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In Ontario, the government is committed to investments that ensure patients’ needs are paramount. This means better care that is closer to home. It is therefore important to understand and measure the impact of health information technology (HIT) investments on patients, clinicians, and the overall health care system.

Globally, many jurisdictions are now heavily investing in developing frameworks that will measure the value derived from HIT across the health care sector. In Canada, most jurisdictions have adopted Canada Health Infoway’s Benefits Evaluation Framework and customized it for their specific needs. Working with a variety of stakeholders, and utilizing this global effort, including the Ministry of Health and Long-Term Care (MOHLTC), eHealth Ontario (the Agency) has developed a standardized approach to Benefits Realization (BR).

Benefits Realization is the iterative process of planning, measuring, evaluating, and modifying plans to ensure technology implementations are providing value. BR is an ongoing journey evolving over time to reflect the maturity of HIT, its respective adoption, meaningful use, and system evolution. Depending on the maturity of the HIT, the benefits derived can be short, medium, or long-term. Over the course of the BR journey, the following elements will be considered:

- Adoption and usage of the HIT investment
- Anecdotal case studies pointing to potential benefits, and
- Evaluative studies providing evidence on the benefits

Clinician engagement is a crucial aspect of benefits realization as they are the frontline users of HIT. Proactive change management and clinician engagement in system design and implementations empowers the end users and tends to produce higher adoption of eHealth systems and tools. It is also of note that patient engagement is essential as they are the final beneficiaries of any health systems. Furthermore, HIT ecosystem robustness (maximized information sharing) and system usability have a direct impact on the perceived benefits of eHealth offerings. Therefore, it is important to monitor system interoperability and connectivity as it will impact the clinical adoption and use.

The Agency’s Office of the Chief Medical Informatics Officer (CMIO) developed the Benefits Realization Framework and tools with the Agency’s three regional partners and in collaboration with other health care focused agencies. The Benefits Realization Framework will assist projects and programs in utilizing a formal method of managing time and resources to deliver business results and guide future investment. The framework employs the Institute for Healthcare Improvement’s (IHI) “Triple Aim” which is comprised of improving patient experience, improving population health, and reducing cost. The Office of the CMIO is undertaking a series of activities to realize the benefits of government investments in health IT:

1) Clinical-value driven planning
2) Benefits evaluation, and
3) Realizing value via enhanced use of HIT

What is Benefits Realization?

Benefits Realization is...
...the iterative process of planning, measuring, evaluating, and modifying plans to ensure technology implementations are providing value.

Purpose of this Report

The purpose of this report is to provide an update to eHealth Ontario Board of Directors, the Ministry of Health and Long-Term Care, and sector stakeholders on Benefits Realization with a focus on:

- Results external to the Agency
- Results to date within the Agency
- Overview of Benefits Realization Framework
- Testimonials and stakeholder stories
## Results from eHealth Ontario Environmental Scan

<table>
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<tr>
<th>Electronic Health Record (EHR) Components</th>
<th>Saving % Assumption</th>
<th>Ontario Adoption Progress</th>
<th>Benefits Statements</th>
<th>Strength of Evidence</th>
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</table>
| **Clinical Data Repository (CDR)**      | 14%-84% reduction in adverse drug events or medication errors due to access to enhanced patient data (i, ii) | • CDR/EHR is being built in partnership with the Connecting Ontario initiatives  
• cSWO - 162 clinical sites have access to ClinicalConnect™ (CC)  
• cGTA - 1,239 clinicians are using cGTA | • Improved clinical information sharing resulting in better quality of care  
• Increased financial synergies with positive socioeconomic impact with reduced waste in documentation cost and improved utilization of resources | 🟢 |
| **Diagnostic Imaging (DI)**             | 20%-80% improved turnaround time (iii, iv, v) | • Approximately 11,574 clinicians have access to Diagnostic Imaging Repositories, while Di-Common Services (Di-cs) is deployed to 63 users  
• Di-cs R1 is the first provincial program to consume the Provincial Client Registry (PCR) | • Reduced turnaround time in preliminary and final reports and improved workflow  
• Increased cost savings due to the reduction of labour cost and films  
• Improved time for clinical decision-making | 🟢 |
| **Laboratory Information Management System (LIMS)** | 36.5% decrease in patient follow-up visits (vi)  
69% of clinicians believe OLIS prevented ordering unnecessary duplicate tests (vii) | • Approximately 80,000 users with access to Ontario Laboratories Information Systems including over 14,000 unique logins in Q4 of 2014-15 | • Reduced duplication of unnecessary lab tests  
• Improved decision-making at point of care | 🟢 |
| **Electronic Medical Record (EMR)**     | 56%-63% of clinicians agreed that it improved quality of care (viii)  
12.9%-14.3% (ix) reduction in duplicate tests | • 11,364 community-based providers are enrolled in an EMR adoption program  
• 8,107 EMR-enabled clinicians are connected to Ontario Laboratories Information System (OLIS)  
• Over 80% of EMR adoption in primary care settings | • Readily available medical information at providers’ fingertips  
• Reduction in unnecessary and duplicate testing  
• Increased patient safety due to more informed decisions for better care/medication management  
• Improved provider billing process | 🟢 |
| **Medication Management**               | 15%-41% (x, xi) decrease in dispensing errors | • Approximately 11,000 clinicians have access to the Drug Profile Viewer with 3,400 unique users accessing over 263,000 drug histories in December 2014 | • Significant decrease in the number of adverse drug effects (including across Canada)  
• Enhanced patient safety and compliance with ePrescription  
• Reduced administrative costs | 🟢 |
| **Registries**                          | Currently evaluating registries at the Agency  
Required underpinning for EHR | • 1,763 clinicians have access to Provincial Client Registry (PCR)  
• 1,700 clinicians have access to Provider Registry (PR) | • Improved quality of care due to registries facilitating fast clinical information to the providers for appropriate preventive action  
• Improved administrative process with efficiency gains  
• Improved data access and quality and increased ability to identify and plan care, leading to financial savings | 🟢 |

