

## 1. Introduction

Recently, The Ottawa Hospital (TOH) was asked to provide a written summary of its views on the current and future value of Ontario's digital health assets. This report is intended to provide a brief history of TOH information systems development, a synopsis of the current state and our plans for acquiring and implementing a Hospital Information System (HIS). Our future horizon is 3 – 5 years and includes a summary of key barriers and enablers.

## 2. A History of IS/IT at The Ottawa Hospital

The Ottawa Hospital is a multi-campus organization resulting from a sudden and, for many, an unforeseen merger of three Ottawa-based hospitals in 1998 - The Ottawa General Hospital, The Ottawa Civic Hospital, and The Riverside Hospital, and the closure of a fourth hospital, the Salvation Army Grace Hospital. Both the General and the Civic hospitals had academic mandates affiliated with the University of Ottawa (uOttawa). The competition between the Civic and General was intense and the hostilities were deeply rooted right down to the frontline staff and physicians.

Prior to the merger, each organization had its own IS/IT department and very little if anything in common for IS/IT solutions. Both organizations used a “best-of-breed” model, whereby individual software solutions were purchased or developed, configured, customized and integrated together into a more complete solution.

Looking at Electronic Health Records solutions, the General had installed the OACIS (Open Architecture Clinical Information System) solution in 1995, which had recently been deployed using a Web browser client. The Civic had recently purchased the Cerner Millennium solution to replace its aging PCS registration/scheduling system (running on unsupported Tandems computers) and to provide new EHR functionality.

Immediately after the merger took place, the combined leadership of the two IS/IT departments were tasked with streamlining operations, combining systems, and certifying for Y2K, in less than two years. Faced with this situation, several leaders chose to take a package and leave TOH. An IS/IT Y2K task force was put in place to do a systematic review of corporate software assets, assess the risk for each one, and devise a strategy and a workplan to get through the next two years. The assessment revealed that the Civic Millennium project was not progressing as expected, and faced with a potential Y2K system failure for its mission-critical system, carried very significant risks. Consequently, the Millennium project was cancelled, and the Civic operations were urgently transitioned to the General's systems for patient registration/scheduling. Y2K passed.

Immediately after Y2K, the IS/IT department focused its attention on expanding the OACIS Electronic Health Records capabilities to all three campuses. This had become an urgent priority because clinical operations were now being realigned between campuses, which meant that patients and clinicians were travelling between campuses; however, the patient charts were still on paper, using separate banks of Medical Record Numbers, and were not allowed to move between campuses. The next challenge was to combine the banks of Medical Records, move all systems to use a single MRN bank, relabel all paper charts, and rollout an enterprise version of the OACIS EHR so that all clinicians could have access to patient charts from any

location, using a single Medical Record Number. This project was completed in 2002, and laid the foundation for a continuing transition to enterprise solutions (including the Lab system, Pharmacy, Diagnostic Imaging, etc.), as well as further investments in the OACIS EHR which took place over the next 5-7 years.

During this time (2001-2008), TOH was a pioneer in a number of areas, including:

- The implementation of a fully digital PACS solution for Diagnostic Imaging, eliminating the need for traditional films and readers
- The implementation of an Emergency Department Patient Tracking module in OACIS
- The implementation of an Enterprise Data Warehouse for TOH, which today provides the critical data required for continuous improvement for clinical and operational processes as well as for funding data under HBAM and HSRF
- The rapid roll-out of OACIS data-sharing throughout 14 partner organizations in the region for improved access to clinical information
- The implementation of a regional Enterprise Master Patient Index (EMPI), operated by TOH as a regional hub, allowing hospitals in the region to share clinical information across multiple banks of Medical Record Numbers
- The implementation of a complete automated supply chain for the Operating Rooms, including an integrated mobile solution from warehouse to patient supplies, and the first integrated solution in North America for sterile instrument processing
- The introduction of Oracle eCommerce and eBusiness solutions including a new Human Resources System which now includes learning management, performance management, and self service capabilities.
- The development of case costing information provincially
- The introduction of innovative Patient Safety solutions

In 2008, TOH adopted as a corporate goal to become a top 10% performer in quality and patient safety in North America.



Already seen as a leader in IS/IT and regional solutions, and given the market shift towards mobile devices such as iPhones and iPads, TOH developed the first EHR application for the iPad in 2010 (a custom-built mobile version of OACIS), which led to the largest iPad deployment in Healthcare in the world (3,000 iPads). This project was developed in partnership with Canada Health Infoway (CHI).

