

## Digital Health in Ontario Sunnybrook's Journey

October 2016

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Sunnybrook's vision to **invent the future of healthcare** has moved us along many rewarding paths. We have been fortunate to have the support of regional partners, provincial agencies and the Ministry of Health and Long-Term Care throughout our journey. As an academic health sciences centre (AHSC) and regional partner in care delivery, Sunnybrook is engaged in a number of unique initiatives that focus on making health information readily available to clinicians and patients to improve quality of care. We are committed to using information to bring about new approaches in the way we deliver care, and believe that this work is **fundamental to improving the health of, and delivery of health care to, our patients.**

**Sunnybrook's strategic journey with eHealth has required a significant investment of time and effort.** As an academic centre, Sunnybrook is committed to innovation in everything we do. We also acknowledge our role within the broader health care system and work collaboratively with our partners to look at new ways to deliver care that improve the patient experience. We are privileged to work hand in hand with clinicians, staff, researchers, system partners and, most importantly, our patients. At the root of our work is the collective belief that information, and the sharing of that information in an efficient and effective manner, allows for greater opportunities to improve the health of our patients and make the health system better.

**Sunnybrook's accomplishments have, in no small part, been advanced by our reputation as a trusted partner and our extensive collaborations within the provincial health system that have been built over many years.** For the last decade and more, the health care system has gone through some fundamental changes that have afforded Sunnybrook the opportunity to align and participate in key health system and health information initiatives as part of our role as both a hospital and a health system partner.

**Local Health Integration Networks** have offered providers new models of health care funding and accountability that have driven the need for better information to enhance reporting and definition of service delivery requirements within regions. Like hospital restructuring before it, a key enabling factor of partnerships across the continuum of care is investment in common information systems. Regional system imperatives such as those spearheaded through the Toronto Central LHIN (TC-LHIN) and Health Links, gave Sunnybrook the opportunity to contribute to and support regional partnerships and align our systems to the needs of regional care delivery. Examples include the **TC-LHIN Referral Tracking System**, a Sunnybrook-developed, web-based application that supports central intake and wait time management reporting for hip and knee referrals, the **Resource Matching and Referral System (RM&R)** and, most recently, the **North East Toronto Health Link Better Care System**, a Sunnybrook-developed patient flagging and provider notification system focused on supporting the identification of patients who could benefit from greater coordination in care.

The **provincial wait time and information management strategy** also drove the need for integrated data and the use of information within the provincial context. For example, the first iteration of the wait time strategy for the province, led through Cancer Care Ontario (CCO), made it clear that in order to solve issues related to wait times one must understand the magnitude of the issue and create transparency and accountability to focus **on the key opportunity for health system change**. While much can be said about the various disparate repositories and reporting arrangements that currently exist within the provincial health care system, it has become evident that a comprehensive information management strategy that aligns the utility of information that not only informs government and administrators but also providers and the care delivery process has significant value. As a result, organizations closely linked with investigating key areas of health system opportunity, including research and those in provincial agencies such as CCO, the Cardiac Care Network (CCN) and the Institute for Clinical Evaluative Sciences (ICES), have become key partners to both government and delivery organizations alike.

Another key area where we have a vested interest is **electronic health record related investments**, specifically those being spearheaded through eHealth Ontario and Canada Health Infoway. One of the key enablers of an integrated delivery system is the availability of key diagnostic and interventional data that spans the entire patient record, irrespective of the provider. Hospital Diagnostic Imaging Repository Services (HDIRS), Ontario Laboratories Information System (OLIS) and ConnectingOntario (cOntario) have all provided mechanisms for the aggregation of key clinical data from across the province. In addition, the work of OntarioMD has facilitated the increased adoption of electronic medical records (EMRs) by our provincial physician community and helped consolidate the number of EMRs in the province through its certification service. And finally, the Ontario Telemedicine Network (OTN), which was originally conceived at Sunnybrook as the North Network, has developed a robust infrastructure that not only connects providers and patients across the province's vast geography, but is also helping build a new generation of applications to improve provider-to-provider communications, like its recently developed eConsult service. On a pan-Canadian basis, the significant investments made by Canada Health Infoway, like those made in Sunnybrook's Consumer Health Solutions project and our Ambulatory EMR initiative at our Odette Cancer Centre, have also proven critical to advancing our connections throughout the continuum of care.