Note: Text in blue indicates benefit has been realized in Ontario.

(i) The Commonwealth Fund (2012)  
(ii) C.D. Howe Institute (2015)  
(iv) Academic Radiology (2012)  
(vi) International Journal of Medical Informatics (2012)  
(vii) OLIS LHSC BR Study (2015)  
(viii) Velante (retrieved June 2015)  
(x) Canada Health Infoway (2010)  
(xi) American Journal of Health System Pharmacy (2011)
1. Global Scan of eHealth Benefits Realization
Clinical Data Repository (CDR) is the cornerstone of the Electronic Health Record (EHR). CDR consolidates electronic patient-centered records from a variety of health care sources in a centralized source that is interoperable across the health care environment.

**Potential Benefits**

**Quality of Care**
Clinical Data Repository (CDR) promotes safe and accurate information sharing across health service providers, allowing more focus on patient care and less time searching for patient information. EHR systems improve the quality of care by facilitating more secure and private information access compared to paper systems. These quality improvements ultimately improve patient care across the continuum.

**Cost of Care**
A complete and integrated CDR will increase efficiency in the care process, such as reducing wait times, leading to more financial savings. The availability of accurate and timely information prevents duplicate tests, fewer clinician visits, and improves practice productivity, thus reducing demands on health care resources while facilitating cost effective care.

**Patient/Provider Experience**
With information readily accessible and interoperable across providers, the health care system can see better coordination of care with providers and patients making more informed care planning decisions. Automated workflows will improve practice efficiencies and reduce redundancies in the care process.

**Realized Benefits**

Across the U.S. and Europe, studies have shown benefits gained through EHR systems in various health care organizations.

In the U.S., the implementation of CDR has shown improvement in workflow efficiencies, such as decreasing initial and returning nursing visits by 15 and 20 minutes, respectively, and decreasing the average time from written order to medication administration by 94 minutes. Across various health organizations, examples of benefits include an 84% reduction in adverse drug events, 93% completeness in physician orders, and 750 staff hours saved in a labour and delivery department in a health care enterprise. In a 2014 study, 82% of physicians agree that the ability for patients to update their own records is proactively involving them in their own care and thus increasing patient satisfaction.

Across Europe, evidence suggests that health care organizations have been the main beneficiaries of EHR implementation. Since 2006, Denmark realized €872 million in financial benefits after their adoption of an interconnected EHR system, which reached over 3,500 general practitioners. Another hospital in southern Denmark saw improved collaboration across hospitals and standardization of information exchange, allowing for timely consecutive clinical decisions. These positive outcomes are paving the path for future EHR investments. In Spain, the adoption of a patient EHR and ePrescribing system allowed a regional health service to accumulate savings of €37 million and approximately €635 million in non-financial benefits and redeployed resources. By 2010, a southern Swedish county had an EHR system operational across all their health care facilities with 98% of practitioners using the EHR system. This adoption saw improvements in quality of care leading to better continuity of care, more informed decisions, improved patient safety, better efficiency, and avoided financial wastes. Further examples of realized benefits in quality of care and financial gain have been shown in European countries such as Finland, France, Czech Republic, and several others.

Clinical Data Repository (CDR) is the cornerstone of Electronic Health Record (EHR). CDR consolidates electronic patient-centered records from a variety of health care sources in a centralized source that is interoperable across the health care environment.
Diagnostic Imaging (DI)

Diagnostic Imaging (DI) systems provide clinicians with electronic copies of radiology reports and images of patients’ previous exam results across various health care organizations and providers.

Potential Benefits

Quality of Care
DI systems with remote access allow clinicians to easily access images from any of their work environments or remote locations and retrieve images and reports during off-hours. These improved points of access also reduce the risk of being exposed to unnecessary radiation (1).

Cost of Care
With DI systems implemented, the health care system can expect to see an overall improvement in diagnostic efficiency and productivity. Financial savings are possible given the reduction of required resources and personnel. Turnaround time can be expected to decrease and the number of duplicates and lost films are lowered, which leads to cost savings (2).

