Overview

Digital health is one of the eight Ontario Health Team (OHT) building blocks and it includes both:
1) digital-health assets and services (which are the focus of RISE brief 7); and
2) data analytics made possible through the use of these assets and services (which are the focus of this RISE brief).

The three domains within the digital-health building block that touch on data analytics include:
1) data harmonization across organizations, sectors and systems;
2) data modelling and analysis; and
3) data sharing and use:
   a) in patient care (at point of service),
   b) in rapid learning about and improvement in patient experiences and outcomes, and
   c) in population-health, financial-risk and other performance management.

> **Box 1: Coverage of OHT building blocks & relevance to sections in the OHT full application form**
>
> This RISE brief primarily addresses **building block #5** and secondarily **building blocks #4 and #8**
> 1) defined patient population
> 2) in-scope services
> 3) patient partnership and community engagement
> 4) **patient care and experience** (secondary focus)
> 5) **digital health** (primary focus)
> 6) leadership, accountability and governance
> 7) funding and incentive structure
> 8) **performance measurement, quality improvement, and continuous learning** (secondary focus)
>
> It is relevant primarily to **appendix B** (digital health) **and** secondarily to **section 3** (how will you transform care?) and part of **section 5** (questions 5.1 and 5.2.1) in the OHT full application form.

While all of these domains (and sub-domains) are important, it's the data sharing and use in patient care that likely has the greatest potential to drive improvement. If patients and providers can see impacts on care experiences and health outcomes, they'll be much more likely to push for and support other data-driven efforts.

This RISE brief addresses three topics:
1) harnessing digital-health assets (building block #5) to enable data analytics;
2) using data analytics to improve patient care and experience (building block #4); and
3) using data analytics in performance measurement, quality improvement, and continuous learning (building block #8).

The sections corresponding to these topics will be of interest to, respectively, those deciding where to go for data, those wanting to use data to improve care experiences and health outcomes for year 1 priority populations, and those committed to 'moving the needle' on quadruple-aim metrics.

Harnessing digital-health assets to enable data analytics

In harnessing digital-health assets, OHTs may want to adopt two principles: 1) draw on all relevant assets from participating partners, not just those that have historically been part of the care circle, to understand the full population for which the OHT is accountable; and 2) push for more and better data, as well as more and better data harmonization, to understand existing problems and their causes, and to monitor the implementation of new approaches.

Those deciding where to go for data will need to know both the language used to describe a digital-health asset that can be a source of data and the language used to describe a dataset that can be used to make comparisons across organizations and over time. Below we provide the names of and acronyms for common examples of such assets

and datasets, with the datasets bolded when they have been standardized according to norms set by the Canadian Institute for Health Information (and not bolded otherwise). We do not repeat an asset or dataset (e.g., interRAI) after it has been mentioned once in the table.

Table 1: Examples of data sources for data analytics

Type of care	Examples of digital-health assets and the types of data they include	Examples of datasets that draw on these digital-health assets (in bold when standardized)
Home and community care	• **Client Health and Related Information Systems (CHRIS)** for inbound eReferrals, assessments, care planning, care coordination, eReferral to community-support service providers, eNotifications with hospitals, and long-term care placements • **Integrated Assessment Record (IAR)** for clinical assessments from home- and community-care organizations, long-term care homes, and mental health organizations	• Home Care Database (HCD) • **interRAI datasets** for home care (and for long-term care, complex continuing care, and mental health care)
Primary care	• **Electronic medical records (EMRs)** for primary-care providers	• Ontario Health Insurance Plan database • Community Health Centres dataset • Canadian Primary Care Sentinel Surveillance Network (CPCSSN) • Electronic Medical Record Administrative data Linked Database (EMRALD)
Specialty care	• **Hospital information systems (HISs)** for discharge summaries and diagnostic imaging reports (including those of more than 211 hospital sites, 100 independent health facilities (IHFs) and Health Shared Services Ontario) • **Wait Time Information System (WTIS)** for wait times for a range of services provided in surgeons' offices, hospitals and IHFs • **iPort and iPort Access** for performance related to access-to-care priorities (e.g., CT and MRI scans, alternative-level-of-care days) • **electronic Canadian Triage and Acuity Scale (eCTAS)** for emergency-department nurses' triage decisions	• **Discharge Abstract Database (DAD)** • **National Ambulatory Care Reporting Systems (NACRS)** • **Continuing Care Reporting System (CCRS)** for continuing care in hospitals (and long-term care) • **Ontario Case Costing Initiative (OCCI)** for specialty and continuing care (and rehabilitation and mental health care)
Rehabilitation care		• **National Rehabilitation reporting System (NRS)**
Long-term care	• **Integrated InterRAI Reporting System (IRRS)** for summaries of patients' risk profiles as they enter long-term care homes	
Public health	• **Immunization Connect Ontario (ICON)** for immunization records;	• Population demographics (e.g., from 2016 census) and related indices (e.g., Ontario Marginalization Index) • Vital statistics (e.g., births and deaths)
Care for select conditions		• **Ontario Mental Health Reporting System (OMHRS)**
Care using select treatments		• Ontario Drug Benefit claims database