These system-level opportunities have been pivotal in Sunnybrook's evolution as an organization, but there are also unique local attributes that, from our perspective, differentiate Sunnybrook. **Sunnybrook provides our departments with significant input into the selection of their own local information systems and therefore has many systems that support care.** This "best-of-breed" approach supports the implementation of systems that meet departmental business needs and, most importantly, workflow. This approach also has some inherent challenges, specifically with respect to integrating data being captured across these local systems. Poor data integration could have had a material impact on our integrated clinical workflows and the quality of patient care. To address this and, more importantly, to support broader use of information across our organization, we implemented standards that allowed us to interface these systems throughout the organization under a **single integrated architecture**. This approach laid the foundation for what we do as an organization. From a business perspective, this underlying infrastructure allows Sunnybrook to respond quickly to business change, provide accurate and accessible information across many systems and, most importantly, create personalized interfaces for users that are tailored to their needs. "Freeing" information has allowed us **to build our own front-end applications focused on the user experience**, customized to their specific workflows, all without disrupting the integrity of data in the underlying source systems.

The most notable examples of this type of innovation are **two applications that we have developed at Sunnybrook, MyChart and SunnyCare**. MyChart is Sunnybrook's personal health record (PHR) system that currently enables over 140,000 patients to manage their personal health information within their circle of care. SunnyCare is Sunnybrook's integrated electronic clinical care system that provides quick and easy access to integrated clinical information in a seamless clinical workflow for our clinicians.

Over the past decade, Sunnybrook has had the opportunity to partner with clinicians and health system partners to develop local innovations that have changed the care experience for patients, providers and the regional health system. From the outset, Sunnybrook's innovative solutions have been driven by a few, simple **guiding principles: (1) engage patients in their care, (2) develop clinical workflows rather than functions, (3) clinician-driven design, and (4) integrate workflows across systems, services and sectors**.

**The difference between developing systems based on functions and systems based on workflows is subtle, but critically important.** A functional approach focuses on tasks that need to be completed, which can lead to a fragmented user experience across multiple systems or screens. In contrast, a workflow approach focuses on how work is completed and pulls together information that clinicians need to complete their work, leading to an integrated user experience that is more intuitive and efficient.

Sunnybrook's in-house development approach has provided us with unique advantages from the provincial eHealth strategy perspective. Maintaining independence in code development has allowed Sunnybrook's development team to quickly and seamlessly integrate provincial assets into our solutions, making information from across a patient's episodes of care available at the point of care, at a click of a button and when it's needed most.

Delivering high quality care also requires an effective partnership between clinicians and their patients. Secure exchange of patient health and care plan information is central to success of the partnership. MyChart was developed to support the patient/clinician relationship by giving patients access to their personal health information and empowering them as **equal partners in their care**.

MyChart compiles information from electronic systems at participating sites into an **integrated personal health record for the patient**. Information can be accessed in real time at the patient's fingertips. **Patients are in control of their information**, and can choose who can see their information within their circle of care. **MyChart meets the highest privacy and security industry standards**, and has achieved Canada Health Infoway's certification as a consumer health solution including all privacy and security requirements.

In addition to giving patients access to their PHR, MyChart offers features that support **two-way communication between patients and clinicians**. Patients in Sunnybrook's Family Practice Health Team (FPHT) can view clinician availability and book appointments in MyChart. In addition, MyChart offers shareable daily logs and diaries to enhance patient/clinician communication and monitoring across a broad array of parameters such as sleep patterns, blood pressure, diet, weight and mood. Using these tools, patients are able to make their own contributions to their PHR.

Patients at Sunnybrook's Odette Cancer Centre have experienced a **paradigm shift in care delivery using MyChart**. Having access to their information has allowed patients to self advocate and proactively ask for appointments based on results flowing into their record. In addition, clinician documentation practices have evolved to ensure that content is understandable to patients,

and comprehensively outlines findings, decisions made during appointments, treatment alternatives and plans. In turn, patients are able to ask better questions and clinicians are more confident that patients absorb critical and complex information fully. Planning is underway to push tailored information that is specific to the patient's diagnosis and treatment phase through MyChart in the near future.