Patient/Provider Experience
Efficiencies in processes are expected as there will be less travel time for patients to pick up physical copies of reports and images to bring to the specialist. This ultimately leads to reduced wait times to retrieve images (3).

Realized Benefits

In Canada, a survey was conducted in the summer of 2014 by Canada Health Infoway to review the benefits of DI-rs and assess clinician experience. Of the physicians surveyed on workflow improvement, 28% noted somewhat improvement, 40% noted improvement, and 22% noted great improvement. Of the radiologists surveyed on workflow improvement, 26% noted somewhat improvement, 35% noted improvement, and 31% noted great improvement. In addition, 62% of referring physicians and 68% of radiologists agree that there is a decrease in the number of duplicate reports. 82% of referring physicians and 85% of radiologists reported that DI-rs improved their ability to provide quality care.

Internationally, studies have been conducted to evaluate the benefits of DI systems. In the U.S., multiple studies have been conducted by Viahealth to evaluate the benefits of DI systems in Rochester General Hospital. The results showed increased satisfaction among customers and staff after implementation of DI systems. Analysis of financial data showed a 20-40% saving, depending on the procedure. Reduction in turnaround time (TAT) was noted as 80% (2).

- 80% reduction in turnaround time (U.S.)
- Turnaround time reduction from 80 hrs to 20 hrs in 8 years (U.S.)
- Financial savings of 20% - 40% (U.S.)
- $3.2 million cost reduction in 5 years (U.S.)

- 44% reduction in turnaround time (Europe)
- Turnaround time reduction from 22 hrs 47 min to 12 hrs 47 min (Europe)
- 90% of users experienced faster access to images (Europe)
- Clinical decision-making significantly improved from 3 hrs 21 min to 2 hr 6 min

Figure 2. Benefits Realization of DI in U.S. and Europe.

1) Journal of Management Information Systems, 2009
2) Academic Radiology, 2012
3) eHealth Ontario, 2015
Laboratory Information Management System (LIMS)

Laboratory Information Management System (LIMS) streamlines the storage, transfer, and processing of medical laboratory results to care providers at all points of care.

Potential Benefits

Quality of Care
A Laboratory Information Management System (LIMS) reduces transcription errors and improves data quality. The fewer errors involved in laboratory results, the higher the level of patient safety (1). Computerized lab information for each patient enables fewer gaps in the patient’s records, especially as they move from one care setting to another (2).

Cost of Care
A LIMS enables faster turnaround time and allows physicians to be more efficient in their work and complete more work in the same period of time (3). A LIMS reduces the number of unnecessary laboratory tests as there are no more paper-based results, which are at a higher risk of being lost or misplaced. The system also enables enhanced data mining possibilities to discover patterns, which can be used to implement predictive models, which yield financial gains.

Patient/Provider Experience
The LIMS assists the clinicians in the monitoring of laboratory history in order to support the chronic disease management of patients. The remote access availability of laboratory results ensures the results are available at an appointment. The system enables clinicians multiple routes for data searching by name, patient number, laboratory, test results, or analysis performed, enabling the clinician to find a patient’s record even if the record is incomplete. It also improves workflow through advanced functionality.

Realized Benefits

A study conducted at the Comprehensive AIDS Resource Education (CARE) Clinic at St. Mary’s Medical Center in California reported a decrease in follow-up visits since the introduction of their LIMS from 1.15 visits to 0.73 (4). The response time to address a change in therapy decreased from an average of 37 days to 31.4 days post-implementation.

In another LIMS study from Massachusetts, U.S., there was a realized annual benefit of approximately $300,000 per laboratory (5). Every $1 spent was offset by $1.50 of savings on hardware and software. Support activities, like help desk and user administration declined as much as 75% as a result of the standardized LIMS.

A study evaluating LIMS in Wales found that the system enables management of 21 million tests per year by one system (6). This system improved interoperability by connecting 18 disparate laboratories. Other observed benefits included better service for patients, increased efficiency and effectiveness of care, reduced duplicate and repeat testing, and easy user adoption.

- Decrease in the number of follow-up patient visits from 1.15 prior to LIMS intervention to 0.73 post-implementation (U.S.)
- 75% reduction in administrative activities (U.S.)
- 30% – 90% reduction in system downtime response (U.S.)
- 77% improvement in quality work (U.S.)
- LIMS enabled 21 million tests per year to be managed by one system (Europe)
- LIMS improved interoperability by connecting 18 laboratories in 6 different health boards (Europe)

Figure 3. Benefits Realization of LIMS in U.S. and Europe.

2) eHealth Ontario, 2015.
3) Ontario Hospital Association, 2006.
5) American Laboratory, 2005.
Registries collect and allow easy access of provider and client/patient data in an organized and streamlined fashion that improves the process of verifying individuals’ identity across the continuum of care.

**Potential Benefits**

**Quality of Care**
Provider and patient registries improve patient flow, safety, and continuity of care by reducing administrative burdens. More accurate and up-to-date data is more accessible at all times also reducing duplication of reports (1).

