for the most part, calculated using a population-based allocation of cross-Canada overall benefits.

Also on October 7, 2016, the Minister of Health and Long-Term Care asked the Premier's business adviser to assess the value of Ontario's digital health program, its assets and all related intellectual property and infrastructure.

Our report contains 12 recommendations, consisting of 23 recommended actions, to address our audit findings.

OVERALL MINISTRY RESPONSE

The Ministry of Health and Long-Term Care (Ministry) thanks the Auditor General and welcomes her recommendations as important

inputs to strengthen Ontario's investment and operations of health-care information technology systems, including the patient's Electronic Health Record component.

The Ministry has a mandate to steward the health system, which includes systems used to run Ontario's 156 hospitals, systems used by thousands of local community and public health-care providers, and systems used to support the secure exchange of digitized clinical information to ensure the best health outcomes for Ontarians.

The audit covers the 14-year period (2002-2016) representing a time of dramatic change in health care and technology, and supported by the Ministry's investment of $8 billion in these systems and their daily operations. According to Canada Health Infoway, Ontario is well positioned relative to its peers in terms of availability, use and benefits from investments in digital health solutions, and, in 2015, Ontario benefitted $900 million from selected digital health projects. This investment represents 1.4% of the Ministry's total spend, which is lower than the approximate 4% technology spending in the United States' private health-care sector in 2010 (a year representing the middle range of the period audited).

As the foundational EHR projects approached completion, the Ministry established a governance structure to oversee the development of its renewed strategy—the Digital Health Strategy (Strategy). The Strategy, nearing completion, is built on previous Ministry-commissioned reviews and consultation with numerous province-wide stakeholders. Once approved, the Strategy will clearly outline reporting mechanisms and roles and responsibilities of delivery partners. It will address the need to leverage industry-adopted standards for secure information exchange and for value-driven innovations.

The Auditor General's recommendations are critical to refining our Strategy and ensuring it is robust. We look forward to working with Ontarians to make our health system one of the most integrated, patient-centred, modern, and sustainable health-care systems in the world.

OVERALL RESPONSE FROM eHEALTH ONTARIO

eHealth Ontario thanks the Auditor General for her observations about the progress made in the health-care technology domain and her recommendations. After addressing early challenges, the foundation of the patient's electronic health record now exists. Today, more than 84,000 clinicians are registered to use the EHR across 80% of the province's population, with plans to connect the remaining 20% within the next few months. eHealth Ontario expects this work will be done within budget.

Building and sustaining the EHR for 13 million people is the primary focus of eHealth Ontario. Health care has continuously improved with the adoption of technology across the entire health-care system; some, not all, related to the EHR implementation. Previously, in the 2009 Auditor General's Special Report, eHealth Ontario's project costs were appropriately the reference point for both cost and value. Today, the value of all these investments cannot be captured in the benefits of the EHR alone, as noted by the Auditor General's inclusion of these broader health systems and their costs in her report.

Every month, clinicians' access millions of patient records in the EHR. In the last year alone, over 138 million lab reports were viewed across multiple labs, in a "trended" way with anomalous results flagged. This example demonstrates the true value of the EHR now and into the future.

The value will continue to grow as the use of the EHR matures and the foundational elements are completed. Together with the Ministry, eHealth Ontario looks forward to addressing the Auditor General's recommendations and to

advance health care in Ontario through secure sharing of this clinically relevant information with the province's thousands of authorized health-care professionals.

2.0 Background

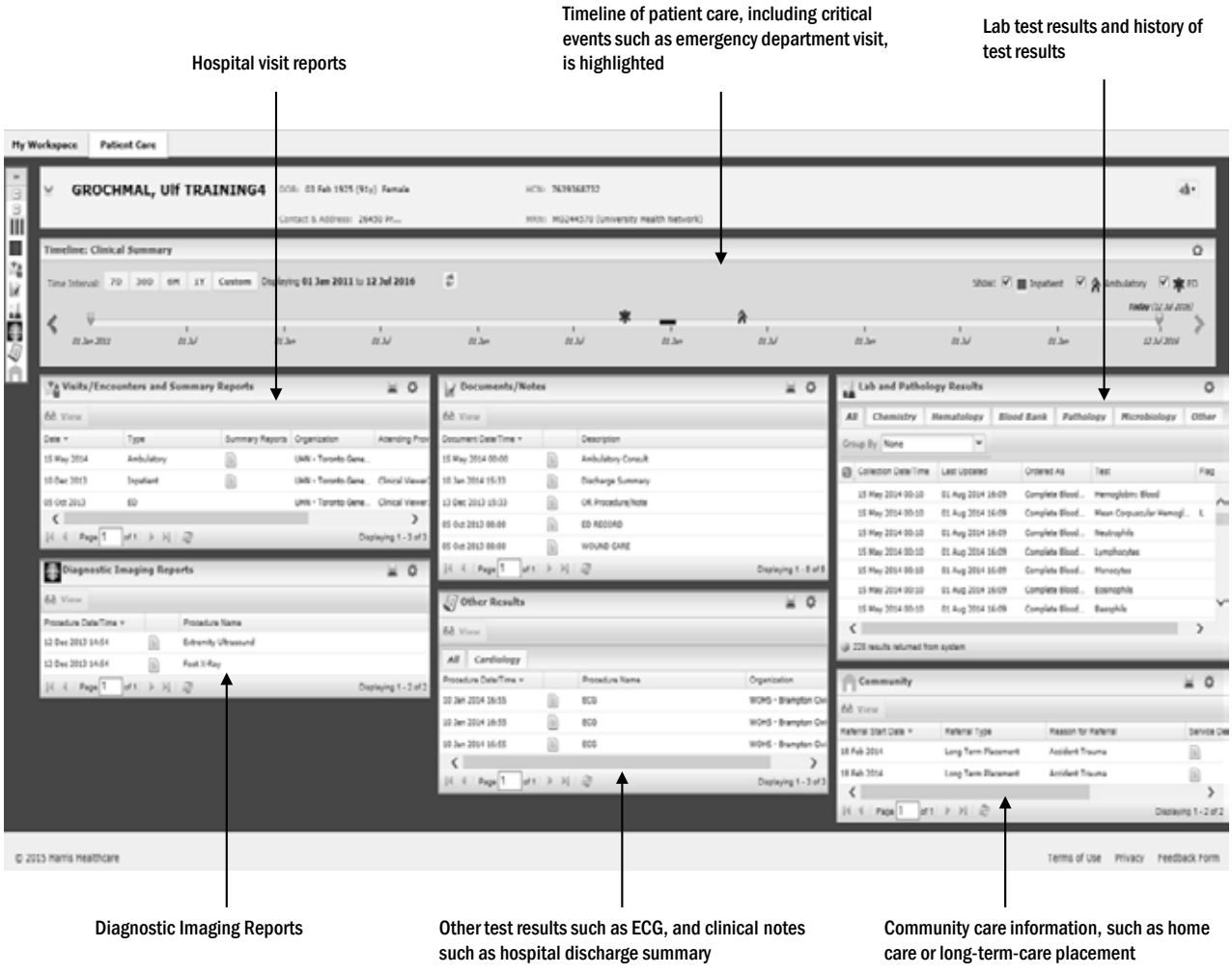
2.1 What is an Electronic Health Record?

The federal agency that works with the provinces and territories to co-fund digital health projects defines an Electronic Health Record (EHR) as "a secure and private lifetime record of an individual's health and health-care history, available electronically to authorized health-care providers." See **Figure 1** for a sample EHR.

The scale of a project that aims to create EHRs for the entire population is enormous, and the electronic health environment in Ontario is extremely complex: Ontario has about 300,000 health-care professionals—such as family doctors, specialists, pharmacists, imaging technicians and so on—who care for nearly 14 million people. As well, multiple individual local electronic health systems (known as point of care systems) that store health information already exist.

In Ontario, a patient's health information is securely stored in a variety of places, including

Figure 1: View of a Sample Electronic Health Record Used by Health-Care Professionals in the Greater Toronto Area
Sources of data: eHealth Ontario



the Ontario Laboratories Information System that stores lab test results for fluids and tissue; hospital information systems that contain information on patient care provided in hospitals; independent clinics that do diagnostic imaging tests such as CT scans and x-rays; Ministry systems that store prescription-drug data for Ontarians on provincial drug programs; computer systems in doctors' offices and pharmacies that store prescription records; and physicians' offices, where many doctors have their own local, stand-alone systems to log details of interactions with patients.

Each year, health-care professionals generate millions of patient medical records, many of them on paper, x-ray film and the like, which can be difficult to access by health-care professionals not working where the records are stored. Those records that do exist in digital form are often stored in a plethora of different and often incompatible computer systems used by health-care professionals, hospitals, and so on—meaning patient records cannot always be readily shared outside the facility that produced them. And even if the patient records could be shared, it would be necessary to ensure that only authorized health-care professionals can access them.

EHRs' objective is to address these issues. Once fully implemented, an EHR system will have complete information on lab test results, diagnostic images and reports, medication profiles and key medical reports such as hospital discharge summaries and immunization history, and will make such information available to all authorized health-care professionals in real time as they care for their patients.

Consider the hypothetical case of a Nipissing resident who becomes ill during a visit to Toronto. She goes to the St. Michael's Hospital emergency room in Toronto, where the attending physician orders a blood test that is analyzed at a lab in Toronto. The visitor then returns to Nipissing and sees her own family doctor. Without an EHR, the patient would need to tell her doctor about the lab test in Toronto, and the doctor would then either contact the Toronto physician to get the test results, or request a second blood test in Nipissing. With an EHR, however, the doctor in Nipissing using a certified Electronic Medical Record system would be able to see the results of the Toronto blood test, as well as receive the hospital report documenting the visit, thus potentially preventing the patient from taking an unnecessary duplicate blood test or repeating information.

Another term often used interchangeably with EHRs is Electronic Medical Records, but this term means something different. Electronic Medical Records are defined as office-based records that allow a health-care professional such as a family doctor to electronically record information gathered during a patient's visit. This could include weight, blood pressure and other medical information that would previously have been handwritten and stored in a file folder. Electronic Medical Records that are certified to meet provincial standards will allow the doctor to connect to a patient's complete health record, including information stored in the EHR by other health-care professionals.

This audit report will apply the above definitions to discuss the implementation of EHRs and Electronic Medical Records.

2.2 History of Implementation of Electronic Health Record Initiative in Ontario

In September 2000, federal and provincial health ministers committed to develop an EHR system, and the federal government created Canada Health Infoway (Infoway) the following year to accelerate the process across the country.

Infoway's goal was to provide compatible EHRs for 50% of Canadians by 2010, and to all Canadians by 2016. It reported in its 2015/16 annual report that four of six key areas were available as of March 31, 2016: client registry; clinical reports; diagnostic imaging and provider registry, and was working toward having complete lab and drug information available for all Canadians.

In Ontario, work on provincial technology infrastructure, among other activities, began in 2002 with the creation of the Smart Systems for Health Agency, which was replaced by eHealth Ontario in 2008. (See **Appendix 1** for a timeline of key EHR events in Ontario.)

eHealth Ontario's objectives are to provide eHealth services and related support for the effective and efficient planning, management and delivery of health care, while developing the supporting strategy and operational policy and ensuring the privacy of individuals whose information is transmitted, stored or exchanged by and through the agency. To meet the objectives, eHealth Ontario must plan, deliver and manage an EHR system that provides secure storage and sharing of patient medical information with authorized health-care professionals in Ontario.

The agency is accountable to the Ministry of Health and Long-Term Care (Ministry) through a Memorandum of Understanding and an Accountability Agreement that set out expectations for the operational, administrative, financial, staffing, auditing and reporting arrangements between the Ministry and eHealth Ontario.

As of March 31, 2016, eHealth Ontario employed 763 staff, compared to about 700 people (about 400 staff and 300 fee-for-service consultants) in 2009. These 300 consultants were originally retained by the Ministry's former eHealth Program Branch, which outnumbered the 30 full-time Ministry employees, an issue we noted in our 2009 special audit. The Branch was amalgamated into eHealth Ontario when the agency was created in September 2008, and the number of consultants had dropped to just 13 at the time of our current audit.

eHealth Ontario's staff work in areas such as project management, system architecture, management of agreements with health-care organizations, and information-technology services.

eHealth Ontario has had to work closely with a wide range of organizations in the health-care sector—hospitals, for example, and community-based health-care providers—that each have their own governance structure, and therefore different priorities and needs, resulting in the use of different data systems to meet their needs.

In addition, other stakeholders that influence eHealth Ontario's work include Local Health Integration Networks (LHINs), Infoway, health-sector associations (such as the Ontario Hospital Association, the Ontario Medical Association, the Registered Nurses Association of Ontario, and the Ontario Pharmacists Association) and professional colleges (such as the College of Physicians and Surgeons, and the College of Nurses of Ontario). Some of these working relationships are defined in contractual agreements that specify funding, the work to be done and reporting requirements.

2.3 eHealth Ontario's Scope of Work to Create Electronic Health Records

The Ministry envisions a seamless EHR system that stores and/or allows access to all patient records and health information online, securely, to authorized health-care professionals. The intent is for all Ontarians to eventually have access to their own EHRs.

In order to achieve this, an EHR system requires four fundamental components:

- patient data, such as treatment history, lab test results, diagnostic images, and prescribed medications, in digital form;
- a secure network on which to store and move this digital data;
- applications that enable authorized users to record, store and retrieve the data; and
- terminals or access points from which users can input and retrieve the data.