Recently, Sunnybrook worked with **eHealth Ontario** to make lab results from the Ontario Lab Information System (OLIS) available in MyChart. This joint innovation provides a significant benefit to patients due to the fact that 84 percent of lab data is available in OLIS, and lab results are a critical input to a clinician's assessment, diagnosis and planning. When this integration is complete, MyChart users will have comprehensive lab information available to them at the point of care to provide valuable context to the clinical assessment process.

**In short, patients and clinicians have been the drivers of innovation behind MyChart** and the belief that patients must be given a voice in their care. A recent survey of 70 physicians using MyChart showed that 91 percent reported they believed their patients' access to MyChart improved the patient experience. Additionally, clinicians recognized that MyChart helped them focus on actually delivering care, and not on retrieving information. Significant value reported by patients and clinicians includes:

- **improved continuity of care** through secure sharing of integrated patient health information across the circle of care;
- **efficient care delivery** as a result of patient self-advocacy and proactive requests for appointments based on information received in MyChart;
- **improved disease tracking and treatment compliance** through enhanced two-way communications;
- **reduced invasive treatment** through increased access to test results and care plan activities;
- **reduced exposure to infection** by avoiding hospital admissions/emergency visits because information is available to provide context for clinical assessment; and
- **increased patient confidence in Ontario's system of care.**

A significant human factor deserves emphasis: MyChart is a shared record, and reflects the needs of both the patient and the provider. Implementation has required significant change management to ensure that everyone's needs are met in the best way possible. An example is how the timing of release of information to patients was addressed. Initially, concern was expressed about patients potentially receiving information before clinicians. These concerns were reviewed in the context of the different types of information available and, currently, the only results that are held back by participating physicians are cancer pathology results. Because of the sensitive nature of these results, they are held for review and discussion with the patient prior to release.

MyChart has truly become a shared record. MyChart-participating sites have grown to include Mount Sinai Hospital, Mackenzie Health, MedicAlert Canada, Lifelabs (CML), Toronto EMS, Michael Garron Hospital, William Osler Health Services Centre, Headwaters Health Care Centre, University of Ottawa Heart Institute, The Ottawa Hospital, Central CCAC, Baycrest Hospital and St. Michael's Hospital. As MyChart continues to extend its network, planning is underway to further integrate others including family members, allied health professionals and community services. **As a result of Sunnybrook's work to date, MyChart has been extended to 13 health service providers, is accessed from 160 countries and over 4,650 cities worldwide, and has 140,000 users.**

***“MyChart is rapidly transforming the way patients and front line clinicians work with each other.***

*MyChart has been **designed for patients**, and gives them access to their health information in the format they need. It’s an excellent patient interface that is **simple to use**.*

*Patients contribute to their record using personal journals in MyChart. This information, combined with information from participating hospitals’ electronic record, creates a powerful tool for **personal health management**.*

*MyChart has completely **changed the paradigm of care delivery** for Odette patients by empowering them as equal partners in their care. MyChart gives patients access to the information they need and a voice to advocate for themselves, resulting in more **effective and efficient care**.”*

*Chief, Odette Cancer Centre and Regional VP Cancer Care Ontario*

Sunnybrook has also achieved strong momentum with SunnyCare.

Several years ago, we found ourselves at a crossroads in deciding how to integrate information from our best-of-breed systems, such as our lab, diagnostic imaging and pharmacy information systems, to enable access to critical information at the point of care. We had to make an important strategic and operational decision: follow the common path and purchase an off-the-shelf health information system and accept related vendor reliance and constraints, or **create a new path and build a system that supports clinical workflow**.

With the support of and partnership with clinicians, we chose the latter.

**SunnyCare is Sunnybrook’s electronic clinical workflow system that has been developed in house and is designed by clinicians, for clinicians.** SunnyCare supports clinical workflow by pulling information from separate sources into a single interface where clinicians do all their work. Navigation through the system is intuitive; screens are displayed based on integrated workflows. SunnyCare is web-based, facilitating secure access for Sunnybrook clinicians anywhere, anytime.