**Cost of Care**
Both types of registries increase productivity and efficiency by expending less effort and resources on client registration. Human errors are reduced as automated systems help improve client data quality and validate provider identity.

**Patient/Provider Experience**
Provider registries make the referral process easier for providers, thus reducing time for clients to see providers, and reduces efforts for the provider re-credentialing process. Client registries allow physicians to have a more complete picture of their patients’ health through secure and private searches.

**Realized Benefits**

In Canada, the Newfoundland and Labrador Centre for Health Information (NLCHI) implemented a provincial Unique Personal Identifier and Client Registry (UPI/CR) in 2001. Major benefits from this registry include financial savings of approximately $3.9M annually for the province, and improvements in data access and quality (2).

The U.S. government has identified that a provider identifier repository (i.e. a registry) improves efficiency by allowing consistent transfer of standardized identifiers through a fast electronic exchange (3). Benefits include reduction in medical errors, improved processes, and better patient privacy (4).

The South Australian Health Department sponsored a provider registry in 2002-2003, which not only facilitates clinical patient information to the providers but also efficiently alerts providers of any public health concerns so proper preventative measures can be taken. With this registry, providers only need to contact one department if they change their contact details, and are able to retrieve timely and accurate information on their patients (5).

- Reduction in medical errors, simplified use of electronic records, improved efficiency in processes, and better patient privacy (Canada & U.S.)
- The Health Provider Registry facilitates improved timely and accurate patient clinical information to providers, ultimately improving the quality of care for patients (Australia)

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1) eHealth Ontario, 2015.
2) Canada Health Infoway, 2005.
4) RAND Corporation, 2008.
5) Health Provider Registry, V. 3.10.
Electronic Medical Record (EMR)

An Electronic Medical Record (EMR) is a computer based medical record used in the primary care setting, usually consisting of patient information, clinical documentation, and clinical decision supports.

Potential Benefits

Quality of Care
EMRs improve the availability of a patient’s information to care providers enabling them to make more informed clinical decisions, aided by system alerts, leading to improved quality of care for the patient. Having a complete history of medications, examinations, and lab tests can also lead to a reduction in duplicate tests. Complete information and alerts for allergies, medication interactions, and prescription dosages enhance patient safety.

Cost of Care
Enhanced patient safety from alerts can alleviate pressures on the system caused by adverse drug events. Physician offices with EMRs can see savings in the elimination/reduction of the creation, maintenance, and storage of (new) paper charts. There is also a reduction of transcription costs related to transcribing information from one medium to another. Because information is directly added to the EMR in an electronic format, it can be exported to other systems without much effort.

Patient/Provider Experience
With a complete patient history in their EMR, the provider can quickly reacquaint themselves with their patients’ history and their current needs during appointments. The availability of all test results and examination reports can produce a reduction in the ordering of duplicate tests, to the patients’ benefit. The use of electronic ordering and referrals can expedite care and ensure the consulting physician has access to all of the necessary information before consultation.

Realized Benefits

According to the 2013 National Physician Survey, approximately 74% of primary care physicians and community-based specialists use EMRs in Canada (1). 64.3% of GPs and 59.5% of specialists use an EMR to enter and retrieve clinical notes. 74.2% of GPs and the same percentage of specialists have been using some form of EMR for over two years. A 14.3% decrease in diagnostic test orders per visit was found in a U.S. outpatient study (2).

In Australia, a study conducted in 2009 found a 30% reduced length of stay which was attributed to a reduction in surgical adverse events through the use of medication management in EMRs (3). 98% of Danish physicians have an advanced functioning EMR, allowing them to relay clinical information to different systems in pharmacies, laboratories, and hospitals (4).

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56% of physicians report that the quality of patient care they provide is better with the use of an EMR (Canada)
64% of physicians in Ontario suggest an EMR provided improved patient safety within a year (Canada)
63% of doctors feel that the use of EMR has improved quality of patient care (Canada)
76% reduction in errors on discharge summaries due to the use of EMRs (Australia)
14.3% decrease in the number of diagnostic tests ordered in the outpatient setting per visit (U.S.)
12.9% decrease in diagnostic test costs per visit when using an EHR with CDS and CPOE components (U.S.)
14% decrease in the number of tests ordered by physicians per visit due to the decisions support element of the EMR system (Europe)

Figure 5. Benefits Realization of EMRs in Canada, U.S., Europe, and Australia.

4) Medtech Europe, Denmark: Electronic Patient Record.
Medication Management

Medication management systems provide clinicians with electronic prescriptions and/or the transfer of medication histories for each of their patients through a safe, accurate, and timely process.

### Potential Benefits

#### Quality of Care

Medication management systems help prevent adverse drug reactions from occurring, thus increasing patient safety. It also allows for clinicians to have fast and easy access to a patient’s medication history. Legible prescriptions lead to more accurate dispensing, thereby reducing the number of dispensing errors, thus further improving safety (1).

#### Cost of Care

Medication management systems reduce administrative time by eliminating the requirement for repeatedly collecting medication history. This leads to an increase in assessment time and improves clinician efficiency. The system also enhances provider communication, resulting in improved productivity (2). These systems can also help reduce the number of extra appointments made to obtain a lost prescription.