In order to achieve its main mandate, eHealth Ontario must build dedicated province-wide databases, both repositories and registries. Repositories store health information such as lab test results and drug prescription information. Registries contain listings of authorized health-care professionals,

patients (including those who have opted out of having their information in the system), and other users such as researchers who may need access to non-identifying patient information.

These repositories and registries must also be able to connect, through a network, to existing systems of different health-care organizations in a variety of settings—for example, local physician office, hospital and community care—to enable health-care professionals to access patient information stored outside their own organization's system.

In May 2008, Cabinet approved the first Ministry-prepared EHR strategy. Subsequently, in 2009, eHealth Ontario, under the authority of a regulation made under the *Development Corporations Act*, developed a more detailed EHR strategy that is overall in line with the 2008 Cabinet-approved strategy, covering the years 2009 to 2012.

The 2009 to 2012 eHealth strategy set out specific clinical and foundational priorities expected to be achieved by March 2015 with costs to fall within the 2009 Ontario budget commitment of about $2 billion. The clinical and foundational priorities included:

- three clinical health priorities—a diabetes registry, a drug information system and a wait-times strategy—to create "quick wins" to demonstrate immediate clinical value to health-care providers and Ontarians; and
- foundational priorities—the centralized repositories and registries of users and clinical data—to support these clinical priorities.

After this strategy was developed, the Ministry directed eHealth Ontario in a June 2010 mandate letter to focus its efforts on 12 projects essential to implementing an EHR. The letter confirmed the target completion date of 2015 for the overall initiative. Six of the 12 projects were aligned to core projects that Infoway was also co-funding and working on with Ontario and the other provinces and territories.

Of these 12 projects, the government designated seven as core in its submissions to Cabinet in December 2010. These core projects were also identified as important projects in the government's 2008 eHealth strategy.

Figure 2 shows a list of these 12 projects, including the seven core projects. Detailed descriptions of all 12 projects are provided in **Appendix 2**. The Cabinet submissions in 2010 reconfirmed March 2015 as the overall completion date for most of the EHR initiative, except for the drug information system, which had a March 2016 deadline. The submissions also included a revised approach that stipulated that system integration would be done first at the regional level and then linked province-wide to make implementation easier and more economical.

2.4 Funding to eHealth Ontario

Between 2009/10 (the time of our last audit of the EHR initiative) and 2015/16, eHealth Ontario received an average of $370 million a year from the Ministry. Funding over this period decreased by 7%, from $352 million in 2009/10 to $329 million in 2015/16.

3.0 Audit Objective and Scope

The objective of our audit was to assess whether eHealth Ontario, in conjunction with the Ministry of Health and Long-Term Care (Ministry), had effective governance, systems and procedures in place to ensure that Electronic Health Records (EHRs) were implemented in accordance with requirements and adopted for use and that status of implementation and adoption is appropriately measured and reported on.

A significant portion of our work related to assessing whether the Ministry and eHealth Ontario achieved the overall EHR strategy. In making this assessment, we reviewed in detail the implementation status of the following selected key EHR projects, which had either the greatest level of progress or had ended:

Figure 2: Electronic Health Record Projects in Ontario Funded by the Ontario and Federal Governments

Sources of data: eHealth Ontario and the Ministry of Health and Long-Term Care

Projects	Required as per 2010 eHealth Ontario Mandate Letter from the Minister of Health and Long-Term Care	Required as per Government Commitment	Aligns with Similar Nationwide Projects Co-Funded by Canada Health Infoway
Ontario Laboratories Information System*	√	√	√
Diagnostic Imaging*	√	√	√
Integration Services*	√	√	√
Drug Information System*	√	√	√
Diabetes Registry*	√	√	X
Physician eHealth	√	√	X
Client, Provider, User Consent Registries*	√	√	√
Client, Provider, User Portals*	√	√	X
Consumer eHealth	√	√	X
Panorama	√	√	√
Chronic Disease Management	√	X	X
Technology Services	√	√	X
Total	**12**	**11**	**6**

Note: Refer to **Appendix 2** for description of projects.

* The Ontario government considers these seven projects as "core" in its 2010 commitment.

- the Ontario Laboratories Information System;
- the Diagnostic Imaging System, including the central and regional repositories;
- the Diabetes Registry;
- the Drug Information System (now called the Digital Health Drug Repository);
- community-based physicians' Electronic Medical Records; and
- the Integration Services project (work required for connectivity of various information systems; now called the Connecting Hubs).

Our audit fieldwork was conducted over the period of November 2015 to May 2016. We conducted most of our audit work at eHealth Ontario's offices in Toronto. At eHealth Ontario and at the Ministry, we reviewed relevant documents and interviewed senior management and staff.

To gain an understanding of stakeholders' roles and responsibilities, and to obtain their perspectives, we interviewed management at selected health-care organizations, including community and hospital laboratories, hospital and primary-care physicians, professional associations such as the Ontario Hospital Association, the Ontario Medical Association and its OntarioMD subsidiary, and the College of Physicians and Surgeons of Ontario. We also spoke to the Ontario Pharmacists Association, the Ontario College of Pharmacists, the Registered Nurses Association of Ontario, and the College of Nurses of Ontario.

We obtained financial information from a sample of hospitals, the Ontario Association of Community Care Access Centres, and Cancer Care Ontario in order to better understand EHR-related spending in the broader health sector.

In addition, we interviewed a sample of specialist physicians, and we surveyed a sample of physicians in Ontario on their use of the various EHR projects. Thirty-five percent of the surveyed physicians responded to this survey. We also spoke to representatives from Canada Health Infoway (the

organization created by the federal government in 2001 to help provinces develop EHRs), Cancer Care Ontario, and the Institute for Clinical Evaluative Sciences.

Further, we interviewed representatives from the three Connecting Hubs—three large hospitals that administer the connectivity work under contract with eHealth Ontario to enable health-care professionals to access patient information contained in various electronic information systems—to gain an understanding of the hubs' capabilities. Additionally, we interviewed management of the four regional Diagnostic Imaging repositories, which store images such as x-rays, CT scans and MRIs. We also spoke with management at a sample of Local Health Integration Networks to get an understanding of their roles and responsibilities related to the EHR initiative.

3.1 Subsequent Events

Subsequent to our audit, Canada Health Infoway (an organization composed of deputy ministers of health from across Canada, including Ontario's) issued a report on October 7, 2016, done at the request of the Ontario Ministry of Health and Long-Term Care, which had asked for an assessment on Ontario's progress on digital health's availability, use and benefits, and how Ontario compares to other provinces and territories.

The report concluded that Ontario is well positioned relative to its peers in terms of availability, use and benefits from investments in digital health solutions. The report also estimated that in 2015, the benefit to Ontario from selected digital health projects was $900 million. The benefits estimate was, for the most part, calculated using a population-based allocation of cross-Canada overall benefits.

Also on October 7, 2016, the Minister of Health and Long-Term Care asked the Premier's business adviser to assess the value of Ontario's digital health program, its assets and all related intellectual property and infrastructure.

4.0 Detailed Audit Observations

4.1 Lack of Provincial Strategy and Leadership to Guide Ongoing eHealth Work

4.1.1 Province Has Been Without a Comprehensive eHealth Strategy

As discussed in **Section 2.3**, the Ministry received approval from Cabinet in 2008 to execute an eHealth strategy, with a goal to establish an EHR for every patient in Ontario by 2015. Following that Cabinet-approved strategy and under the authority of the regulation that created it, which gave it the authority "to develop an eHealth services strategy", eHealth Ontario developed a more detailed strategy, titled "Ontario's eHealth Strategy 2009-2012", covering those three years.

In this same time period, in a 2010 mandate letter to eHealth Ontario, the Ministry noted that it would jointly develop an EHR strategy with the agency (over the summer of 2010) covering the period up to 2015. This updated strategy was to have been presented to Management Board of Cabinet by September 2010. We also recommended in our 2009 special audit of the EHR Initiative that the agency develop a comprehensive strategic plan that specifically addressed EHR targets and laid out a path to implementation by 2015. In December 2010, the Ministry submitted a strategic overview document to Cabinet covering the period to 2015, detailing the plans on the core EHR projects. However, the strategic overview did not include any other projects that could be related to the development of EHR but that are managed by health organizations other than eHealth Ontario. The Ministry indicated that it was not required to include projects managed by these health organizations in the strategic overview submission to Cabinet.

At the direction of the Ministry, eHealth Ontario developed and released an EHR "connectivity

strategy" in July 2015 to describe how health-care information will be connected to provide a provincially-integrated EHR in the future, as shown in **Figure 3**.

According to the connectivity strategy, in the future, patients in Ontario can expect to electronically view their health information on their own personal computers, and health-care professionals and researchers can expect to monitor and manage the care of certain patient populations using health data contained within the EHR. Regarding the latter, for instance, health-care professionals in Hawaii used their EHR to monitor the health of the entire state's chronic kidney disease patients.

eHealth Ontario developed and released a blueprint in 2015 that provides a high-level view of the various components of an EHR once the connectivity strategy is achieved.

However, neither the connectivity strategy nor the blueprint provides detailed timelines for when components or capabilities will be available across the health sector.

With the lack of a comprehensive provincial strategy, maintaining stability at the senior management level is critical to help ensure clarity and focus on achieving the agency's objectives, and enable progress toward goals. At the time of our audit, eHealth Ontario's CEO was the agency's seventh since its inception in 2008. In fact, the agency had been under the leadership of an average of one CEO or acting CEO per year, with the actual tenure of each ranging from three months to three years. The current CEO joined eHealth Ontario in September 2014.

Such frequent change in leadership poses risks of lowered employee morale, and loss of continuity with stakeholders, thus causing confusion and uncertainty; all of which may have contributed to delays in completing EHR projects and meeting planned goals.

In response to these concerns, the Ministry has taken responsibility to establish a new provincial EHR strategy, and began this work in 2014/15. At the time of our audit, the Ministry was in the process of developing the strategy based on consultations and feedback from health-sector stakeholders.

The Ministry said one of the key items it will include in the new strategy is the completion of

Figure 3: Contents and Functions of Selected Electronic Health Record Systems in Ontario in the Future

Prepared by the Office of the Auditor General of Ontario, compiled from eHealth Ontario's *An Overview of Ontario's EHR Connectivity Strategy, The Vision for 2015 And Beyond*

Type of EHR	Contents and Functions Anticipated in the Future
Labs	• All reports from hospital, community and public labs. • Primary-care physicians can submit lab orders to the Ontario Laboratories Information System.
Drugs	• All medication dispense information for all Ontarians. • Primary-care physicians can send prescriptions electronically to pharmacies.
Diagnostic imaging	• Provincial diagnostic imaging reports and images available through regional viewers and through physician offices' electronic medical record systems.
Physicians' Electronic Medical Records	• Integrated with other EHR systems such as labs and diagnostic imaging systems. • Physicians can send documents and data to provincial repositories and registries. • Physicians can receive electronic referrals from EHR systems. • Electronic referrals from primary-care physicians to other specialist physicians.
Community care	• Patient health information in community agencies such as Community Care Access Centres and community support services agencies integrated with provincial EHR.
Hospital data	• All hospital reports available to health-care professionals through provincial repositories. • Patients can access their own clinical data and documents.

work required in the Cabinet-approved projects in the EHR strategy. The new strategy will also consider patients' access to their own data, and financial sustainment of the systems in place.

The Ministry informed us that it expected to submit a revised provincial EHR strategy to Cabinet for approval by late 2016. As well, on October 7, 2016, the Minister requested the Premier's business adviser to assess the value of Ontario's digital health program, its assets, and all related intellectual property and infrastructure.

4.1.2 Governance Model Did Not Fully Address Accountability Relationships in the Health Sector

Given the complex electronic health environment in Ontario as discussed in **Sections 2.1** and **2.2**, eHealth Ontario cannot work alone to implement EHR. In fact, the then Minister of Health and Long-Term Care noted in her mandate letter to the agency in 2010 that the agency was the "principal partner in delivering an EHR". According to eHealth Ontario's 2009-2012 strategy, the agency was the single point of accountability, responsible for aligning all publicly funded EHR projects to build a comprehensive system by March 2015.

Similarly, the government's 2008 strategy set out the various information systems and types of data to be included into the EHR such as a drug information system, lab information, diagnostic imaging and reports, as well as clinical viewers (web-based access) for use by health-care professionals.

However, the roles and responsibilities were not defined in the government's May 2008 strategy, eHealth Ontario's 2009-2012 strategy, the eHealth Ontario 2015 Blueprint and connectivity strategy, or anywhere else, for the many parties involved in the collective effort to develop a fully functioning EHR system by March 2015.

To achieve the government's goal of having an EHR for all Ontarians by 2015, eHealth Ontario must work with other provincial organizations such as Cancer Care Ontario, regional bodies such as the LHINs, local groups such as hospitals, and private-sector organizations such as independent health facilities that also operate their own electronic health information projects. Although eHealth Ontario was accountable to the Ministry, only some health-care organizations were accountable to eHealth Ontario through partner agreements. Most other health-care organizations made their own decisions through their internal governance structure to implement electronic solutions to meet their needs, which may not necessarily have advanced progress towards the provincial EHR goal.