**Clinicians are at the core of the design team.** Certified user-centred design analysts work with clinicians to design optimal screen layout and content, and map screen navigation based on how the clinician performs their work. Once designed, the design specification is quickly turned into an interactive prototype for clinician review and validation. While intensive in terms of gathering the necessary feedback, the process ensures the workflow application is fit for use and intuitive to use. To test the design, a second group of clinicians are brought in to try out the prototype and, if they are not comfortable with it within 20 minutes without training, the prototype goes back to the design phase.

Sunnybrook has used an incremental approach to designing SunnyCare, both from the perspective of designing workflows as well as **customizing the application to meet the needs of specific specialties across the hospital**. Workflows were selected that had immediate clinical value and improved access to information that already existed electronically and caused minimal disruptions to clinicians. Specialties were selected that would experience the greatest benefits from the system.



The first component developed was a clinician interface that improved access to all electronic results through mobile or desktop devices. It was followed by the development of an electronic consult note that connects a patient's previously documented medical history, recent laboratory, radiology, and echocardiographic results, and the clinician assessment and treatment plan. Free-text notes soon followed. Development of computerized provider order entry and full, interdisciplinary clinical documentation including electronic medication administration records is underway and anticipated to be completed by 2018.

With funding secured from Canada Health Infoway, the development team created an integrated workflow product for the Odette Cancer Centre that pulls information from multiple systems to allow clinicians to see all the information they need in a single view. The SunnyCare team also designed and implemented new functions to support outpatient cancer care, including a medication profile and an electronic version of the Edmonton Symptom Assessment Score so that patient symptoms and concerns could be monitored and addressed over time. An integrated results inbox was also developed to enable clinicians to review and sign off new results while viewing a full patient record. This integration allows new results to be efficiently viewed, interpreted and signed off within the context of the full chart, without interrupting clinical workflow. In keeping with our academic mandate, SunnyCare is also integrated with Sunnybrook's Cancer Information Portal, a valuable resource for clinicians that contains cancer-related journal articles, practice guidelines and tools such as mobile apps. This information is at the clinicians' fingertips in SunnyCare.

Further integration has been achieved by developing interfaces between SunnyCare and commercial EMRs that are now being used by Sunnybrook's Family Practice Health Team (FPHT) and private offices of Sunnybrook specialists. For example, if a patient seen at Sunnybrook is a patient of the FPHT, a link to the patient's cumulative patient profile in the FPHT EMR displays in SunnyCare, giving the clinician access to this information. Similar connections have been made with EMRs in use in specialists' private medical offices. At the request of Sunnybrook's Psychiatrist-in-Chief, in addition to using SunnyCare for inpatients, psychiatrists will soon be using SunnyCare across all Sunnybrook outpatient mental health encounters. This type of **cross-sector workflow integration** is particularly important because it allows information to flow with patients across the continuum of care and promotes care continuity.

SunnyCare's in-house development has brought unique value to Sunnybrook clinicians when it comes to **integration with provincial eHealth assets**. The SunnyCare development team has been able to integrate Hospital Diagnostic Imaging Repository Services (HDIRS) reports directly into the SunnyCare record so that a patient's imaging reports can be viewed in a single, integrated, reverse chronological ordered list. Select HDIRS images are also imported into SunnyCare for any scheduled visits to our cancer centre or orthopaedic/fracture clinics. SunnyCare is also fully integrated to ConnectingOntario with a single click, and without the need for clinicians to enter any additional passwords or patient information. This level of integration has led to Sunnybrook realizing the highest cOntario user adoption rate in the Greater Toronto Area (GTA), and prompted an invitation from eHealth Ontario to become their implementation partner in the GTA. We are proud to be part of this important provincial initiative that improves access to critical health information at the point of care.

Sunnybrook's clinician-driven design and focus on integrated workflow has led to a number of outcomes that have been difficult to achieve and sustain elsewhere in the Ontario health system:

1. **Adoption** of SunnyCare is high because it is designed by clinicians for clinicians and meets user requirements. Clinicians are not being forced to fit the requirements of a system.