#### Patient/Provider Experience

Medication management systems enable access to medication history, even if a patient is unable to communicate, and therefore helps lead to a correct diagnosis. From a clinician perspective, pharmacists can spend less time receiving telephoned prescriptions from physician offices. The resulting time savings enable more clinical time between the patient and clinician and provide easier workflow for the clinician (1).

### Realized Benefits

Canada Health Infoway (CHI) commissioned a pan-Canadian study on the benefits of medication management and found that 15% of medication errors and adverse drug events were avoided, amounting to $41 million in annual benefits. While improving patient, physician, and pharmacist satisfaction, it also limits medication abuse, and total system benefits are estimated to be $436 million (2).

Within the U.S., an implementation of a medication management system significantly lowered dispensing errors in clinics that use e-prescribing at the Beth Israel Deaconess Medical Center (1). At the Suburban Hospital ED in Maryland, it was found that 21% of ED collected data lacked the dose, form, and strength of the medication. Electronic reports also improved efficiency as it only took one second to produce post-implementation, compared to 5.2 minutes the ED history took to obtain (3).

The eRecept program in Sweden transmits prescriptions to a specific pharmacy or National Mailbox, enabling patients to choose a pharmacy when it is convenient. This has led to benefits of €27M in the first five years, and an estimated annual economic benefit of over €95M in 2008 (4).

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<th>Benefit Description</th>
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<tr>
<td>15% reduction in adverse drug events and $23 million of annual benefits (Canada)</td>
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<tr>
<td>15% of medication errors and adverse drug events can be avoided and add $41 million of annual benefits (Canada)</td>
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<tr>
<td>9 out of 10 pharmacists claimed there were improvements in patient, physician, and pharmacist satisfaction (Canada)</td>
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<tr>
<td>The implementation of the eRecept Program has benefited Sweden €27M in the first five years (Europe)</td>
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<tr>
<td>The implementation of electronic prescribing has reduced the number of dispensing errors (U.S.)</td>
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<tr>
<td>The electronic report required an average of 1 second to produce, compared to an average of 5.2 minutes it took the ED history took to obtain (U.S.)</td>
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### References

2. eHealth Ontario Results
The Agency recognizes the importance of the benefits realization methodology and program areas are collecting data to demonstrate the value of their initiatives. However, there is an opportunity for greater use of standard BR processes across the Agency to continue collecting data and help inform ongoing investments.
Ontario Laboratories Information System (OLIS)

OLIS Query & Unique Logins

Implications

- The consumption of OLIS data has been steadily increasing over time
- A significant increase in use is from the regional/hospital viewers, which is in line with the Agency’s effort in connecting Ontario. The environmental scan illustrates that the increased usage will yield significant benefits for the Province
- A detailed study is required to understand the impact of the usage patterns and how to increase meaningful usage
- During Q4 of fiscal year 2014-15, there were over 14,000 unique logins per month to OLIS

OLIS in Primary Care

Case 1. OLIS Usage

Patient Impact

7,425 primary care physicians have access to the OLIS-EMR channel, covering prospective OLIS data for upwards of 7.4 million Ontarians in primary care.

Calculation and Assumptions

- 2,470 unique logins were all primary care physicians
- 12.5 million Ontarians have access to primary care physicians (MOHLTC)
- 996 primary care patients per primary care physician (Market Intelligence)
Benefits Evaluation in Progress

Ontario Laboratories Information System (OLIS)

OLIS was implemented into London Health Sciences Centre (LHSC) and eight other hospitals in southwestern Ontario in February 2014.

A benefits realization study was being conducted to evaluate the impact of OLIS, where positive results have been seen across several domains, including improvements in care coordination among providers, patient education, and self-management.

69% of clinicians that were surveyed believed that the OLIS system prevents unnecessary duplicate lab tests. 51% of respondents expressed there was a reduced wait time for lab test results, and 69% of respondents also experienced reduced administrative time to access a patient’s lab tests that were conducted externally to the facility. These results will be tracked provincially.

Diagnostic Imaging (DI)

CHI conducted a survey in June/July 2014 to review the benefits of DI-Repositories (DI-rs) and assess the experience of clinicians. Of the referring physicians surveyed on workflow improvement, 28% said it was somewhat improved, 40% said it was improved, and 22% said it was greatly improved. In addition, of the radiologists surveyed on workflow improvement, 26% said it was somewhat improved, 35% said it was improved, and 31% said it was greatly improved. 77% of referring physicians and radiologists agreed that the amount of time for decision making had improved (average of 47 mins for physicians, 70 mins for radiologists).