In 2013, the Ministry and eHealth Ontario's board of directors asked two former Ontario public servants to undertake a strategic review of eHealth Ontario and the provincial EHR strategy. In their 2014 report, the consultants noted that the strategy was broad and did not provide a clear description of the specific roles of the various participants. They further noted that the Ministry would be best suited to lead the provincial strategy.

In 2016, eHealth Ontario underwent a mandate review as required by the province's Agencies and Appointment Directive. In the April 2016 report resulting from this review, another external consultant also identified the lack of clarity in the roles of both the Ministry and the agency. The consultant also noted that the Ministry should carry the responsibility for developing the eHealth vision and strategy, and establishing priorities.

As previously noted, at the time of our audit, the Ministry had taken the lead in developing the next EHR strategy, which was not yet finalized.

RECOMMENDATION 1

To ensure that all parties are held accountable for their responsibilities, the Ministry of Health and Long-Term Care should clarify and document the roles and responsibilities of all parties in the development of relevant projects in the next version of its Electronic Health Record strategy.

MINISTRY RESPONSE

The Ministry welcomes this recommendation and is pleased to receive advice and recommendations from the Auditor General in this area. As noted by the Auditor General, the Ministry is developing its Digital Health Strategy (Strategy), which will be informed by the Auditor General's findings and recommendations for this audit. The Strategy will be built on previous Ministry-commissioned reviews of these topics and consultation from numerous stakeholders across the province. The cornerstone of the Strategy is its governance structure, which will clarify the optimal roles and responsibilities of delivery partners including, for example, eHealth Ontario, the Ministry, LHIN-funded health-care organizations and Ministry-funded health agencies.

4.2 Significant Funding Provided to Implement Electronic Health Records

4.2.1 Publicly-Funded Health Agencies Spent $8 Billion Over 14 Years on EHRs and EHR-Related Systems and Activities

The Ministry, through eHealth Ontario, the agency's predecessor, and other Ministry-funded health organizations, spent more than $4 billion over the 14 years between 2002/03 and 2015/16 on EHR systems and EHR-related activities. It also provided another $4 billion, through the Local Health Integration Networks, to various health-care organizations to fund their own local information technology systems that contain patient health information necessary for sharing in the EHR systems. **Figure 4** shows a breakdown of the amount spent.

The Ministry considered these projects and activities to be part of the eHealth initiative in its internal discussion in 2015 to the eHealth Investment and Sustainment Board (Board). The Board was formed in March 2015 by the Ministry to provide advice to the Minister on the development of the new electronic health records strategy and to assist in monitoring its successful implementation. The new strategy was not yet finalized at the time of our audit.

During the same 14-year period, the federal government paid the Ontario government about $190 million towards its provincial spending.

eHealth Ontario and Smart Systems for Health Agency Expenditures

Both eHealth Ontario and its predecessor agency, Smart Systems for Health Agency, spent over $3 billion in a 14-year period from 2002/03 to 2015/16 to implement eHealth projects. Included in this amount are $1 billion spent on the seven core projects as described in **Section 2.3** and $2 billion spent on the development of a provincial technology infrastructure, among other activities, to support the EHR system and corporate costs.

Ministry-Funded Projects' Expenditures

From 2002/03 to 2015/16, the Ministry spent over $1 billion on eHealth projects that it is responsible for. These projects include the Ontario Telemedicine Network, Panorama—the province's immunization record system—Cancer Care Ontario, and payments the Ministry made to primary-care physicians to implement local Electronic Medical Record systems.

EHR-Related Information Technology Expenditures of Local Health-Care Organizations

eHealth Ontario is tasked with building data repositories and allowing various health-care professionals to connect to these databases to get a complete understanding of a patient's health story. As discussed in **Section 2.1**, health records reside in many local point-of-care systems such as those in LHIN-funded hospitals or Community Care Access Centres (CCACs). While some of these

Figure 4: Public Funding to Enable Electronic Health Records in Ontario, 2002/03–2015/16

Source of data: eHealth Ontario, the Ministry of Health and Long-Term Care, Cancer Care Ontario, Ontario Association of Community Care Access Centres, and selected hospitals

	Annual Spending ($ million)									
	2002/03–2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	14-Year Total
Ministry-Funded										
Core Projects										
Integration Services	–	7	11	17	46	41	47	80	79	**328**
Diagnostic Imaging	44	25	32	21	20	20	13	27	21	**223**
Ontario Laboratories Information System	89	8	14	14	19	26	19	17	10	**216**
Client, Provider, and User Consent Registries	–	19	15	15	15	21	15	12	11	**123**
Diabetes Registry	–	5	5	12	18	4	2	22	3	**71**
Drug Information System	13	5	5	2	10	9	5	2	5	**56**
Client, Provider, and User Portals	–	4	4	4	2	2	1	1	1	**19**
Subtotal	**146**	**73**	**86**	**85**	**130**	**123**	**102**	**161**	**130**	**1,036**
eHealth Ontario and Predecessor Agency[1]										
Smart Systems for Health Agency	647	225	–	–	–	–	–	–	–	**872**
eHeath Ontario	–	–	221	197	201	186	187	181	169	**1,342**
Subtotal	**647**	**225**	**221**	**197**	**201**	**186**	**187**	**181**	**169**	**2,214**
Other Ministry-Funded Projects										
Electronic Medical Records - OntarioMD	–	–	49	75	75	70	56	50	35	**410**
Cancer Care Ontario[2]	102	31	25	32	39	27	36	40	37	**369**
Ontario Telemedicine Network	–	27	29	32	40	48	49	51	57	**333**
Ontario Association of CCACs[2]	54	13	13	13	13	13	13	16	16	**164**
Electronic Child Health Network	28	10	9	8	8	8	8	8	8	**95**
eHealth Investment and Strategy Branch	21	5	2	1	1	1	1	1	3	**36**
Panorama	–	–	–	1	3	8	9	9	5	**35**
Implementation, adoption and other eHealth initiatives	–	19	3	–	–	–	–	–	–	**22**
Community Care Information Management	–	–	–	–	–	–	–	4	15	**19**
Subtotal	**205**	**105**	**130**	**162**	**179**	**175**	**172**	**179**	**176**	**1,483**
Total Ministry-Funded	**998**	**403**	**437**	**444**	**510**	**484**	**461**	**521**	**475**	**4,733**

	Annual Spending ($ million)										14-Year Total
	2002/03–2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16		
LHIN-Funded											
Hospitals[2]	761	302	318	315	321	333	338	349	363		**3,400**
Community Mental Health and Addictions	15	7	6	8	9	10	11	14	12		**92**
Community Care Access Centres[2]	–	–	12	11	12	13	13	13	14		**88**
Children's Treatment Centres	9	4	4	4	5	5	5	5	5		**46**
Community Support Services	2	3	3	4	5	5	5	6	6		**39**
Long-Term Care Homes[3]	–	–	–	–	–	–	–	–	–		–
Community Health Centres[3]	–	–	–	–	–	–	–	–	–		–
Total LHIN-Funded	**787**	**316**	**343**	**342**	**352**	**366**	**372**	**387**	**400**		**3,665**
Total Ministry- and LHIN-Funded	**1,785**	**719**	**780**	**786**	**862**	**850**	**833**	**908**	**875**		**8,398**

1. Agency costs include corporate and other project costs not reported in "core projects" above.
2. Based on information obtained directly from the entity (or a sample of entities) rather than as recorded by the Ministry.
3. Ministry's record of these organizations' information technology expenditures is nil.

systems would exist even without the EHR initiative, many of these local systems contain health information needed for the provincial EHR systems. Without these local systems in the broader health sector and the health information they contain, eHealth Ontario cannot achieve the goal of an EHR initiative.

The 2016 eHealth Ontario mandate review noted that much of the funding provided by the LHINs to hospitals and other health-care organizations supports ongoing front-line operations, such as hospital information systems, home care information systems, and other community programs. These systems contain patient health information important to the EHR initiative.

While the Ministry's financial information system shows that LHIN-funded health-care organizations have spent over $7 billion on information technology in the 14-year period between 2002/03 and 2015/16, the Ministry could not determine how much of that $7 billion was spent on information systems that contain patient information relevant to the EHR, and how much was spent on other systems such as human resources and payroll systems for health-care professionals who work in these organizations.

Of the $7 billion, we estimated the EHR-related spending in the 14-year period using information we obtained directly from a sample of hospitals and the Ontario Association of Community Care Access Centres. This amount is about $4 billion.

Overall Public Spending to Enable EHR in Ontario

In total, the government had spent $8 billion to enable EHR in Ontario over the last 14 years ending in March 31, 2016, according to financial information maintained by the Ministry, eHealth Ontario and our own estimate.

Canada Health Infoway, an organization composed of Deputy Ministers of Health from across Canada, estimated that, in 2015, the benefit to

Ontario from selected digital health projects was $900 million.

We expect total Ontario government spending for the EHR initiative will exceed $8 billion from all sources, as work is still under way by most health-care organizations and eHealth Ontario still has more work to do to complete its outstanding commitments.

4.2.2 Ministry Does Not Have an Overall Cost Estimate for the Overall EHR Initiative

The government-prepared 2008 eHealth strategy did not contain estimated costs of EHR implementation, though the 2009 Ontario Budget did include a commitment of about $2 billion for the implementation of an EHR over the next three years. This budget was to cover costs of all EHR projects such as physician adoption of electronic medical records, the Electronic Child Health Network, and Panorama—the province's immunization system—in addition to the seven projects that the government later identified as "core" including the labs system, diagnostic imaging system and the drug system.

Similarly, eHealth Ontario's 2009-2012 eHealth strategy noted an estimated cost of $2.133 billion over the three-year period to complete its strategy.

Despite the publicly announced $2 billion commitment made by both the Ontario government through its budget and eHealth Ontario through its strategy document, Treasury Board still had to officially approve the spending through a formal budgetary process. In 2010, Treasury Board approved a budget of $1.06 billion to implement seven core EHR projects, of the total 12 projects identified in the June 2010 Ministry's mandate letter. The Ministry noted that this approved budget was to be applied against all EHR expenditures incurred prior to 2010 as well.

As explained in **Section 4.2.1**, to enable a fully functional EHR, public spending is also needed on the remaining five projects noted in the 2010 mandate letter, and other health information systems that operate out of Ministry-funded and LHIN-funded health-care organizations and agencies in the broader health sector. These organizations receive annual funding allocation for operations from the government's formal budgetary process.

eHealth Ontario indicated in a June 2016 presentation to its board that it anticipates incurring another $48 million, which is within the $1.06 billion budget, to complete all of its outstanding EHR commitments to build core projects by March 2017 to enable physicians and other health-care professionals to access complete patient health information in their care of patients. eHealth Ontario also determined that it will work on expanding contribution and use, and sustainment of the core projects it is responsible for beyond March 2017. However, there is no additional cost estimate for the remainder of the work of all other health-care organizations participating in the EHR initiative, such as the estimated $2 billion needed to upgrade information systems in local hospitals, as noted in an August 2016 report of an advisory panel on hospital information systems formed by the eHealth Investment and Sustainment Board.

Good planning practice and fiscal prudence would require the Ministry to consider spending by these individual organizations when determining the entire estimated costs for implementing EHRs for all Ontarians. Neither the Ministry nor eHealth Ontario was aware of any other overall government budget specific to the EHR initiative other than the $1.06 billion approved for the core project work that considered the costs related to the implementation of EHR by all organizations funded by either the Ministry or the LHINs. Without such information, the government cannot easily monitor overall spending on the EHR initiative.

A new EHR budget would also need to reflect changes made to the EHR initiative since the original 2010 Treasury Board-approved project budgets. For instance, since the Ministry took over the responsibility of the drug information system from eHealth Ontario, it had only estimated a budget of $20 million for an initial phase of the project, but not for the remainder of the work required

to March 2020 to complete the project. The Ministry indicated that it would establish separate budgets for the different parts of the project for the remainder of the work. The project had a budget of over $200 million when it was the responsibility of eHealth Ontario. As well, the Diabetes Registry had a budget of $98 million but the project was cancelled in 2012 and no registry was built. We discuss these projects further in **Section 4.2.4**.

4.2.3 eHealth Ontario Incurred Other Project Costs Besides Those Reported Against Approved Project Budgets

As shown in **Figure 5**, eHealth Ontario and its predecessor agency have reported a total of about $730 million of core project spending over a 14-year period against the $1.06 billion approved budget for the seven core EHR projects. Spending that is directly attributed to the projects is required to be reported annually by the Ministry to Treasury Board.

In addition to the approximately $730 million in core project costs, we found that eHealth Ontario and its predecessor agency also incurred roughly $300 million more in operational support costs over the same period, categorized as project costs in their internal financial systems. These include eHealth Ontario's salaries for senior management and staff, and administrative and overhead costs related to the projects. eHealth Ontario stated that these other costs do not fall within the scope of the approved budget of the core projects and that these costs are reported separately to the Ministry through eHealth Ontario's annual budget.