2. **Clinician onboarding to SunnyCare is achieved without significant investment in training** as a result of intuitive application design.
3. **Integration with provincial assets and commercial systems** is maximized as a result of in-house development.

Developing a clinical workflow system is not easy and has inherent risk. Through the course of SunnyCare development, Sunnybrook has had to pay particular attention to defining and enforcing rigorous **software development life cycle processes and controls** that are grounded in industry and CobIT best practices. Significant governance oversight has been required to ensure that SunnyCare can be safely implemented. To date, across seven code releases, there has been only one high priority production support issue that, fortunately, did not impact patient care. This incident has kept the team vigilant and helped to enhance our control practices. The incident also provided the opportunity to test processes in place to identify and quickly respond to production issues.

**Today, SunnyCare is integrated with 25 commercial systems, seven regional systems and eight locally developed systems.**

Sunnybrook is also proud to have been recognized by our system partners:

- SunnyCare received a **Canada Health Infoway** LEADing Practice Award in 2014.
- SunnyCare Consult Note software won first place in the 2015 **Canada Health Infoway** ImagineNation e-Connect Impact Challenge.
- Outpatient order management application won a Quality and Innovation Award from the **Cancer Quality Council of Ontario (CQCO)** in 2008.
- Inpatient electronic sign-out application was a Canadian Information Productivity Award (CIPA) Finalist in 2007.

**Today, SunnyCare has 2,400 unique and 11,000 daily logins, 157,000 consult notes, 277,000 free-text notes, and 200 daily mobile logins.**

*“... this is my first weekend on call using SunnyCare after using it in the clinics for several weeks.*

*This is the best IT product I've ever used in my 15 years at Sunnybrook –*

*it brings information from the multiple programs that I need to access now to one screen. It allows for more convenient and rapid searching for the information I need. Overall, it is **reducing the time I spend in front of a screen and allowing me to get to my patients with the information I need faster.***

*Last, but not least, the user interface has a professional, clean and modern appearance - **these design elements are too often ignored in the design of electronic medical records and entry systems and they make a big difference for the user.***”

*Medical Oncologist, Sunnybrook*

**Sunnybrook is now looking ahead to what is next both for our organization and for the health system as a whole.**

**One area where we see great opportunity is in the area of improving communication and coordination amongst providers, especially in support of primary care.** Our experience with Health Links, as well as in our Better Care System, has reinforced this prevailing need within the system. One such opportunity is in the area of **consults and referrals amongst physicians.** Consults with and referrals to specialist services are critical processes in providing and coordinating patient care. Currently, it is the referring primary care physician, in consultation with the patient, who decides the most clinically appropriate option for specialist care. The process today can often be very time consuming and filled with multiple steps and challenges in order to support scheduling an appointment. As a result, referral management within the health system today involves a number of participants and steps involving mostly primary care providers, specialists and their related staff, and patients have a limited role.

With the introduction of Health Links and now sub-LHINs into the provincial health care landscape, an opportunity has emerged to improve this process, both for providers and for patients. Embedded in the Health Link model are **groups of health care providers who work together to coordinate services for those who live and receive care in their local area.** Health Links and sub-LHINs offer a key opportunity to bring together existing providers to develop new and better ways of coordinating services for patients and local residents. The need for process improvements has been confirmed through our discussions with our primary care providers (PCPs) as well as through planning through the Toronto Central LHIN and the North Toronto Health Link. These findings are further echoed through our neighbouring partner Links, Toronto East and North York Central Health Links. **Specifically, the key areas identified through these consultations included improving access to specialist care, improving the referral and referral management process, and facilitating greater information sharing amongst providers.**

To better facilitate specialist access, referrals and information sharing among those in the patient's circle of care, a common consultation, referral and booking system that supports patient choice is required. The system must facilitate equal access to specialists and help to drive down wait times, reduce frustration and eliminate unnecessary referrals. For family doctors, this would provide ease of access; for specialists, this would mean seeing the right patients and improving capacity and access to care. **For patients, it would mean having greater choice in their health care.** Being able to electronically choose a specialist based on time, location and wait time in partnership with their family doctors would allow patients equal access to specialty services and control of their appointment, helping to significantly reduce the anxiety of not knowing when that next appointment will be scheduled. In addition, this would enable advice and guidance services for primary care through electronic consultations to improve the appropriateness of referrals for specialist services. Preliminary planning for this priority has already occurred amongst the North East Toronto, East Toronto and North York Central Health Links including piloting the OTN's eConsult solution through OntarioMD.