Those deciding where to go for data will also need to know how best to access these data. The Integrated Decision Support Business Intelligence Solutions (IDS) is an example of a platform that OHTs can use to access harmonized data. IDS contains integrated patient-level data from over eight million unique patients across six regions (Erie St. Clair, Hamilton Niagara Haldimand Brant, Mississauga Halton, South West, Toronto Central, and Waterloo Wellington) and has plans to add new participants from two more regions (Central West and Champlain). IDS includes most of the standardized (bolded) datasets listed in the third column of Table 1, as well as data from some primary-care providers (e.g., EMR data drawn from 12 Community Health Centres and one large Family Health Team) and from sources that enable descriptions of the neighbourhoods where patients live. IDS is based on the voluntary participation of health organizations that have signed a data-sharing agreement and service-level agreement to allow the linking of personal-health information into a longitudinal record for each included patient (i.e., it captures their care both across organizations and over time). Hence data are missing for patients who obtained care from an organization that does not participate in IDS (e.g., primary-care data are missing for patients who obtained care from a Family Health Team that does not participate in IDS). Self-submission by participating organizations enables timely access to data, with new data loaded weekly into IDS and with most metrics within IDS only 25-60 days old. IDS data can be used with many data-visualization tools and statistical packages.

OHTs can also access a more raw form of data from IntelliHealth. This source differs from IDS in four important respects. IntelliHealth contains:
1) patient-level data for all patients (not only patients obtaining care from organizations that participate in it), but these data are not linked into a longitudinal record for each included patient as IDS does;
2) many of the same datasets, but not primary-care datasets, census and case costing (among others) as IDS does;
3) data that are updated quarterly, not more frequently as IDS does; and
4) some report-generating tools, but the data cannot be used with many data-visualization tools and statistical packages as IDS data can.
The Service Prioritization Decision Assistant Tool (SPDAT) is an example of a decision-support tool that can be used to harness some of the same raw data as IntelliHealth contains.

The Community Business Intelligence (CBI) project is an example of data harmonization across all health and community organizations of a certain type – community health-service providers – in a specific region (Toronto Central). Community-health service providers include community addictions, community mental health, and community-support service providers. The data include individual-level service utilization data. This data-harmonization platform could be used in other regions. Moreover, the data contained in the platform could in turn be added to IDS to further enrich its longitudinal record (or to another data platform like IntelliHealth).

Many other datasets could further complement those included in the above data platforms, such as:
1) Nursing Quality Indicators for Reporting and Evaluation (NQuiRE), which is a database of quality indicators designed for Best Practice Spotlight Organizations to systematically monitor progress in, and evaluate the outcomes of, implementing the Registered Nurses' Association of Ontario best-practice guidelines in their organizations; and
2) thehealthline.ca, which offers an inventory of community services available in every region.
OHTs will need to ask their partners to identify datasets that can help to fill gaps in their preferred data platform.

To undertake the necessary data modelling and analysis using these digital-health assets and datasets, OHTs will need to consider:
1) leveraging the expertise of individuals 'in-house' who can undertake such work;
2) relying on third-party providers in the short term where such 'in-house' expertise is currently lacking; and
3) engaging ICES and/or the Ministry of Health when there's an economy of scale and all (or at least many) OHTs want access to similar data analytics.
On the latter point, the ministry plans to provide all teams invited to submit a full application with data on metrics for their attributed population. These data are intended to help teams on an OHT readiness path to:

1) be accountable for a population that is based on patient-access patterns, whether or not individuals reside in the community; and
2) start looking at population-wide data on key metrics, not organization-specific data.

Using data analytics to improve patient care and experience

To steadily improve patient care and experience (building block #4), OHTs will need to adopt a 'rapid learning and improvement' lens. This involves six steps:
1) identifying a problem (or goal) through an internal and external review, which includes understanding the causes of the problem and the barriers to achieving the goal;
2) designing a solution based on data and evidence generated locally and elsewhere;
3) implementing the plan, possibly in pilot and control settings;
4) evaluating to identify what does and does not work;
5) adjusting, with continuous improvement based on what was learned from the evaluation (and from other OHTs' evaluations); and
6) disseminating the results to improve the coverage of effective solutions across the health system.

The initial focus for teams on an OHT readiness path will be improving care experiences and health outcomes for their year 1 priority populations. In so doing, they will want to document scalable processes that can be spread to other populations in later years.

As described in more detail in RISE brief 6 about population-health management, teams will need to:
1) use a population-health management approach, which means:
   a) identifying one or more year 1 priority populations for whom quadruple-aim metrics are particularly poor and segmenting them into groups (or population segments) with shared needs and understanding the barriers to having these needs met (step 1 in the rapid learning and improvement cycle),
   b) designing in-reach services (i.e., services that are proactively and opportunistically offered anytime a patient is 'seen in' or 'touched by' the health system) and out-reach services (i.e., connecting with those who are not seeking care now and proactively offering services) that are sensitive to the barriers that each group may face in having their care needs met (step 2 in the cycle), and
   c) stratifying services for delivery (step 3 in the cycle); and
2) design optimal care pathways for patients needing acute episodic or planned surgical care (step 2 in the cycle), much like some OHT partners have done in pilot projects for the integrated funding of 'bundled care.'