Figure 5: Budgeted and Actual Costs to Implement Core Electronic Health Record Projects in Ontario, 2002/03–2015/16

Sources of data: eHealth Ontario and the Ministry of Health and Long-Term Care

					Over/(Under) Budget as of March 31, 2016	
	Approved Budget (A)	Actual Project Cost as Reported by eHealth Ontario (B)	Other Project Costs Incurred (C)	Total Costs Incurred (D)=(B)+(C)	Against Project Cost Reported (B)–(A)	Against Total Costs Incurred[1] (D)–(A)
Projects	**($ million)**					
Integration Services	366	328	<1	328	(38)	(38)
Drug Information System (by eHealth Ontario)[2]	206	36	15	51	(170)	(155)
Client, Provider, and User Consent Registries	145	105	18	123	(40)	(22)
Ontario Laboratories Information System	109	81	135	216	(28)	107
Diagnostic Imaging	108	90	133	223	(17)	115
Diabetes Registry – cancelled	98	71	<1	71	(27)	(27)
Client, Provider, and User Portals	25	16	3	19	(8)	(5)
Total	**1,057**	**727**	**305**	**1,031**	**(330)**	**(26)**

1. Numbers may not add due to rounding.
2. The Ministry of Health and Long-Term Care took over this project from eHealth Ontario in May 2015, and has incurred another $5 million against a separate budget of $20 million as of March 31, 2016.

When only core project costs (excluding other costs) are considered, the 14-year spending on all seven core projects was still within their individual project budgets. But when the total project costs are included, spending for both the Ontario Laboratories Information System and the Diagnostic Imaging System was over budget by about $100 million, while spending in the other core projects was still under budget. Nevertheless, when compared to the approved budget of $1.06 billion, all project costs spent as of March 31, 2016 were still within budget. Neither eHealth Ontario nor the Ministry has publicly reported actual spending of the EHR projects against their budget.

RECOMMENDATION 2

To ensure that the full costs of implementing the Electronic Health Records Initiative are transparent, appropriate and reasonable, the Ministry of Health and Long-Term Care should:

- prepare an updated budget of the costs to complete the overall initiative, including estimated costs of all EHR projects to be developed by taxpayer-funded health-care organizations—not just eHealth Ontario—along with its revised EHR strategy; and
- publicly report, at least annually, on all costs incurred to date and the status of these costs compared to the updated budget and plans.

MINISTRY RESPONSE

The Ministry and eHealth Ontario welcome this recommendation. As noted, the Ministry will be seeking approval of the Digital Health Strategy (Strategy). The Strategy will take into consideration the necessary resources required by the overall initiative and appropriate reporting mechanisms.

Within the governance structure, as defined under the Strategy, projects (along with their budgets) will be formally approved. eHealth Ontario, as the principal delivery partner of the EHR core projects, will publicly report (using the existing mechanism of the annual report) on all costs incurred and the status of their costs compared to the updated approved budget and plans as applicable.

The Ministry supports the principle of public reporting and will explore opportunities for further public reporting, at least annually, on all costs incurred to date, and the status of these costs, compared to the updated budgets and plans.

4.2.4 Over $100 Million Spent on Two Original Projects Since Cancelled or Transferred

Two of the 12 EHR projects identified in the Ministry's 2010 mandate letter to eHealth Ontario—the Diabetes Registry and the Drug Information System—were not implemented at the time of our audit in May 2016. Spending on these two projects reached about $120 million before the responsibility of the Drug Information System was transferred from eHealth Ontario to the Ministry, and the Diabetes Registry was terminated before it was completed.

Diabetes Registry

eHealth Ontario had identified the Diabetes Registry as one of three clinical priorities to be addressed between 2009 and 2012 in its strategy. Intended to contain information about every Ontarian with diabetes, the Registry was to have given physicians and the Ministry real-time patient data and enabled comprehensive online patient monitoring.

The Registry was initially scheduled for delivery in April 2009, but this deadline was moved up several times. Our 2012 audit of the Diabetes Management Strategy found that several factors contributed to the delay, including:

- the procurement of a vendor to develop and implement the Registry was delayed, as the contract with the successful vendor was

signed in August 2010, two years after funding was approved in 2008;
- the vendor that won the contract may have underestimated both the time required for the project and the project's complexity when bidding for the contract; and
- the project-design blueprint developed by the vendor appeared to contain many errors and omissions, which led to rejections and reworking of the design.

eHealth Ontario eventually cancelled the project in September 2012. Total spending on the Registry by the Ministry and eHealth Ontario was about $71 million between 2008/09 and 2015/16, including $26.9 million awarded to the vendor through an arbitration process.

As mentioned in our 2012 audit of the Diabetes Management Strategy, as well as this current audit, eHealth Ontario no longer has plans to conduct further work in this area and no longer considers the Registry an essential EHR component, explaining that many physicians are now using Electronic Medical Records software and can access the information necessary in the EHR to manage diabetes.

Drug Information System

Cabinet approved the Drug Information System in the 2008 eHealth strategy, requiring eHealth Ontario to develop a system that would allow for electronic drug prescribing and dispensing, and contain patients' comprehensive medication profiles. The strategy also required eHealth Ontario to procure a vendor to develop a repository to store data to enable identification of events such as adverse drug reactions. The system was supposed to be completed by March 2016.

In May 2013, after eHealth Ontario failed to procure a vendor to develop the repository within the government's approved costs, eHealth Ontario halted the project work. In May 2015, the Ministry received formal central agency approval to take over the responsibility for the project, with technical support to be provided by eHealth Ontario. By March 2015, eHealth Ontario and the Ministry had already spent about $50 million on the project, for purposes such as preparing procurement documents and defining foundational planning and system requirements.

4.3 Available Electronic Health Record Systems Not Fully Functional or Contained Incomplete Information

4.3.1 EHR Initiative Not Completed by 2015 as Planned

By the targeted deadline of March 2015, the majority of the seven core EHR systems had been developed, and information in these systems was being shared among authorized health-care professionals. However, a fully functional EHR was still not available.

A year later, in March 2016, eHealth Ontario estimated that it had completed 77% of the original core assignments—81% after taking into account that some projects had changed, were cancelled or reassigned, as shown in **Figure 6**.

Most of the seven core EHR systems were available at the time of our audit in spring 2016; however, some of the core EHR projects were either not fully functional, or did not contain all the required patient health data.

In **Sections 4.3.2** to **4.3.4**, we discuss the progress and functionalities of five EHR projects—the Ontario Laboratories Information System (Labs System), Diagnostic Imaging, Integration Services, the Drug Information System, and connection of physician offices' electronic medical records to these databases.

4.3.2 Systems Implementation Delayed

Both the Diagnostic Imaging project and the Integration Services project were implemented in phases. Targeted completion dates for each of these phases were established but not met. Similarly,

Figure 6: Percentage of Completion of Core Electronic Health Record Projects, March 2016
Source of data: eHealth Ontario

	Based on Requirements in Original 2010 Government Commitment, Including the Diabetes Registry and Medication Management System		Based on Amended Project Scope Since 2010, Including Cancellation of Diabetes Registry, Transfer of Medication Management System to Ministry, and Evolved Technology Over Time	
Projects	**# of Deliverables Expected**	**% of Completion According to eHealth Ontario**	**# of Deliverables Expected**	**% of Completion According to eHealth Ontario**
Ontario Laboratories Information System	24	92	24	92
Diagnostic Imaging	27	82	19	96
Client, Provider, and User Consent Registries	101	79	96	81
Integration Services	123	72	115	74
Client, Provider and User Portals	28	68	21	97
Total	**303**	**77**	**275**	**81**

Note: eHealth Ontario cancelled the Diabetes Registry in September 2012. The Ministry of Health and Long-Term Care took over the Medication Management System from eHealth Ontario in May 2015.

the connection of physician offices' stand-alone systems to the provincial databases of lab tests and diagnostic images was not completed by the target date of March 2015. We discuss these areas in the following subsections.

Diagnostic Imaging

In 2007, the formation of four regional Diagnostic Imaging repositories to cover the entire province was approved, with a budget of $96 million and a completion date of March 2010.

In 2010, government approval was given to extend the completion date by five years to March 2015, and to expand the project scope to, among other things, form a provincial repository to enable sharing of diagnostic reports and images across the four regions of the province. The project budget also increased to $108 million.

To help organize the integration work, eHealth Ontario divided the project into four separate phases, and established different target completion dates for each, with completion of phase four to be completed by June 2015.

At the time of our audit, all phases were delayed:

- The first phase of the project was the uploading of all diagnostic reports into a central repository so that health-care professionals could share information across regional boundaries. This phase was completed in May 2015, 14 months late. However, health-care professionals in one region could not view reports originating from other regions at that time. As of September 2016, all eligible health-care professionals could access all diagnostic reports in the central repository.
- The second phase included the uploading of diagnostic image manifests, which provide a set of references back to the images at source, and the creation of a viewer to allow health-care professionals anywhere in the province to view the images. This phase was not completed by March 2015 as anticipated. At the completion of our audit, the images were uploaded, but health-care professionals in one region could not view images

originating from other regions. As a result, for example, a health-care professional in Toronto could not access x-rays taken in Ottawa. The patient would have to obtain a CD of the images to provide to their doctor for review. eHealth Ontario expects sharing of diagnostic images across the regions to be available by March 2017, two years past the anticipated March 2015 completion date.

- eHealth Ontario indicated to us that phases three and four of the project, which involve connections to the Electronic Medical Records in physicians' offices and to systems that enable viewing of images, would be available following the completion of phase two.

Integration Services

The Integrated Services project, later renamed Connecting Ontario, was launched in 2008. Its goal was to use a centralized approach to integrate (or "connect") large numbers of stand-alone information systems in various health-care organizations, such as hospitals and community health agencies across Ontario. In 2008, the project was given a budget of $221 million and was to be completed by March 2014.

In December 2010, the government approved a revised approach that included the formation of three regional centres or "hubs," each led by a hospital, as shown in **Figure 7**. The budget was also increased 66% to $366 million with a revised target completion date of March 2015.

At the time of our audit, integrated viewers at only two of the three regional hubs were in use, allowing the health-care professionals in these regions to easily access a variety of health information about their patients, including x-rays and blood test results. Health-care organizations and professionals in the remaining region covering Northern and Eastern Ontario could not access all types of patient information through a single EHR viewer, but had to use different viewers to access different patient information within the region and across the province.

Connection of Physician Electronic Patient Records with Provincial Data

According to the 2014 National Physician Survey conducted jointly by the College of Family Physicians of Canada, Canadian Medical Association and the Royal College of Physicians and Surgeons, about 83% of physicians in Ontario used Electronic Medical Record systems (either fully or partially) for patients in their care. Many physicians, such as family doctors, use these systems in their practice to record details of the patient visits.

Despite this significant use of Electronic Medical Record systems in individual physician offices, many physicians were still not able to connect their systems to the provincial EHR systems containing lab tests data and diagnostic imaging, or to the various repositories and registries even though the goal was to do so by March 2015. As a study commissioned by eHealth Ontario in August 2015 highlighted, better integration of physicians' electronic medical records and provincial assets would result in more comprehensive patient records.

At the time of our audit in spring 2016, about three-quarters of the total physicians funded to use certified Electronic Medical Record systems were indeed accessing the Labs System. (We discuss the Electronic Medical Record systems in more detail in **Section 4.4.2**) However, no physicians' local systems were linked to the regional Diagnostic Imaging databases. As a result, physicians could not easily access x-rays, MRIs and lab data from their local systems, which might contribute to delays in diagnosing and treating patients, thus affecting their timely health care.

4.3.3 Systems Had Only Partial Functionality

Although the EHR projects were in operation at the time of our audit, we noted that the Labs System,

Figure 7: Leads, Delivery Partners, Local Health Integration Networks Served, and Health-Care Organizations and Professionals of the Three Connecting Hubs of eHealth Ontario

Source of data: eHealth Ontario

Connecting Hub	Lead	Delivery Partners	Local Health Integration Networks (LHINs) Served	Health-Care Organizations and Professionals Practising as of March 2016
Connecting South West Ontario (cSWO)	London Health Sciences Centre	• TransForm Shared Services Organization • South West Community Care Access Centre • Centre for Family Medicine Hamilton Health Sciences Corporation	**Four LHINs** • Erie St. Clair • South West • Waterloo Wellington • Hamilton Niagara Haldimand Brant	3,500 health-care organizations and professionals as follows: 69 hospitals, 4 Community Care Access Centres, 194 community support services agencies, 19 community health centres, 103 community mental health and addiction service agencies, 234 long-term care homes, 53 Family Health Teams, 2,806 primary-care physicians, and 18 Public Health Units
Connecting Greater Toronto Area (cGTA)	• Sunnybrook Health (April 2016–Present) • University Health Network (Nov 2009–March 2016)	• Sunnybrook Health (April 2016–Present) • University Health Network (Nov 2009–March 2016)	**Six LHINs** • North Simcoe Muskoka • Central • Toronto Central • Mississauga Halton • Central East • Central West	688 health-care organizations as follows: 43 hospitals, 6 Community Care Access Centres, 237 community support services agencies, 26 community health centres, 176 mental health and addiction service agencies, and 200 long-term care homes*
Connecting Northern and Eastern Ontario (cNEO)	The Ottawa Hospital	• Kingston General Hospital • The Ottawa Hospital • Health Sciences North • Northwest Health Alliance	**Four LHINs** • South East • Champlain • North East • North West	680 health-care organizations as follows: 65 hospitals, 4 Community Care Access Centres, 237 community support services agencies, 28 community health centres, 196 mental health and addiction service agencies, and 150 long-term care homes*

* Unlike South West Ontario, the current and short-term focus in Greater Toronto Area and Northern and Eastern Ontario is on acute care and certain community care settings. Therefore, the following are not included in these regions' scope: family health teams, primary care, and public-health units. The focuses of the three regions differ because the South West Ontario Connecting Hub is at a more mature stage of operation than the other Connecting Hubs.