62% of referring physicians and 68% of radiologists agree that the level of duplicate reports being ordered has decreased (average decrease of 4/wk for physicians and 6/wk for radiologists). 82% of the referring physicians and 85% of radiologist reported that DI-rs improve their ability to provide quality care. There is a new study underway to review progress and confirm the value of DI-rs and DI Common Services (DI-cs).
Benefits Evaluation in Progress (Cont’d)

Registries

In 2014, a benefits realization study was initiated to evaluate the benefits of the Provincial Client Registry and the updated Provider Registry at the pilot sites. Working with the Office of the CMIO, the Identity, Access, and Privacy (IAP) team established a benefits realization working group and have finalized the indicators to be measured. A questionnaire has been sent to clinicians using the registries to gather their feedback. The results are currently being analyzed and reviewed by the IAP team for an interim status update for the MOHLTC. As well as the questionnaire, the benefits study will utilize audit logs and onsite interviews to gather more in-depth data, which will be analyzed to make conclusions for the final report.

Electronic Medical Record (EMR)

As of May 12, 2015, 11,364 community-based providers are enrolled in an EMR adoption program, representing coverage for more than 10 million Ontarians. Ontario’s investments in EMRs have yielded a high degree of adoption in primary care settings at over 80% adoption in 2015, up from 70% in 2012. Given the high rate of adoption, the focus of many physicians is shifting from implementation and adoption to maturity of use. Physicians are seeking the use of advanced functionality such as data mining and analytics that would allow them to assess the needs of their patients more proactively. Many EMR users find the integration of OLIS and Hospital Report Manager (HRM) very useful although there is a desire to integrate other data sources.

8,107 EMR-enabled clinicians are connected to OLIS (as of June 4, 2015) resulting in over 145,000 queries in May 2015. 85% of hospital corporations are now connected to HRM sending 1.8 million reports per quarter. 4,872 clinicians are connected to receive hospital reports as of March 31, 2015 (of which 2,208 are specific to HRM). Physicians report that patient experience is improving due to access to reliable and comprehensive patient information. Furthermore, evidence-based practices are continuously incorporated into physician care due to the ability to readily locate patient information and additional sources of data. Since most EMRs have a single source of data entry and there are a total of 11 different EMR vendors, there is an agreement on the need to focus on data quality and standardization before connectivity to the EHR can proceed. Physicians are observing EMR-enabled enhanced care coordination within their practices but there are limitations without integrating with other EMRs and data sources. The Agency will continue to work in collaboration with OntarioMD, and other stakeholders, to enhance the partnership in EMR adoption and EHR integration.
“Connecting Ontario” Benefits Realization

The Connecting Ontario regional integration initiative involves leveraging local, regional, and provincial assets and connecting existing information technologies in ways that improve patient care and clinical efficiencies through the development of the patients’ EHR. Clinicians can access critical patient data from all sources, anywhere, at anytime.

Connecting Ontario Benefits Realization Forum

The EHR is being built in partnership with three geographic hubs. Every hub will participate in the Agency’s BR work, today and in the future. The Office of the CMIO works with these hubs to coordinate BR streams across the province.

Mandate

The Connecting Ontario Benefits Realization Forum was created to align the BR approach for the three geographic hubs to enable comparison of benefits across programs. In addition, it helps promote BR best practices facilitating information and knowledge sharing.

Membership

The Connecting Ontario Benefits Realization Forum is comprised of executive, BR, and clinical leads from the three hubs, eHealth Liaison Branch at MOHLTC, and eHealth Ontario representatives including the CMIO (Chair), Integration Services SVP, and other Program Leads.

Current Status

A common set of system level metrics and high level methodology have been agreed upon.
The goal of connecting South West Ontario (cSWO) is to implement a regional eHealth program that will make an individual’s health information available in a timely and secure fashion across the continuum of care. The program includes an integrated EHR and a regional clinical viewer, ClinicalConnect™ (CC), to local and provincial information sources.

Approximately 1,700 health service providers and 35,000 health care professionals across all four SWO LHINs are involved. Once completed, 3.6 million residents in SWO will have an integrated EHR, which is approximately 30 percent of Ontario’s population.

As of April 2015, 162 clinical sites have access to CC with evidence showing a strong uptake from LHIN 3 – Waterloo Wellington (Figure 8). These sites include hospitals, CCACs, long-term care homes, community health organizations, public health units, family health teams, and various primary care facilities (Figure 9). Of the 162 sites, over 90 consume OLIS through CC.

In particular, 67 of 67 acute care hospitals are contributing data through CC and 69 of 69 hospitals can now access/consume data through CC.

Figure 8. Number of care facilities with access to ClinicalConnect™.

Figure 9. Main domains accessing and using ClinicalConnect™.
Usage of CC continues to increase with approximately 20 million CC queries by Q3 of 2014 (Figure 10). As of May 2015, 13% of the entire user base accessed CC on a weekly basis, with transcription, radiology (diagnostic imaging), and lab details being the top three clinical modules utilized (Figure 11).

Based on post-implementation survey results, CC usage is showing a positive impact on the quality of patient care (Figure 12). The cSWO program believes that the increase in the number of users that have strong beliefs is related to the extent to which they are embedding its use in workflow.
Impact of ClinicalConnect™ on clinical workflows

**Case 2. Psychosis patients**

Since beginning to use ClinicalConnect in the intake process for early psychosis program referrals, the waiting period before acceptance to the treatment program has been reduced and the variability in access to care has been eliminated.