Teams will likely need to appoint a working group to undertake this work for each year 1 priority population.

Step 1: Identifying a problem (or goal)

Robust data analytics are essential to identifying a priority population and segmenting it into groups (or population segments) with shared needs, including gaps in care and care coordination and barriers to having these needs met. To inform this data analysis, the working group will have ideally chosen an initial basis for identifying the priority population (e.g., quadruple-aim metrics are particularly poor) and defining a population segment (e.g., a combination of age and conditions), and identified the factors that may help to identify their needs (and hence should be included in the data analysis). As described in RISE brief 6 about population-health management, the factors can include: 1) severity of conditions or risk factors; 2) utilization (or non-utilization) of different types of health services; 3) a broad range of socio-demographic factors; and 4) attributes of the neighbourhood where they live. Once the data analysis has been completed, the working group (or the more senior decision-makers to which it reports) can then prioritize population segments (and gaps in care and coordination and barriers to having needs met) where the greatest impacts on the quadruple aim can likely be achieved through in-reach and out-reach services.

Robust data analytics are also essential in understanding the profile of patients who will require acute episodic or planned surgical care, as well as the type, volume and cost of services they're now receiving and the barriers to receiving needed care. This profile will help the working group focused on designing optimal care pathways for the subset of a year 1 priority population that will require such care.

In both cases, the focus of the data analytics is primarily understanding what is not working well now and why.

Steps 2 and 3: Designing a solution and implementing the plan

The working group will need to rely primarily on research evidence, not data analytics, when designing a solution and implementing the plan. Both design and implementation will need to be sensitive to the barriers that each population may face in having their needs met. Data analytics can help only in a targeted way by identifying what solutions and implementation strategies are being provided now and by which providers (and hence how these differ from what the research evidence indicates should be provided and how).

Step 4: Evaluating to identify what does and does not work

Data analytics become important again in monitoring the implementation of prioritized solutions and contributing to evaluations of their local impact, which we address in more detail below.

We capture the essential points about improving patient care and experience from the above, as well as from RISE brief 6 about population-health management and from RISE brief 9 about evidence sources (including how research evidence complements data analytics), in a RISE summary sheet.

Using data analytics in performance measurement, quality improvement, and continuous learning

In addition to using data to improve patient care and experience, OHTs will need to use data analytics in performance measurement, quality improvement, and continuous learning (OHT building block #8). OHTs may want to consider the following suggestions when doing so:
1) focus on a limited core set of metrics that cross objectives (e.g., focusing on a 'vital few' metrics that cover all aspects of the quadruple aim and that cover both sector-specific and cross-sector metrics);
2) use population-based and patient-centred measurement perspectives (e.g., ensuring that there are metrics that include both service users and non-users, and that the metrics can be stratified to compare key population segments and identify inequities);
3) apply 'tiered' measurement and reporting cascades (e.g., ensuring performance is measured across the different organizational units that make up the OHT, that these can be 'rolled up' into measurement cascades, and adding additional metrics to higher-level units as appropriate);
4) match metrics to implementation activities (e.g., when designing a solution, develop a logic model and use it to guide implementation activities; when new activities are introduced, align key metrics to anticipated outputs and outcomes);
5) make metrics immediately actionable at the point of care or patient outreach (e.g., integrating them into decision-support tools contained in electronic health records; providing feedback to health providers and teams on their performance; and feeding them into the OHT's cycles of rapid learning and improvement for the design of in-reach and out-reach services and clinical pathways);
6) frequently review metrics and refine solutions and implementation activities when needed (e.g., ensuring that there are regularly scheduled times to review metrics across organizational units, that these reviews feed into the OHT's cycles of rapid learning and improvement, and that leaders and managers across organizations are held accountable for improvement); and
7) watch for unintended consequences and implementation slippage (e.g., ensuring any unplanned outputs and outcomes are identified and used to feed into the OHT's cycles of rapid learning and improvement).

Regarding the first suggestion, teams invited to full application will find a listing of the ministry's core metrics for OHT candidates in year 1.

As mentioned in the overview and again in point 5, it's the data sharing and use in patient care that likely has the greatest potential to drive improvement. There is an extensive literature about audit and feedback that OHTs can draw upon when planning such activities.

OHTs could benefit from a dashboard that would allow them to benchmark against one another. Such a dashboard has been used in the U.S. to support performance measurement, quality improvement and continuous learning among accountable-care organizations, which share many similarities with OHTs (see RISE brief 11). Ontario has local experience with such dashboards, albeit for benchmarking at the organizational level (e.g., for hospitals in general and for hospital-based obstetric care in particular) not the local health-system (i.e., OHT) level.

RISE
Rapid-Improvement Support and Exchange

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