Integration Services and the drug system were not fully functional, meaning health-care professionals could not efficiently obtain some clinical data of their patients.

Labs System

The Labs System acts as a centralized database, collecting test results and other lab data from hospital, community and public-health labs. The System was designed to provide five functionalities: order entry, order retrieval, order referrals to other labs (when the initial lab cannot do the test), results submission, and results retrieval. The System was expected to be fully operational by March 2015.

At the time of our audit, the Labs System was in use, but with only two of the five planned functionalities—results submission and results retrieval. The remaining three were unavailable because of cited legal and privacy concerns, and technical issues. As a result, health-care professionals could not use the system to electronically order lab tests for patients, retrieve lab orders, or refer lab tests to other sites.

The Labs System is also supposed to allow authorized researchers working on health-care planning and policy-making to access data that is free of any patient-identifying information. This data was to be available for use by March 2013. However, we found that there was no repository free of any patient-identifying information available at the time of our audit. Given that this repository is not yet ready, eHealth Ontario has entered into data-sharing agreements with agencies including Cancer Care Ontario and Public Health Ontario. The agreements require these agencies to remove all patient-identifying information before use.

Integration Services

The goal of the Integration Services project was to link the three regional hubs to a central provincial database to enable province-wide information-sharing and access to data repositories and applications on lab, drug and diagnostic imaging information across the different health-care settings by March 2015.

At the time of our current audit more than a year later (and two years after the initial March 2014 target date discussed in **Section 4.3.3**), provincial integration of the three regional hubs was still not complete, affecting emergency room physicians and other health-care professionals' ability to view clinical data of a patient who may have obtained health services from another region.

Drug Information System

According to a jurisdictional review completed by eHealth Ontario, physicians in Quebec, Saskatchewan, England, Scotland, Australia and the United States can send prescriptions electronically to pharmacies. Except for two pilot sites in Sault Ste. Marie and Georgian Bay, most physicians in Ontario cannot yet do this. In July 2016, the Ministry entered into an agreement with Canada Health Infoway for potential early adoption of the ePrescribing service that is expected to be complete by March 2018.

RECOMMENDATION 3

To ensure Electronic Health Record (EHR) projects are completed on time and comprise the anticipated functionalities, eHealth Ontario should:

- make clinical data available without patient identifying information in the Ontario Laboratories Information System;
- set timelines for completing all phases and functionalities of all EHR projects; and
- monitor that progress is made according to established timelines.

RESPONSE FROM eHEALTH ONTARIO

eHealth Ontario accepts this recommendation and will continue to work with the Ministry, as the Health Information Custodian, and the Information and Privacy Commissioner of Ontario, on strategies to allow secure sharing of

non-identifying patient clinical data for secondary use, such as for health promotion, prevention and research purposes.

Timelines were set for the foundational core elements of the EHR and, though there were delays, all the foundational elements of the core EHR projects under eHealth Ontario's responsibility are tracking for completion by March 2017.

The Ministry is developing its Digital Health Strategy. Once it is approved, timelines for completing all phases and functionality of all EHR projects will be set.

eHealth Ontario will monitor progress of its EHR core projects, and will report this information to its Board.

4.3.4 Systems Contain Incomplete Patient Health Information

Centralized EHR data repositories for four projects did not include all patient health information. As a result, even when health-care professionals access these databases to obtain clinical information such as lab tests, diagnostic images and reports, hospital discharge summaries, and prescription information, they may not have a complete picture of the patient's health history. Patients in turn would therefore be less likely to receive the timeliest health care possible.

Labs System

The Ontario Laboratories Information System (Labs System) is a centralized repository that collects lab data from hospitals, community labs and public health labs to enable the sharing of lab data across the province. In March 2016, eHealth Ontario reported that the Labs System contained 197 million or 86% of the lab tests in Ontario. However, the agency measured this percentage of completion against a baseline of 229 million tests conducted that was established in 2010, instead of a higher number of tests conducted in 2016.

eHealth Ontario could have measured the percentage of completion against the current number of independent lab tests that is already collected by the Ministry—258 million lab tests conducted as of March 2016. Even though this number might include other tests that would not be in the Labs System, it can still be used as a proxy of the total lab tests conducted in Ontario for measurement against the completeness of information contained in the Labs System.

As of March 2016, the Labs System did not contain the following:

- About a quarter of the province's active labs, consisting of 30 hospital labs and two community labs, did not contribute a total of about 33 million test results to the Labs System. Although some of these labs indicated that they needed to upgrade their local systems before they could contribute to the Labs System, eHealth Ontario does not have the power to compel hospitals—or anybody else—to contribute data. Thus these lab test results are not available for viewing by health-care professionals in the care of their patients.
- Tests performed in a physician's office. In 2015/16, about 10 million tests were done in physicians' offices rather than in labs, including pregnancy tests and tests required for private insurance. eHealth Ontario stated that these tests were not intended to be included in the Labs System because they were not performed in accredited labs by licensed lab personnel. However, in November 2015, an expert panel that reviewed lab services in Ontario recommended that the Ministry provide quality oversight on physician in-office tests, and that these tests be connected to the Labs System so that a patient's complete health profile is available to be accessed by health-care professionals.
- Community lab tests not covered by the provincial health insurance plan (OHIP). In 2015/16, about 1.3 million of these tests were conducted, including allergy and prostate

cancer screening, and tests paid for by private or federal government health plans or by patients themselves.

In addition, through contractual agreements with individual labs, eHealth Ontario may specify the types of tests, due to sensitivity or other factors, that the labs can exclude from the Labs System. But eHealth Ontario did not have a listing of the types of excluded lab tests by lab, and had not verified that labs had in fact excluded the right types and numbers of tests as set out in these agreements.

RECOMMENDATION 4

To ensure complete and accurate information is available in the Ontario Laboratories Information System (Labs System) for health-care professionals to provide better care for patients, eHealth Ontario should:

- regularly work with the Ministry of Health and Long-Term Care to help identify any lab information that should be uploaded to the Labs System, and require health-care organizations and health-care professionals to upload all lab information; and
- confirm that individual laboratories do not exclude more tests than specified in their contractual agreements with eHealth Ontario.

RESPONSE FROM eHEALTH ONTARIO

The Ministry and eHealth Ontario accept this recommendation and will continue to work together to identify lab information that should be uploaded to the Ontario Laboratories Information System (Labs System) with due regard to cost, benefit and alignment with the Digital Health Strategy when it is approved.

eHealth Ontario accepts this recommendation and will establish a re-conformance process with the labs currently contributing to the Labs System to ensure that only those results that were agreed to contractually will be excluded from the repository. Following the re-conformance testing, eHealth Ontario will regularly report and monitor to ensure ongoing compliance.

Diagnostic Imaging

Four diagnostic imaging repositories across Ontario store images and reports for exams such as x-rays, MRIs, CT scans and mammograms. These exams are conducted in both hospitals and privately owned, for-profit clinics (referred to as independent health facilities). Independent health facilities provide diagnostic services at no charge to patients covered by OHIP.

As of March 2016, the four regional repositories did not contain all images from independent health facilities and specialty images from hospitals:

- The regional repositories contained only 40% of images available to be uploaded from independent health facilities in Ontario. At the time of our audit, the repositories contained 3.6 million of these images, so eHealth Ontario had in fact surpassed the target of 3.4 million images, but data from 2013/14 (the most recent year of data available at the time of our audit) indicates that almost nine million diagnostic images were taken in independent health facilities across Ontario. The images in the repositories originated from 29% of all independent health facilities in Ontario, while the remaining 5.4 million images originated from facilities that eHealth Ontario identified in 2011 as not able to provide diagnostic images because they did not use digital equipment. eHealth Ontario has not followed up to check if any of these facilities have since converted to digital equipment. As well, at the time of our audit, eHealth Ontario had no plans to identify how many new clinics have opened since 2011 or to include their images and reports.
- All images and reports for specialty areas such as cardiology and ophthalmology are available from hospitals but are not included

in repositories as eHealth Ontario noted that the government did not specify them to be included. Health-care professionals we spoke to said that having access to these images and reports would be of great benefit to patient care.

RECOMMENDATION 5

To ensure complete and accurate information is available in the Diagnostic Imaging central repository for health-care professionals to provide better care for patients, eHealth Ontario, in conjunction with the Ministry of Health and Long-Term Care, should:

- require all currently operating independent health facilities to upload diagnostic images and reports to the repository; and
- require diagnostic images and reports conducted for specialty areas such as cardiology and ophthalmology to be uploaded to the repository, and identify the need to include any other specialty reports.

RESPONSE FROM eHEALTH ONTARIO AND THE MINISTRY

The Ministry agrees that complete and accurate information should be available in the Diagnostic Imaging central repository. The Ministry will work with eHealth Ontario to assess the costs and value associated with integrating new independent health facilities that have opened since 2011, and to include those that have digitized since then. It may be determined based on value to Ontarians that some may not merit inclusion. The Ministry and eHealth Ontario will ensure that the investment to integrate new clinics and recently digitized independent facilities is appropriately assessed in the context of the Ministry's new Digital Health Strategy (Strategy) once approved. The Ministry will work with eHealth Ontario to develop options and recommendations to inform future government decisions through the Digital Health Board.

The Ministry and eHealth Ontario will work with clinician experts and service partners to conduct a review to identify which specialty reports should be included. As part of this review, they will determine the cost estimate and technical requirements of adding this information to the diagnostic imaging repository. The investment to do so will be appropriately assessed in the context of the Ministry's new Strategy. The Ministry will work with eHealth Ontario to develop options and recommendations to inform future government decisions through the Digital Health Board.

Integration Services

Each of the three regional connectivity hubs, under a contractual agreement with eHealth Ontario, is required to implement a regional EHR viewer and ensure it is adopted by targeted health-care professionals. The viewer provides health-care professionals with web-based access to patient health information such as hospital discharge summaries and patient notes that originated within the same region to assist them in their care of patients.

In order to view information, hospitals and other health-care organizations within each region were given a target date of March 2014 to load specific types of patient health information into a central repository, including hospital discharge summaries, reports on emergency visits, community agency reports and patient consent notices.

However, as shown in **Figure 8a**, as of May 2016 (more than two years after the deadline), only about 60% of the targeted health-care organizations in the Greater Toronto Area hub had loaded their patient health information, compared to only about 30% and 15% of the targeted health-care organizations in the other two hubs. As a result, health-care professionals cannot benefit from central access to much of the patient health information created in their own regions, or in

other regions. Because of the low uploading rate, health-care professionals in the Northern and Eastern Ontario region had not yet begun viewing the clinical data in the provincial repository, as shown in **Figure 8b**.

eHealth Ontario expects the targeted number of sites within the three regional hubs to add all required patient information to the central database by March 2017. For the remaining sites, eHealth Ontario had not yet established a timeline for adding patient information.

RECOMMENDATION 6

To ensure that health-care professionals can electronically access all necessary information to obtain a complete medical profile of their patients and deliver timely and quality patient care, eHealth Ontario should monitor the regional hospital administrators for connecting systems to ensure that all health-care organizations in their regions contribute required data to the central database.

RESPONSE FROM eHEALTH ONTARIO

eHealth Ontario accepts this recommendation and will work with the Ministry to identify information that should be made securely accessible to health-care professionals with due regard to cost, benefit and alignment with the Digital Health Strategy when it is approved. The Ministry will work with eHealth Ontario to develop options and recommendations to inform future

Figure 8a: Status of Health-Care Organizations Uploading Clinical Data to Central Repository, May 2016
Sources of data: eHealth Ontario

	Target Completion Date		Percentage of Health-Care Organizations Uploading Clinical Data[1]	
	Original (2010)	Revised (2016)	As at March 2014[2] (%)	As at May 2016[3] (%)
Greater Toronto Area	March 2014	March 2017	29	58
South West Ontario	March 2014	March 2017	0	31
Northern and Eastern Ontario	March 2014	March 2017	0	15

1. Examples of clinical data include hospital discharge summaries and notes on patient encounter or visit.
2. Measured against original 2010 targets.
3. Measured against revised 2016 targets.

Figure 8b: Status of Clinicians Registered to View Clinical Data in Central Repository, May 2016
Sources of data: eHealth Ontario

	Target Completion Date		Percentage of Clinicians Registered to View Clinical Data[1]	
	Original (2010)	Revised (2016)	As at March 2014[2] (%)	As at May 2016[3] (%)
Greater Toronto Area	March 2013	March 2017	0	70
South West Ontario	March 2014	March 2017	0	104[4]
Northern and Eastern Ontario	March 2014	March 2017	0	0[5]

1. Examples of clinical data include hospital discharge summaries and notes on patient encounter or visit.
2. Measured against original 2010 targets.
3. Measured against revised 2016 targets.
4. This region registered more clinicians to view clinical data than the target.
5. No viewing occurred as most health-care organizations in this region had not yet uploaded data to the central repository.

government decisions through the Digital Health Board.

eHealth Ontario has taken steps to establish a rigorous process to monitor and track which health-care organizations contribute data. eHealth Ontario currently requires its regional service delivery partners to report monthly on the number of sites contributing and accessing data. Following the implementation of the revised agreement process, eHealth Ontario's oversight of delivery partners has become more robust to ensure regions contribute additional data to provincial assets like the clinical document repository, which as of October 2016 contained 54 million documents, an 87% increase since a year earlier, and that any barriers to contribution are fully understood with action plans to remediate them. As well, all three regional hubs are currently contributing to the electronic health record and viewing clinical data in support of patient care.