In 2012, TOH was the first hospital in the world to support Computerized Provider Order Entry (CPOE) on an iPad app. All Diagnostic Imaging orders were entered exclusively electronically, the vast majority of orders being entered directly by the physician (which is rare for most CPOE implementations). TOH is still featured on Apple.com's website as a leader for mobile health:

<http://www.apple.com/ca/ipad/business/profiles/ottawa-hospital/>

By this time, TOH was widely recognized as an IS/IT innovator, with a very strong project delivery track record. TOH has been recognized nationally and internationally through many awards in several areas, including medication reconciliation, voice recognition, mobility, process transformation, and more.

The IS/IT team at The Ottawa Hospital has also demonstrated its deep expertise in Clinical Change Management by achieving high levels of physician compliance with significant changes in clinical practice, including ED Patient Tracking, Electronic Discharge Summaries, Electronic Ordering for Diagnostic Imaging, Electronic Medication Reconciliation, Speech Recognition and Physician Self-editing of clinical documents. The high degree of clinical acceptance of these initiatives has led to measurable impacts in patient care metrics and has streamlined care delivery.

TOH also had great success in implementing an enterprise "back-office" solution (financials and Human Resources). The implementation of the HR payroll system for example, was done very cost effectively (\$7M) without post production issues compared to other large organizations. The Human Capital Management suite of applications has since grown to include learning management, performance management and self service capabilities. Further expansion of the Business suite, in addition to supply chain enhancements now includes integrated applications that are service based to support biomedical engineering, transportation, housekeeping and workplace inspection activity.

The establishment of the Enterprise Data Warehouse also provided support for the corporate Quality and Performance Management program that is foundational to reaching the goal of becoming top ten % in patient safety and quality.

During the period of 2001-2014, TOH also became a service provider to several other organizations, as well as a regional hub for many solutions, including:

- Providing many essential IS/IT services to the **University of Ottawa Heart Institute**
- Merging with the **Ottawa Regional Cancer Centre** to become TOHCC, again under a single bank of Medical Record Numbers
- Merging with the **Ottawa Rehabilitation Center**
- Providing many IS/IT services to the **Eastern Ontario Regional Laboratory Association (EORLA)**, created in 2012 and includes staff from 17 hospitals in the region
- A **regional Laboratory system** (Cerner Millennium) ready for other hospitals to join (HDGH recently and Renfrew Victoria Hospital will join by the end of the year)
- A **regional Anatomical Pathology** solution, currently shared with three other hospitals
- A **regional PACS solution**, currently operating across four hospitals

Over the years, eHealth Ontario engaged TOH to participate or provide advice on a number of provincial initiatives, including the implementation of a Provincial Client Registry (EMPI), and the implementation of Provincial EHR services. In 2011, TOH was asked by eHealth Ontario to become the Program Delivery Partner (PDP) of Connecting Eastern and Northern Ontario (cNEO), one of three clusters in the province (now called ConnectingOntario NER). TOH is responsible to ensure that 64 Hospitals and 4 CCACs contribute their Electronic Medical Records to the eHealth Clinical Data Repository (CDR). This region represents approximately 80% of the geography of Ontario and 20% of its population.

In the context of the ConnectingOntario program, TOH contributed significantly to the strategic decision to adopt the cGTA (connecting Greater Toronto Area) solution for the cNEO region, rather than developing a third cluster-specific solution. This decision also comprised some disadvantages and risks: added complexity, potential delays to the solution development, new dependencies and more stakeholders, and required novation from UHN (the purchaser of the original solution) to eHealth to become a provincial asset. Despite these risks, it was strongly felt that reusing the cGTA solution rather than building another one for cNEO was a simpler and superior architectural model in the long term, a much more efficient use of resources and drastically lower costs.

TOH also contributed in specific areas of the provincial solution, including:

- Developing a solution for hospital-based single sign-on to Connecting Ontario that is now provincially available
- Collaborating with eHealth Ontario as the first pilot site post novation to develop processes to onboard sites to ConnectingOntario services
- Leadership in governance structures as an enabler regionally – such as CEOs' from across the region from large academic centers and LHINs at the same table to address challenges rolling out provincial solutions regionally and providing joint oversight
- Providing technical advice and participating in architectural forums around EMPI architecture, provincial integration strategies, portal services, and more.

TOH is still the ConnectingOntario NER PDP to this day, overseeing the rollout of the electronic health record (EHR) services for an estimated 18,000+ clinicians across Northern and Eastern Ontario.

Early in our mandate with eHealth Ontario we faced significant growing pains. Our cultures differed. Determining which organization was ultimately accountable for managing risks and liabilities with the cNEO project was difficult. We also encountered a steep learning curve in understanding how we would work together for strategic decisions and operations management. Despite early challenges, TOH and eHealth Ontario are working collaboratively to do their part in delivering a provincial EHR viewer for Ontario clinicians. We look forward to completion in 2018.