In addition to improving communication and coordination amongst providers, Sunnybrook is **also looking at how to better use information to improve the quality and effectiveness of care we deliver to patients.** We are investigating new ways to unlock greater insights from our shared data assets and emerging opportunities to leverage platforms that already integrate data and partners across the continuum of care. These systems can further support the better use of data to improve quality of care and system sustainability. **Health Informatics** is the use of explanatory and predictive modeling and analytics to reveal trends/patterns that help health care organizations and providers make better and more informed decisions. In the current environment, health care organizations have been slowly expanding their use of data to better serve patients. Some are investigating methods to maximize the potential of data to advance their strategic goals while also creating a positive and lasting impact for patients, providers and the broader health care system.



**The foundation for this already exists** and can yield improved quality and sustainability through existing investments already made in digital health initiatives, such as electronic health records and personal health records (PHRs), Connecting Ontario, as well as work already spearheaded by provincial agencies such as Health Quality Ontario, ICES, CCO and the Ontario Institute for Cancer Research. Sunnybrook also believes this is also aligned with the provincial government's eHealth 2.0 strategy, which puts patients first by focusing on four key objectives: stimulating consumer health innovation, laying the foundation of a connected health system, enhancing data management standards, governance and architecture, taking a programmatic approach to eHealth, and building on the capacity to run eHealth as a business.

**Sunnybrook's MyChart program is well positioned to support the eHealth 2.0 strategy, as a leading health care patient portal in Ontario that has begun to link patients' clinical and event data across multiple organizations.** This model of data integration at the patient level and the potential for the integration of datasets across providers can support realistic and immediate use cases to benefit patients and the health system. From an architectural perspective, MyChart has been able to link to various source systems such as TELUS OACIS, Meditech, Cerner, TELUS Practice Solutions, and the CCAC CHRIS system. **MyChart not only integrates these multiple datasets together for patients, caregivers and their clinicians but it also allows patients to self-enter their own data and directly control who has access to their personal health information.** Regardless of the source of the information within MyChart, the patient remains the ultimate steward and is in control of their health data. MyChart supports and enables the continuum of care by unlocking and integrating data into a singular system. These attributes make MyChart uniquely positioned to be the basis from which the full spectrum of health informatics opportunities can be developed. By connecting and accessing PHR datasets, there is the potential to assess individual patients' medical histories and current status across care providers, providing a greater depth and breadth of review and research opportunities.

**These assets, combined with the data and expertise available through current and expanding MyChart partners, have the potential to become a shared health informatics ecosystem.**

Ultimately our goal as an academic health sciences centre is not only to translate data and information into new knowledge, but to translate that knowledge into practice. With integrated access to patient and health care organizational data, outcomes of care practices can be identified, leading to quality improvement and sustainability planning across the continuum of care. By analyzing patterns found in the data, planners can turn new data into actionable information that can be used to **identify populations in need, and predict and proactively plan the provision of services.** By leveraging existing data assets and technology, real-time identification of opportunities for interventions can also occur. And, once identified, providers can proactively act to better manage the care of their patients. One approach is to embed new knowledge into practice, such as evidence-based personalized regimens into standard workflows. This is most effectively achieved through advanced clinical decision-support tools into SunnyCare and MyChart, which can help health care providers tailor treatment selections for individual patients.

This will take time but it is possible, achievable and worth investing in – not only to improve care for patients but also to support providers in better ways of doing business and helping the health care system become more sustainable. This evolution from electronic health records to data repositories to active decision-support tools requires thoughtful planning, management and full understanding of health care delivery workflows across the system. It requires partnership amongst government and its agencies, industry and researcher partners, and providers across the continuum of care.