Drug Information System

At the time of our audit, many health-care professionals still did not, or could not, access centralized drug information, while others could access only some medication information of their patients. Many patients' drug information was not even available in a central database.

The Ministry, which took over the responsibility of the drug information system from eHealth Ontario in May 2015, was still in the process of developing a central repository of all drug information for Ontarians when we completed our audit in late spring 2016.

Until this repository is built, health-care professionals can access information in the province's drug-claims payment system through a web-based viewer that was developed in 2005. However, even though the viewer is available, health-care professionals still cannot access complete drug information for their patients because:

- The drug-claims payment system contains records for only about 40% of patients in Ontario including those whose drug costs are covered under publicly-funded drug programs—including people 65 or older, those on social assistance, recipients of home care services enrolled in the home care program, and those who have been prescribed very-high-cost drugs or narcotic drugs. Patients whose drugs are paid for by private insurance or federal public programs (such as veterans' benefits) or those who pay for their drugs themselves are not included.
- Prior to a June 2016 legislative amendment, only certain health-care professionals could legally view dispensed monitored narcotics.
- No physicians, except those connected through the South West Ontario hub, could view data on drugs administered during hospital stays. Instead, they have to access this information through individual local hospital systems.

We contacted other Canadian jurisdictions and found that British Columbia, Alberta and Prince Edward Island each had a drug information system that included information on all drugs being taken by a patient, including narcotics, to support decision-making and to help identify potential adverse drug interactions.

Since limited drug information was available for viewing, during the period from April 2015 to January 2016 only 30% of approximately 12,500 health-care professionals authorized to access the viewer actually used it. While most hospital health-care professionals could access the drug information viewer, many others could not. Health-care professionals in only 20 of about 100 community health centres in Ontario had access to the drug information viewer, and the Ministry has no plans to connect the remaining 80 health centres. As well, pharmacists who dispense medication in the community could not access the viewer. Not having access to a patient's complete medication profile through the drug viewer limits a pharmacist's

ability to review and assess patients' medications to avoid potential adverse drug interactions and for drug management.

Subsequent to the completion of our audit fieldwork, the Ministry indicated that a central drug repository has been developed and is in use by authorized early adopters in southwest Ontario, with plans under way to expand access to other health-care providers starting in 2017. At that time, the Ministry will retire the web-based drug information viewer. The Ministry plans to continue to support the viewer until a fully operational central drug repository is made available across the province.

RECOMMENDATION 7

To ensure health-care professionals can access complete drug information about their patients so that potential adverse drug interactions, drug poisoning and other drug-related problems can be reduced, the Ministry of Health and Long-Term Care should:

- include all medication information for all Ontarians in the central drug repository; and
- set targets to connect all health-care professionals across the province to the central drug repository.

MINISTRY RESPONSE

The Ministry agrees that it is important to securely incorporate comprehensive drug information to support the best possible medication history for patients in a repository that is accessible to all health-care providers. As such, the Ministry has developed an overarching Comprehensive Drug Profile Strategy (Drug Strategy) that has been approved by government. The Drug Strategy is designed to leverage existing provincial publicly funded assets, to maximize the Ministry's current investments and successes in Ontario, and to deliver clinical value to patients and health-care providers. The Ministry will adopt an incremental approach where benefits will start to accrue in the shorter term—each discrete stage of the Drug Strategy is to be cost estimated and approved by government as work progresses. The initial stage of the Drug Strategy, a Digital Health Drug Repository, has been developed and is in use by authorized early adopters in southwest Ontario with plans under way to expand access to other health-care providers starting in 2017. The Ministry will ensure eHealth Ontario and its regional partners establish appropriate targets to connect all health-care providers across the province to this repository as it becomes fully operational.

Throughout the subsequent stages of the Drug Strategy, the Ministry will ensure alignment with the new Digital Health Strategy. The non-Ministry funded drug information is not part of the government's assets. As such, work with the health-care providers, private insurers, policy-makers and the Information and Privacy Commissioner of Ontario will be required to fully achieve the Drug Strategy. The Ministry will work to develop options and recommendations to inform future government decisions.

4.4 Many Factors Delayed Full Implementation of Electronic Health Records

4.4.1 Health-Care Organizations Don't Have to Participate in EHR Projects

The participation of health-care professionals in the development of EHRs is critical, yet neither the Ministry nor the LHINs, which fund many of the local health-care organizations that provide direct health care, require them to participate in the initiative except in a small number of projects including Panorama. Instead, participation is, for the most part, voluntary.

LHINs enter into funding agreements with health-care organizations in their region, such as hospitals, Community Care Access Centres and community health centres. These funding

agreements require organizations to use technology solutions that are compatible or interoperable with the provincial EHR plan—but they stop short of requiring the organizations to participate in or contribute health information to EHR systems. As a result, funded health-care organizations may choose not to contribute health data to the various data repositories, as discussed in **Section 4.3**.

In the case of the Labs System, the Ministry had originally anticipated making it mandatory for all community and hospital labs to participate in the system, though this was never implemented.

The Ministry and eHealth Ontario believed that health-care professionals would voluntarily participate in the initiative after seeing the benefits demonstrated in various benefits realization studies conducted on various EHR systems and many are actively involved in contributing data to, and participating in, the implementation of these systems across the province.

The Ministry further indicated that, based on an external consultant's 2015 review of major jurisdictions' experiences in implementing EHR, a "top-down approach" mandating participation in EHR projects has worked well only in limited circumstances—in jurisdictions where their organization environment enabled such an approach, but not in most other jurisdictions.

In our view, voluntary participation in the current "patient first" health environment would be a major hindrance to the success of Ontario's EHR initiative, because there is no assurance that clinical information will be complete in the system. Health-care professionals would therefore not have all available information about their patients.

4.4.2 Standardized Requirements Not Defined at Outset of the Initiative

Defining the standard requirements for the EHR systems implemented by health-care organizations at the outset of the EHR initiative would have been a prudent step to enable integration of systems and facilitate the contribution of data from organizations across the province. Diverging to expanded functionalities later on if they turn out to be critically important would be easy, while converging a multitude of systems without initially agreeing on core requirements would be almost impossible. Initial standardization could have made connection of the various systems easier and possibly cheaper.

The 2014 strategic review of the eHealth strategy similarly noted that health-care professionals and organizations in the broader health sector who develop their own EHR solutions generally align with the broader ehealth strategy, but they could create a challenge because some of these systems may not integrate with other systems to support the EHR.

Many health-care organizations and professionals across Ontario—for instance, hospitals and primary care physicians—had already invested in their own electronic systems to manage their patients' health records prior to the province announcing the EHR initiative. These organizations would have chosen the technology solution that best met their staff's and patients' needs without considering whether the system would be compatible with other organizations'.

Even after the launch of the EHR initiative, the LHINs did not mandate that the health-care organizations they fund adopt common technical systems. For example, each hospital could select from 14 different vendors to implement the hospital information system that they believed met their needs.

Similarly, the Ministry did not require all community-based physicians (such as family doctors) to use a standardized Electronic Medical Record software. Individual community-based physicians who want to manage their patients' health information electronically can select the software of their choice. According to OntarioMD, a wholly owned subsidiary of the Ontario Medical Association, an estimated 80% of patient health data is stored in computers in physicians' offices as Electronic Medical Records, which are critical to the EHR initiative.

Between 2009/10 and 2015/16, the Ministry paid OntarioMD about $410 million to provide incentives to community-based physicians to adopt software from any of 17 certified vendors (reduced to 13 at the time of our audit, and further to 10 subsequent to our audit, due to vendor mergers). A vendor is certified if its software meets provincial specifications to enable integration to other EHR systems such as the Labs System and hospital report systems. Each physician who adopted certified Electronic Medical Records software received a one-time payment and monthly subsidies totalling up to $29,800, based on achievement of certain milestones. The government did not require all primary-care physicians to adopt certified vendor software, so physicians using non-certified software could choose to modify their system (if possible) in order to access the various EHR systems and contribute patient data, or else forfeit the ability to access or contribute to EHR systems at all. OntarioMD does not collect information on the number of physicians who chose software from non-certified vendors.

We conducted research to determine whether the original approval of 17 certified vendors is typical in the implementation of physician office patient record systems in other provinces. We found that five other provinces approved anywhere from one to nine certified vendors, fewer than Ontario's original number. The Ministry explained that it wanted physicians to have more choice when selecting certified patient record systems.

Given the large number of physician patient record systems, extraction of similar patient information from the dozen certified systems is difficult, because the various software packages handle the same data in different ways. As well, because not all physicians use certified software systems, accessing centrally stored health information such as lab tests or diagnostic imaging would not be equally easy for all physicians in Ontario. In addition, according to our survey results, some physicians had to transfer their patient files from one certified system to another certified system due to vendor mergers as noted earlier, costing physicians significant time and money and potentially reducing the time available to provide patient care.

eHealth Ontario expects to spend $366 million to integrate the health sectors' diverse systems—the Integration Services project is the most costly component of the EHR initiative.

RECOMMENDATION 8

To ensure participation of all health-care agencies, organizations and providers in the Electronic Health Record initiative, and to confirm interoperability of systems, the Ministry of Health and Long-Term Care should:

- amend service agreements to require participation in, and contribution of, information to projects within the Electronic Health Record initiative; and
- establish interoperability standards where necessary.

MINISTRY RESPONSE

The Ministry and eHealth Ontario agree interoperability of systems is required for the continued success of the Electronic Health Record initiative. The Ministry will carefully mandate use/participation as technology advances and the concerns and complexities of the stakeholder community can be addressed.

The Ministry will seek opportunities to implement compliance requirements for participation in the EHR domain including adopting industry-supported messaging and data standards and remaining current in the technology used with due regard to cost, benefit and alignment with the Digital Health Strategy when it is approved. The Ministry will work to develop options and recommendations to inform future government decisions, through the potential creation of new levers, such as regulations or through modifying core funding models, and where practical, amending service agreements.

4.4.3 Policy and Legislative Issues Not Always Resolved in Timely Way

Policy and legislative issues that may have prevented implementation of some EHR projects were not always addressed ahead of time, thus contributing to delays.

In one case, physicians were unable to electronically order lab tests in the Ontario Laboratories Information System at the time of our audit because the regulation required physicians to physically sign lab-test requisitions. An amendment to the regulation is therefore required to allow physicians to electronically order tests, which would speed up the process and lower the risk of transcription errors.

Similarly, not all physicians and other health-care professionals could access narcotics medication information because the *Narcotics Safety and Awareness Act, 2010* needed to be amended to allow access without the need for a written request if the health-care professional is not the original prescriber and dispenser. Lifting this requirement to access narcotics medication information helps avoid prescribing medications that may adversely impact patients. This issue was addressed through a change, which was proclaimed in June 2016, to this Act.

RECOMMENDATION 9

To ensure that all functions of the Ontario Laboratories Information System can be operational, and for all future work on Electronic Health Record systems to be successfully implemented, the Ministry of Health and Long-Term Care should first identify policy and regulatory implications, and then work to amend them within the project timelines.

MINISTRY RESPONSE

The Ministry accepts this recommendation. The Ministry has provided and will continue to provide any required legislative and policy support as needed for the core EHR projects. Through the Digital Health Strategy, the Ministry will seek opportunities to identify future policy and legislative requirements in support of the digital health initiatives.

4.4.4 Better Oversight of Contracted Service Providers Needed

At the time of our audit, eHealth Ontario had entered into agreements with about 30 health-care organizations with contracted costs totalling about $200 million to deliver various aspects of the province's EHR initiative.

The agreements set out specific requirements such as the responsibilities of the organizations, funding to be provided, the final products to be delivered, and regular reporting of performance data such as number of registered users, active users, connections and response times.

Previous reviews of eHealth Ontario indicated that it lacked appropriate oversight of its contracted service providers. For example, a strategic review of eHealth Ontario and the overall eHealth strategy in 2014 noted that the agency's oversight of its health partners would benefit from more rigour and discipline. The review suggested that the agency institute formal structures to govern decision-making and take remedial action when required, establish disciplined assessment and reporting, and implement metrics to enable progress measurement.

Similarly, eHealth Ontario's own internal audit group that conducted an audit of the agency's oversight of contractual agreements between 2011 and 2014 noted governance and oversight issues in an August 2015 report, including:

- Project deliverables and milestones set out in agreements were not linked to funding paid to health-care partners. Payments were made based on forecasted amounts instead.
- eHealth Ontario paid health-care partners without first reviewing invoices for their appropriateness or confirming that deliverables were achieved.

Further to issues already identified in these reviews, we also noted that eHealth Ontario did not require health-care agencies with which it contracts to report on any outcome-based performance measures. Instead, performance measures in agreements were mostly output-based and related to such indicators as volume of active users, number of registered users, and percentage of lab test volumes contributed. Outcome-based indicators such as measures of user satisfaction, reduced repeat emergency department visits, reduced number of unnecessary repeat tests, and reduced adverse drug interactions, can help eHealth Ontario evaluate whether project objectives were met.