Approximately 128 days of non-treatment were avoided for patients living with psychosis (Figure 13) after community providers received the proper training on CC.

**Case 3. Emergency department**

CC can provide considerable value to its hospitals and patients, with 5-10% of Emergency Department (ED) cases benefiting from CC.

In a case review from the ED at Guelph General Hospital, one ED physician saw a total of 170 patients and used CC nine times (5.3%). From this, three tests and two admissions were avoided.

Preliminary results based on the small sample size are very positive. If we consider the potential impact of CC at a provincial level, we could achieve significant benefits in delivering high quality of care to all Ontarians. These findings are consistent with other international case studies in larger integrated health systems.
cGTA - Benefits Realization

ConnectingGTA (cGTA) is a hub for electronic health information, intended to enhance care for approximately 6.75 million Ontarians by providing clinicians and care providers with the data they need to make care decisions.

Once fully implemented, cGTA will benefit clinicians at more than 750 health care organizations, representing the continuum of care. The system provides access to data to improve timeliness of care decisions, and reduces duplicate tests and procedures. In the early adopter phase, the program is set to reach approximately 20,000 clinicians.

As of August 2015, the number of users for cGTA has reached more than 30,000 with the solution being accessed over 3,600 times. Adoption and usage shows registered users have exceeded the program target and of those users, 39% were using the system weekly (this is 4 times higher than CHI’s definition of an active user (Figure 15). Go-live, as of summer 2015, increased to 18 sites with data contributions from lab, diagnostic imaging, consult reports, discharge summaries, blood bank information, and hospital medication profiles.

To date, cGTA is used at six Community Care Access Centres and 13 hospitals and/or hospital networks. Around 2.4 million patients are captured (36% of GTA’s population) by cGTA. Over 106 million messages are captured, with 100% regional CCAC information, 75% regional lab results, and 50% regional acute information captured.

In a case example from William Osler Health System, an early adopter site, the portal had 131 users for the week of April 28 to May 4, 2015 (Figure 16) and 50 unique visits with internal medicine having the greatest number of total and unique visits (Figure 17).
Estimating the Impact of the EHR

The EHR is expected to strengthen primary care, which drives better health care usage and eases transition between care settings, potentially yielding considerable monetary benefits.

The largest cost saving is shown in EDs through a drop in usage and more efficient workflows. Through data analysis and expert opinion interviews, it was determined that the ED is the care setting that may yield the greatest cost savings as it is primarily driven by the impact of the EHR on the primary care setting.

Figure 18 shows the upper and lower estimates of cost savings due to EHR usage. At its upper peak, use of EHR is seen to generate over $40 million dollars in cost savings, with more than 50% of that total attributed to the usage of the EHR in EDs.

The Agency has conducted investigations to further understand the value of the EHR. 61 clinicians, research, and administration stakeholders were consulted through interviews and surveys. Literature reviews and historical data analysis were also conducted.

The results show that improving a clinician’s comfort level, and their ability to use the EHR, can yield significant benefits and have a substantial impact on potential cost savings (Figure 19). In other words, the more they know how to use it, the greater the cost savings. As such, effective change management, training, and maturity of use can enhance the value of the EHR over time.

Figure 18. Estimated cost savings of all sectors and ED from cGTA usage.

Figure 19. Estimated cost savings due to clinician comfort and usage level with cGTA.
Next Steps for Benefits Realization

The Road Ahead

The information in this report illustrates the value of health care information technology. Looking at the evidence from other jurisdictions to the results from the Connecting Ontario Program, there is growing evidence that the impact health care information technology can have on the provision of care. As technology is further enhanced, adoption is increased, and more data sets are added, the value of eHealth technology will clearly increase.

As the Agency progresses on this journey, the Office of the CMIO will continue to gather data by tracking adoption and usage, and conducting benefits evaluations, further shining light on how eHealth is improving the health care delivery sector. Collaborating with academia and sector partners, the Office of the CMIO will look at studying the system and population health impacts of eHealth technology.

Given the importance and widespread impact of the Connecting Ontario programs, the Office of the CMIO will continue to work closely with regional partners to assess benefits realization work across the province and spread best practices to better understand the benefits of an integrated electronic health record.

Part and parcel of this journey would be to continue to drive value-based planning in the sector. Collaborating with the Agency’s Clinical Advisory Council, the Office of the CMIO will explore how Agency programs can be evolved to deliver greater benefits. This will include sharing clinical evidence and examining potential enhancements to existing or planned initiatives.

Looking into the future, moving from adoption to enhanced and meaningful use of eHealth assets will be crucial. The Office of the CMIO will continue to support the Board of Directors and the Ministry of Health and Long-Term Care’s vision for the sector. These are certainly exciting times for the health care information technology sector.
3. Benefits Realization Strategy
Measuring the Benefits of the EHR

As a project progresses, different benefits will be observable.