It should be noted that, to improve oversight, eHealth Ontario formed an internal group in February 2016 that is responsible for providing contract management and oversight for all contracted services.

RECOMMENDATION 10

To ensure service-delivery partners comply with contractual requirements, eHealth Ontario should revise agreements to include outcome-based performance measures and related targets for the various Electronic Health Record projects, and collect this information to assess achievement of project objectives.

RESPONSE FROM eHEALTH ONTARIO

eHealth Ontario accepts this recommendation. While the initial implementation projects with delivery partners contain output measures, once the core foundational elements are completed, eHealth Ontario will work with entities (such as Health Quality Ontario) to establish outcome-based indicators—including user satisfaction, reduced repeat emergency department visits, reduced number of unnecessary repeat tests, and reduced adverse drug interactions—to evaluate whether project benefits are being met over time.

4.4.5 Reduced Annual Funding Impacted Ability to Deliver on Project Targets

eHealth Ontario's spending on its own operations and on EHR projects depends on its annual funding from the Ministry. When eHealth Ontario's annual budgets fluctuate, it has to reprioritize work plans to stay within budget, which may affect project completion. For instance, eHealth Ontario's approved funding went from $426 million in 2014/15 to about $300 million in 2016/17. As a result, eHealth Ontario noted in its 2016/17 annual business plan that it had to change a project target relating to the Ontario Laboratories Information System: instead of collecting 90% of the total Ontario lab test volumes into the system, it will target about 85%. It should be noted that the decreased funding was partly due to implementation of fiscal restraints across the government as well as removal of funds related to OntarioMD, which is now the Ministry's responsibility.

4.5 System Usage Below Expectation and Needs to Be Better Measured

The ultimate success of any information technology system is dependent on whether it was delivered on time and on budget, whether it meets the needs of users, and whether users actually use it. It is therefore critical to have health-care professional buy-in on EHR projects because they need to adopt the technology and incorporate it in their daily workflow, to fully realize the systems' benefits.

Determining who accesses the systems and the data contained within them helps eHealth Ontario identify opportunities to increase awareness and support users so that benefits to the health-care system are realized. In turn, patients can receive better quality and timely health care, such as improved diagnosis and disease management, and reduced adverse drug interactions.

4.5.1 Utilization Data Not Reliable or Useful

eHealth Ontario establishes targets of active users for its various projects to gauge adoption rates, but we have concerns about how eHealth Ontario defines "active" users, how reliable the active-usage rates are, and the type of usage data collected.

Differing Definitions of Active Users

Canada Health Infoway (Infoway) defines an "active user" as one who accesses at least two domains/sites containing patient medical information at least once a month. Our research found that other Canadian provinces also apply this definition.

eHealth Ontario management informed us that it uses two definitions for active users. One is similar to Infoway's, but only requires the user to access one site, not two, and it also defines an active user as one who accesses the system at least three times a quarter. Our discussions with Infoway indicated that they also accept this latter definition, which counts a health-care professional who accesses one site three times in the first month and then not again in the next two months of the quarter as an active user. Given the current technological environment, these active use definitions seem to be set very low.

eHealth Ontario contracts with other organizations, including labs and administrators of repositories and connectivity, referred to as health-delivery partners, who are responsible for tracking usage. eHealth Ontario expects these partners to follow its definition of active users, but this is not always the case. Different definitions were used for similar databases or systems and, as systems matured, definitions changed over time. These factors make it difficult to compare usage between systems or measure usage trends.

Because eHealth Ontario did not initially mandate a specific definition to be applied by the health delivery partners, they have historically applied a variety of definitions for active users, depending on the project, including: once a month, once a month within the most recent 90-day period, once in the last six months, and three times in a quarter. It also counted as active those users who knew or remembered their log-in password, or had the help desk reset their password. Only in November 2015 did eHealth Ontario ask the four Diagnostic Imaging repositories in Ontario to apply Infoway's active use definition where health-care professionals access the system at least three times a quarter. At the time of our audit, three of the four had done so, while the fourth kept its definition of an active user as one who had accessed the system once in the last six months. As a result of the different definitions applied, summarizing usage results for all four Diagnostic Imaging repositories in Ontario would not be useful.

A May 2016 benefits realization report conducted by external consultants commissioned by eHealth Ontario noted that Ontario is in a similar position as Australia, Germany and the United Kingdom—all were seeking to determine the value of implementing costly EHR initiatives without having a full understanding of adoption and usage.

In January 2016, eHealth Ontario and the three hospitals that administer the regional connectivity hubs started a project to update the definition of active use target by care setting. The project will gather an understanding of usage by type of health-care setting and the frequency of usage. It will impact both the Labs System and the diagnostic imaging system as health-care professionals can access data from these systems in the EHR connectivity viewer. eHealth Ontario expects to present this work to its board of directors in fall 2016, subsequent to the completion of our audit fieldwork.

Reliability of Active-User Data in Doubt

The active-user data that eHealth Ontario collects and reports to the Ministry could potentially be overstated, as in the case of the active-user information reported for the Labs System. eHealth Ontario advised the Ministry that 55,400 unique active users logged into the system in 2015/16.

However, this number could be overstated because, for example, a single health-care professional who logged in three separate times from a hospital, a regional Connectivity Hub and a family doctor's office would have been counted as three different users. After we brought this to eHealth Ontario's attention, they analyzed the 2015/16 user data and identified about 7,500 users who had logged in through multiple access points. Not having reliable active-user data can result in missed opportunities to direct adoption and training efforts to specific areas.

Usage Data Not Sufficiently Detailed or Consistently Collected

eHealth Ontario does not always collect active usage data by type of health-care setting or by type of health-care professional, criteria that could enable targeted efforts to increase usage. Increasing usage of the system means more patients can benefit from their health-care professionals having quicker access to available health information. In a December 2015 meeting, eHealth Ontario's board recognized that health-care professionals who work in different settings would likely access EHRs at different frequencies. For example, a physician in a hospital emergency room would probably use the system more often than one working in primary care, where most patient records are already available in their office.

For the Integration Services project, the lead hospital/hub administrator in South West Ontario maintains usage rate by care setting, such as hospital, primary care, community care and public-health units. It also maintains usage rate by type or role of health-care professional, such as family physician, imaging technologist, specialist physician or pharmacist. However, the lead hospital/hub administrator in the Greater Toronto Area did not maintain usage data by type nor did eHealth Ontario require that similar data be collected by all the administrators/hospitals. As a result, the Greater Toronto Area would not be able to determine the type of health-care professionals to whom it should target adoption rates.

Similarly, these criteria were not universally applied to usage information for the Labs System, so it was not possible to determine how health-care professionals working in various units of a hospital and in community physician offices used the system. As well, while the lead hospital in South West Ontario follows the Infoway guideline of setting a preliminary usage rate at 20% of registered users, the lead hospital in Greater Toronto set as its target 20% of *anticipated* users which, in the majority of cases, is a lower number.

This lack of consistency in types of data collected as well as usage targets set makes it difficult to conduct analysis or to identify trends or patterns of usage to determine where greater adoption and usage efforts are needed so that physicians can provide better quality of care to patients.

4.5.2 Usage Targets Not Met or Not Set

Measuring usage rates of an EHR system can help determine whether uptake is at sufficient levels to improve patient care and achieve greater efficiencies. It can also help identify which health-care organizations or types of health-care professionals to target when usage rates are below target.

In the case of the Integration Services project, in addition to the usage rate, eHealth Ontario measures the registration rate, which is the step before usage. For this project, eHealth Ontario follows Infoway's "active user" target, which initially aims to have 10% to 20% of registered users become active users, and then to eventually increase the target over time as the service becomes more widely available.

The Greater Toronto Area connectivity project did not meet the registered users target in time. eHealth Ontario originally wanted the lead hospital to register 40,540 health-care professionals by March 2013. The hospital did not achieve this total until January 2016, almost three years late. As well,

as of April 2016, only 13% of the registered users in Greater Toronto were using the regional viewer.

In the case of the Labs System, eHealth Ontario does not track usage rates for the entire system, but does maintain usage data through the different access points such as hospital information systems, and the provincial viewer. Using this data, we estimated that 34% of registered health-care professionals used the Labs System in 2014/15, and 37% in 2015/16. But neither eHealth Ontario nor the Ministry established a target user number for the Labs System, which could have been based on the Infoway target of 20% initially, and gradually increasing over time. Instead, eHealth Ontario set user target on the connectivity projects as a proxy for access to the different information systems (such as the Labs System and the Diagnostic Imaging system) that users can access through the connectivity projects. However, this measure would not identify instances where physicians continue to access lab results through means other than the connectivity projects when they bypass the regional viewers. Some physicians currently receive electronic lab results directly from larger labs that were and have been providing this service outside of the EHR initiative.

Given that the Labs System was fully functional in 2006 and became available for clinical use in 2012, it would be reasonable to expect a higher usage rate by the 2015/16 fiscal year.

In the case of the Diagnostic Imaging system, eHealth Ontario did not set user targets for any of the four regional Diagnostic Imaging repositories. Instead, as discussed in the case of the Labs System, eHealth Ontario set user target on the connectivity projects as a proxy for access to available systems, including the Diagnostic Imaging system. According to 2015/16 usage data reported by each regional repository, on average 7,600 health-care professionals accessed each repository, and actual usage by region ranged from 2% to 36% of registered users. Even though some community-based physicians can also access diagnostic images through the regional viewers in their offices using their Electronic Medical Record systems, not all of these local systems are interoperable with the regional viewers.

RECOMMENDATION 11

To ensure efforts to promote the Electronic Health Record projects are appropriately directed and to increase system adoption, eHealth Ontario should:

- establish and communicate a consistent definition of active user to be applied across the province;
- establish growth targets for active usage of each project as more registered users are given authorized access; and
- collect actual usage data by unique user and by access points, and regularly compare this data against established targets to identify areas of under-utilization that require further action.

RESPONSE FROM eHEALTH ONTARIO

eHealth Ontario accepts this recommendation and agrees that there should be a standard definition of active user. eHealth Ontario currently uses the two definitions of active users that are approved by Canada Health Infoway—health-care professionals who have either accessed the system a minimum of three times per quarter or once a month. Service delivery partners across the province have been using either one of these definitions for reporting purposes since November 2015. eHealth Ontario will work with its delivery partners to determine which is the most representative definition and communicate a consistent definition across the province.

eHealth Ontario will work with the Ministry to develop a plan to establish growth targets for registered users. eHealth Ontario established targets each year through agreements with its delivery partners. eHealth Ontario has completed an extensive review of current adopters and developed profiles of high users and low

users, which will be used to inform appropriate growth targets.

eHealth Ontario will develop a plan to implement measurement tools to collect actual usage data by unique user, access points and other types of usage data, and compare against established targets. In doing so, areas of under-utilization that require further action will be identified.

4.5.3 Physicians Not Using Available EHR Systems

We interviewed and surveyed a random sample of physicians in Ontario to gauge their awareness and usage of the EHR projects. Only 12% of the physicians who responded to our survey indicated that they fully used the available systems. The most common reasons they cited for not using the systems were lack of awareness or not knowing how to use the systems, ability to obtain the required information elsewhere and technological barriers.

We discuss these issues in the following subsections.

Health-Care Professionals Not Aware of the Functionalities of EHR Projects

Although most physicians who responded to our survey were aware of the systems we asked about—the Labs System, the diagnostic imaging system, the drug system, the Connectivity hubs, Electronic Medical Records in physician offices, and consumer eHealth (patients having access to their own records), 35% of physicians indicated they did not know how to use the systems.

Similarly, various health-care professionals we interviewed said they were unaware of the capabilities of the Labs System. In addition, we followed up with a sample of participants in a limited-production-release project for the Diagnostic Imaging central repository and found that, in some cases, the participants themselves were not even aware of the project or its capabilities.

eHealth Ontario has a province-wide communications strategy, but the strategy lacks details on areas of responsibility by specific parties and the required timelines for completion. As a result, ensuring all health-care professionals who would benefit from having more timely and complete information of their patients poses challenges.

Health-Care Professionals Needs Not Met

Health-care professionals we interviewed said that retrieving test results from the Labs System takes longer because they must first enter individual patient names, and then locate a specific test from all the results provided, including some ordered by other physicians. This concern could be addressed by making available a practitioner query function, which was not initially included in the system due to privacy, legal and technical concerns identified during pilot testing. The function was still not available at the time of our audit.

Another barrier cited was legislative—there is a legal requirement for labs to deliver results to the ordering physician within a reasonable time. Since not all physicians use Electronic Medical Records software that meets the provincial certification standards, the risk exists that some physicians will not receive lab results via the Labs System within the required time.

Finally, 38% of the physicians who responded to our survey noted that they did not need to access EHR systems because they could access data elsewhere.

Information Technology Environment Not Fully Considered

We looked into why only about 13% of the users registered to use the connectivity viewer in the Greater Toronto Area were viewing the data in the system. Health-care professionals we interviewed told us that it took very long to load data in the viewer. The system was designed to load data in seconds, but the actual loading time experienced in the Greater Toronto Area in early 2016 was up

to three minutes, which is a long time in most fast-paced health-care settings. eHealth Ontario explained that this slow response was due to a number of factors, some related to system performance that were within eHealth Ontario's control and some were related to technology configurations within the hospitals. In the case of the hospitals, no thorough assessment of individual hospital systems had been made prior to integrating their systems with the regional viewer. The impact of this lack of assessment was only apparent after the integration work was completed.