Benefits cannot be realized without proper planning and evaluation of the value being achieved. A multi-faceted approach needs to be explored with evidence based planning that meets business objectives.
Measuring the Benefits of the EHR

As a project progresses, different benefits will be observable

Without adoption, eHealth technology cannot yield benefits. Adoption is more than accessing the technology, but rather adopting it into a clinician’s workflow.

Throughout adoption, patient experiences become anecdotal evidences that offer valuable insight into what realized benefits may be at a population level. Crucial to a successful evaluative study, stakeholder buy-in is important along with a sound set of metrics and indicators.

### Adoption & Usage

* A standardized approach to measuring and reporting on adoption is crucial.

Adoption and usage metrics are being used by programs and will be reported to the Senior Management Committee (SMC) and Clinical Advisory Council (CAC) for feedback and support.

**Clinical factors for consideration:**
- Clear definition of adoption and use
- Data metrics and collection
- Establish a credible baseline

**Initiatives:**
- BR Framework, BR Toolkit
- Connecting Ontario BR Forum
- Project gating/clinical value indicators

### Anecdotal Evidence

* Patient and clinician stories create compelling narratives.

It is important to garner clinical and patient experiences in using eHealth solutions during direct patient care. eHealth solutions are at various stages of maturity (adoption and use), the evaluation needs to factor in this aspect.

**Clinical factors for consideration:**
- Patient engagement
- Clinical engagement
- Public friendly storyline

**Initiatives**
- Connecting Ontario Forum
- Collaboration with clinicians/patients
- Jurisdictional research

### Evaluative Studies

* Evaluative studies offer more concrete evidence on the benefits of the intervention.

Baseline data is critical for future system evolution and continuous improvement using both qualitative and quantitative evaluations. Existing data need to be leveraged in various domains to align with government priorities and indicators aligned with credible research in a defendable manner.

**Clinical factors for consideration:**
- Metrics and indicators
- Stakeholder buy-in
- Data interpretation & data implications

**Initiatives:**
- Connecting Ontario Forum
- Collaboration with clinicians/patients
- Jurisdictional research
4. Clinician Testimonials
Testimonials

Grey Bruce residents benefit from Ontario lab data.

Improving care for Ontario’s children with electronic lab results.

Video - https://youtu.be/WWBE2YA0Rng?list=PL88C9D7DC2EDB27E9

Video - https://www.youtube.com/watch?v=2D35dxwF2w&index=5&list=PL88C9D7DC2EDB27E9
Testimonials

Electronic Medical Record (EMR)

EMR technology is life changing for Markham Family Health Team patient.

Physicians now able to view patient lab data through their EMR.


Dr. Masood saw a patient post-op who had a procedure done at a downtown hospital. Dr. Masood was able to pull up test results instantly which saved the patient from having to do extra blood work. It also saved Dr. Masood time that he would have wasted while waiting for these results.

**Dr. Asim Masood**, Deputy Chief of Staff and Chief Medical Information Officer, William Osler Health System

Dr. Mohan saw a post-op patient experiencing stomach pain who had recently been discharged from another hospital. Using ConnectingGTA, Dr. Mohan accessed the test results from the other hospital, including a CAT scan that was performed the previous evening, to determine a diagnosis and course of action without unnecessarily repeating the test.

**Dr. Naresh Mohan**, Chief of Staff, Rouge Valley Health System

Having access to the portal allowed Anita to expedite discharge during the recent flu outbreak. She was able to access discharge plans and discharge medication which helped maintain continuity by building on what was planned for follow-up care. As a result, she was able to anticipate healthcare support that their clients needed immediately after the discharge.

**Anita Fast**, Rapid Response Nurse, TC CCAC
Testimonials

Emily Kedwell, RN at Quest Community Health Centre, speaks to the benefits of ClinicalConnect™.

Dr. Mark Jany, Chief of Respirology at Niagara Health System speaks to the benefits of ClinicalConnect™ in his practice.
Testimonials

Alexandria Moss, BScN, RN. Emergency Department. St Catharines Site, Niagara Health System speaks to benefits of ClinicalConnect™.

Jenny Stranges, Program Director at Quest Community Health Centre in St. Catharines, speaks to the benefits they’re seeing using ClinicalConnect™.
Testimonials

“Technology has been changing the way health care is delivered in clinical settings for years — but tools like cSWO’s Regional Clinical Viewer, ClinicalConnect™ aren’t just helping hospitals, but are also “a big step forward” for family medicine, too.”

**Dr. William Buckton**, Sarnia-based Rapids Family Health Team (FHT)

“ClinicalConnect™ speaks for the patient. The quicker we can have access to information the quicker patients would be seen by the doctor. The use of CC has made the ED much more efficient. We no longer have to make phone calls or send faxes to ask for more information. This can make your job safer, easier and give much more patient-client centric care”.

**Alexandria (Sandy) Moss**, RN
St. Catharines General

“When a patient arrives to the ER in the middle of the night, they (clinicians) are usually already well-versed with the patients’ previous treatments and therefore use time spent on the phone more efficiently. They don’t have to ask all the background questions because they know the answers from what they’ve obtained in ClinicalConnect™.”

**Dr. Walker**, Hematologist
Hamilton Health Sciences