For the Labs System, we found that doctors do not find it necessary to access the Labs System to obtain these test results, perhaps because large community labs feed test results directly to individual physicians via their Electronic Medical Records.

For the Diagnostic Imaging system, two hospitals worked with eHealth Ontario in 2015 on pilot projects to test the suitability of storing images of electrocardiograms and echocardiograms (both are non-invasive cardiology tests) in the Diagnostic Imaging repository. At one test site, the electrocardiogram pilot project yielded a savings of about 780 administrative hours, worth about $16,000 in annual savings. Similarly, two sites reported that overall reading times were reduced from over five days to just one, and the volume of duplicate electrocardiograms was reduced by about 50%. eHealth Ontario did not complete the other pilot project, on echocardiograms, because of technological challenges. At the time of our audit, eHealth Ontario indicated that reports from the pilot sites were archived in the region's repository. However, both types of images from all other hospitals were not required to be included into the Diagnostic Imaging repository of the regions.

Similarly, in March 2015 and in December 2015, eHealth Ontario followed up with a sample of health-care professionals who tested a module of the centralized Diagnostic Imaging repository in 2014 to find out why they did not use the module as often as expected. Health-care professionals said that the repository did not sufficiently integrate with their own systems, it required an additional set of passwords to log in, and it did not provide access to diagnostic images generated by independent health facilities. At the time of our audit, eHealth Ontario had not made any changes to this module.

Forty-five percent of the physicians who responded to our survey cited other technological barriers as reasons for the low adoption rates, such as cumbersome log-ins, inability to readily find information, pages that were difficult to navigate, and interoperability issues.

Overall, the uptake of the EHR projects could be higher if the Ministry and eHealth Ontario had sufficiently planned for and understood the user needs and information technology environment.

RECOMMENDATION 12

To improve uptake of existing and new Electronic Health Record projects such that health-care professionals can provide better care to patients, eHealth Ontario, and the Ministry of Health and Long-Term Care (in the case of the drug information system) should:

- examine the reasons for the low uptake rates and prepare an action plan to address the root causes of the low usage rates;
- update the communication strategy to define roles and responsibilities for each project and timelines; and
- implement the practitioner query function in the Ontario Laboratories Information System.

MINISTRY RESPONSE

eHealth Ontario and the Ministry accept this recommendation and agree with the Auditor General's comments. Subsequent to the completion of the Auditor General's audit, eHealth Ontario has implemented processes to improve loading time to under four seconds for 76% of the sites in the Greater Toronto Area. In addition, eHealth Ontario has completed an extensive review of current adopters and developed

profiles of high users and low users, and will use this information to promote enhanced adoption through more tailored methods. A detailed strategy will be developed to increase the active user base, taking into account where and how the EHR is currently being viewed, and identify service delivery efficiencies and assets and sectors on which to focus contribution and viewing efforts.

The Ministry is developing its Digital Health Strategy and, once approved, roles and responsibilities will be clarified and clearly communicated.

RESPONSE FROM eHEALTH ONTARIO

eHealth Ontario accepts the Auditor General's recommendation. Lab tests are currently retrieved from the Ontario Laboratories Information System (Labs System) by health-care professionals from several sources, including two clinical viewers and through some certified Electronic Medical Records (EMRs).

eHealth Ontario piloted the practitioner query in 2015 and the lessons learned have been included in the Labs System product to be released in the 2017/18 fiscal year. Once the individual certified EMR vendors make the necessary product changes and the clinicians using certified EMRs have upgraded their systems accordingly, then they will have the ability to automatically receive reports for their patients through the practitioner query function.

Appendix 1: Key Events Relating to the Electronic Health Record Initiative in Ontario, 1999–2016

Prepared by the Office of the Auditor General of Ontario based on information provided by eHealth Ontario and the Ministry of Health and Long-Term Care

Date	Event
June 1999	• Health Services Restructuring Commission submits Ontario Health Information Management Action Plan to Minister of Health and Long-Term Care. • Action Plan recommends acceleration of information and technology investments to better capture, share and analyze health-care information. • Action Plan also recommends creation of independent, arm's-length entity to provide strong central leadership, manage implementation of Action Plan, and allocate financial resources.
2001	• Government of Canada creates and funds Canada Health Infoway (Infoway) as an independent, not-for-profit Shared Governance Corporation. • Infoway's goal is electronic health records (EHRs) for 50% of Canadians by 2010, and for all Canadians by 2016.
2002	• Ontario Government creates the Smart Systems for Health Agency (SSHA). • SSHA begins operations in April 2003 with a mandate to support Ministry of Health and Long-Term Care (Ministry) programs. It begins work on a private data network to connect Ontario's medical community.
2004	• Ministry's eHealth Program Branch created to establish and maintain an eHealth strategy and oversee delivery, including development of EHR applications and databases.
April 2007	• Ministry develops an eHealth Blueprint that provides a high-level scope and requirements from a technological viewpoint.
September 2007	• Ministry and SSHA sign an Affirmation of their Memorandum of Understanding. • SSHA's mandate is to provide "secure, integrated, province-wide information technology infrastructure to allow electronic communication among Ontario's health-service providers."
May 2008	• Government approves provincial eHealth strategy.
September 2008	• Through a regulation of the *Development Corporations Act*, Ontario government creates eHealth Ontario by combining the activities and responsibilities of SSHA and the Ministry's eHealth Program Branch into one organization responsible "for all aspects of eHealth in Ontario, including creating an Electronic Health Record for all Ontarians." • Ontario Government forms eHealth Ontario's first board of directors; no members of SSHA's board invited to join. The Premier appoints board Chair.
March 2009	• eHealth Ontario's 2009-2012 eHealth Strategic Plan published. • Strategic Plan describes activities to be undertaken, targets delivery of an EHR system by 2015, and outlines three clinical priorities: diabetes management, medication management and wait times.
April 2009	• Ministry and eHealth Ontario sign a Memorandum of Understanding and a Transfer Payment Agreement setting out their respective accountability.
October 2009	• Auditor General releases Special Report on Ontario's Electronic Health Record Initiative. • Audit identifies a lack of comprehensive strategic plan, weak oversight and slow progress of projects, and excessive use of external consultants.
June 2010	• Ministry issues a mandate letter to eHealth Ontario, directing agency to focus its efforts on 12 projects essential to implementation of an EHR.
December 2010	• Treasury Board/Management Board of Cabinet approves eHealth Ontario's submission outlining agency's understanding of the key projects and deliverables needed to complete the foundational components of the EHR.
September 2012	• eHealth Ontario terminates contract with vendor for implementation of Diabetes Registry, resulting in an arbitration award of $26.9 million.

Date	Event
March 2013	• Ministry halts eHealth Ontario work on a Drug Information System.
March 2014	• Report issued based on strategic review of the status of eHealth at the Ministry's request. The review, conducted by two former Ontario public servants, covers the Ministry, eHealth Ontario and all other parties involved in achieving an EHR for all Ontarians by 2015.
November 2014	• eHealth Ontario publishes the revised eHealth Blueprint, which establishes a common framework and consistent terminology to support business service needs, the health information needed and the technical solutions needed.
March 2015	• Ministry creates new eHealth Investment and Sustainment Board, chaired by the Deputy Minister of Health and Long-Term Care, and consisting of representatives from the Ministry, selected LHINs and eHealth Ontario. • Deadline for completion of 12 key EHR projects listed in the June 2010 mandate letter to eHealth Ontario.
May 2015	• Ministry takes over the Drug Information System and redesigns it. System still under development at the time of our audit.
July 2015	• eHealth Ontario issues Connectivity Strategy, detailing how health-care information will be connected to form the EHR of the future.
April 2016	• Report issued by external consultant to conduct mandate review of eHealth Ontario as required under the Agencies and Appointment Directive.

Appendix 2: Description, Potential Benefits and Project Status of All 12 Planned Electronic Health Record (EHR) Projects in Ontario as of March 2016

Prepared by the Office of the Auditor General of Ontario based on information provided by eHealth Ontario and the Ministry of Health and Long-Term Care

	Projects*	Component Description	Potential or Realized Benefits	Status as of March 2016
1.	Ontario Laboratories Information System	Connects hospitals, community laboratories, public-health laboratories and health-care professionals to allow for the secure electronic exchange of lab test orders and results. What it means to the patient: a family doctor can, for example, electronically access the results of a blood test regardless of where in Ontario it was taken.	Timelier access to test results for health-care professionals, better monitoring of laboratory history and treatment progress, reduced number of unnecessary lab tests.	In progress
2.	Diagnostic Imaging	Gives health-care providers electronic access to patients' diagnostic images and reports. What it means to the patient: an X-ray taken at a North Bay hospital, and the accompanying report, could be accessed electronically by a specialist in Toronto.	Eliminates need to physically transfer images to physician, reduces wait times for tests and results due to faster access, reduces duplicate and unnecessary exams.	In progress
3.	Integration Services	Connects all of the different EHR systems using a standardized approach. What it means to the patient: provides health-care professionals with secure electronic access to a wide variety of patient health information residing in a variety of systems.	More timely care because health-care professionals can quickly access patient data regardless of when or where tests were completed.	In progress
4.	Drug Information System	Electronic database allows physicians to electronically prescribe new medications, and physicians, pharmacists and nurses to electronically view and access information about patients, including their medications. What it means to the patient: if a patient arrives unconscious at hospital emergency department, attending physician can access the system to review medications that patient is taking and determine which drugs to administer so there will be no adverse reaction.	Ability to access medication information when patients are unable to communicate, reduction of repeated information, and prevention of drug reactions.	Ministry took over the project from eHealth Ontario in May 2015
5.	Diabetes Registry	Electronic system to manage diabetes treatment by providing health-care professionals access to OHIP claims and lab test results, producing reminders and reports for appointments, and manage the care of patients according to recommended guidelines. What it means to the patient: active management of diabetes results in fewer complications such as heart disease, blindness and kidney failure, which means lower costs to treat people with diabetes.	Reduction in number of lab tests, easier and faster access to results, reminders and alerts to reduce missed appointments, and fewer emergency room visits.	eHealth Ontario cancelled the project in September 2012

	Projects*	Component Description	Potential or Realized Benefits	Status as at March 2016
6.	Physician eHealth	Program within eHealth to provide funding and support to community-based health-care providers to adopt electronic-medical-record systems. Electronic medical record systems allow physicians to electronically collect, manage and share health information. What it means to the patient: family physicians can access a patient's EHR on their own office computer to review patient's lab results and diagnostic images to help make clinical decisions and create efficiencies in getting required patient information on a timely basis.	Timely access in the physician's office to all patient test results, such as blood tests, x-rays, MRIs and hospital reports. This gives physicians a complete health picture of the patient and can reduce the time required to make a referral to another physician or specialist.	In progress
7.	Client, Provider, and User Consent Registries	Databases that store information on patients, health-care providers and users of the entire EHR system. Patient information is linked to one profile for that individual, regardless of what test was done, where it was carried out or who their physician is. Patient identifying information such as health card number is stored to allow for the linking of information to test results. Provider information is stored to ensure that physicians and other licensed health-care providers have appropriate access to patient records. Patients can specify who can or cannot access their health information.	Reduction of time in searching for patient information from different sources, reduction in duplicate tests, and increased security and privacy.	In progress
8.	Client, Provider, and User Portals	A web-based viewer that provides health-care professionals with real-time access to patients' electronic medical information, all in one place. What it means to the patient: physician access to portals to review data on lab results, x-rays and other images can cut wait times and unnecessary duplicate tests, and improve quality of care.	Improved communication and care transitions for patients, reduced duplication of lab and diagnostic tests, and timely access to the needed patient health information.	In progress
9.	Consumer eHealth	Patients can electronically view their health information on their personal computer. What it means to the patient: a patient can view, for example, their blood-test results by logging on from home at any time, helping people manage and contribute to their own care.	Reduction in the number of visits to doctors to obtain test results.	No plans yet
10.	Panorama	Provincial immunization and pandemics management system that electronically tracks and stores information on immunizations of children in daycares and schools, and those vaccinated at public-health clinics. What it means to the patient: a child severely cuts her finger on a rusty nail, requiring medical attention. Doctor can access child's immunization history to determine if a tetanus shot is needed based on date of the last immunization, helping to avoid unnecessary new tetanus shot.	Reduction of time in reviewing patient immunization history, prevention of duplication of immunizations.	System contains only immunization records of school-aged children

	Projects*	Component Description	Potential or Realized Benefits	Status as at March 2016
11.	Chronic Disease Management	Management of chronic diseases that involves the connecting and sharing of the components of the provincial electronic health record to enable health-care professionals to access patient information for patient care. What it means to the patient: helps physicians to access patient test results and other health information such as electrocardiograms to help manage the chronic disease to prevent the condition from worsening.	Increased patient safety and prevention, and improved management and outcomes for those with chronic diseases.	In progress
12.	Technology Services	Core technology services that help ensure EHR systems and databases function smoothly and reliably. What it means to the patient: EHR systems function well, with a minimum of down time, ensuring EHRs are always there when needed.	EHR data is delivered to providers and users on eHealth Ontario's secure private network and through encrypted Internet connections.	Completed

* Listed in the Ministry's 2010 mandate letter to eHealth Ontario.