### 3. The HIS: a new foundation for Innovation

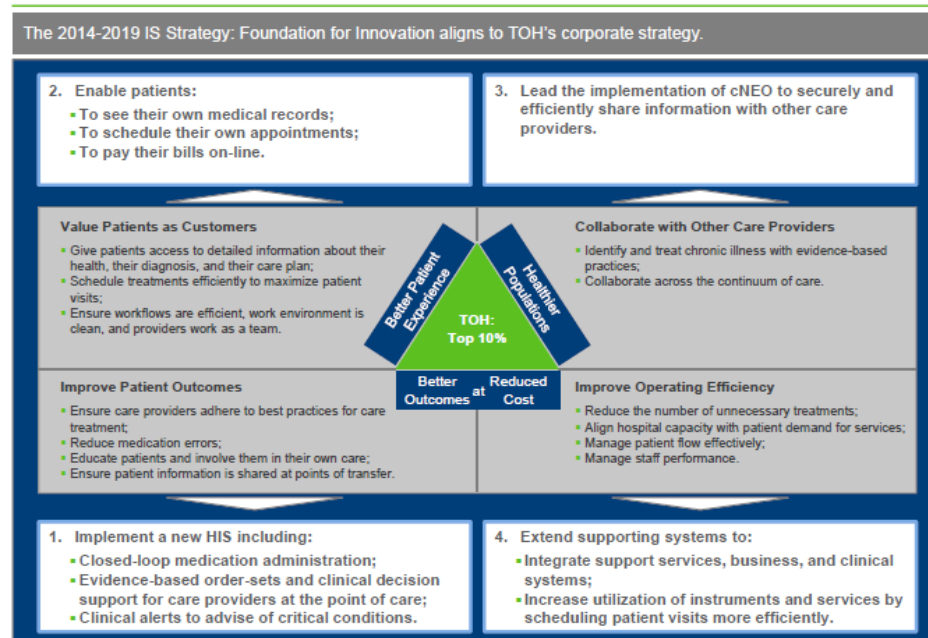
Every 5 years since the merger, TOH revisits its strategic plan for IS/IT. In 2014, a team of healthcare technology consultants interviewed a large number of internal and external stakeholders, and conducted an environmental scan of the healthcare IS/IT industry.

The consultant's report concluded that despite the good work of the TOH IS/IT team around the best-of-breed model, the gap between the TOH clinical solution set compared to the commercially available enterprise solutions had grown significantly in the last 5 years. The environmental scan also revealed that most leading academic medical centers (in particular in the U.S.) had abandoned the best-of-breed model in favor of purchasing a commercial HIS. The ongoing sustainment costs to support custom, home-grown, and siloed solutions were also becoming untenable. The consultants also noted that the current OACIS user base had grown from 100 clinicians when it was first installed in 1995 to almost 20,000 clinicians using essentially the same system today.

This report confirmed our direction to acquire and implement an integrated HIS, as the best way to enable standardization and optimization of Best Practice Clinical Workflows, in a relatively short time frame. Successful automation of inpatient, outpatient and emergency domains, as measured by realizing Level 6 or 7 on the HIMSS EHR adoption model (EMRAM), was identified as a means to deliver significant improvement in operational efficiency, quality of care and patient safety.

Given our goal to become a top 10% performer in quality and patient safety in North America, the recommendation was to follow the path of leading organizations that had reached the highest levels on the Electronic Medical Record Adoption Model (EMRAM) scale as defined by HIMSS. All of these organizations were using one of the leading HIS solutions. This recommendation was approved at all levels of TOH, and a new CIO was hired to lead the way.

## Foundation for Innovation



In the summer of 2015, the senior management teams at Sunnybrook (SB) and TOH asked their IS teams to explore a potential collaboration between TOH and Sunnybrook to build a common EHR based on OACIS (since both hospitals use OACIS for their EHR), as an alternative roadmap to TOH's plans to install an off-the-shelf HIS.



After a thorough investigation, the two IS/IT teams presented the following conclusions:

1. **Not all OACIS systems are the same:** despite sharing the same base product, the current SB and TOH systems have evolved in different directions, and are technically different now; aligning the roadmaps and having the teams work together would be a challenge. To illustrate TOH's current EHR solution in relation to the OACIS base product, please refer to the diagram below.
2. **TOH has gaps that Sunnycare alone could not address:** several existing SB vendor systems are considered viable long-term and will complement the SunnyCare EHR: corporate scheduling, bed management, radiology (RIS), Critical Care, and more. For TOH, these are gaps that could be addressed by the HIS, but not by SunnyCare alone.
3. **There is still an opportunity for the organizations to partner:** TOH and SB have already exchanged architecture diagrams, roadmaps and costing information, technical specifications, and other documents and ideas. TOH will also implement the Sunnybrook-developed patient portal - MyChart - and may consider other components.

TOH elected to proceed with its strategy to procure a full-featured HIS.

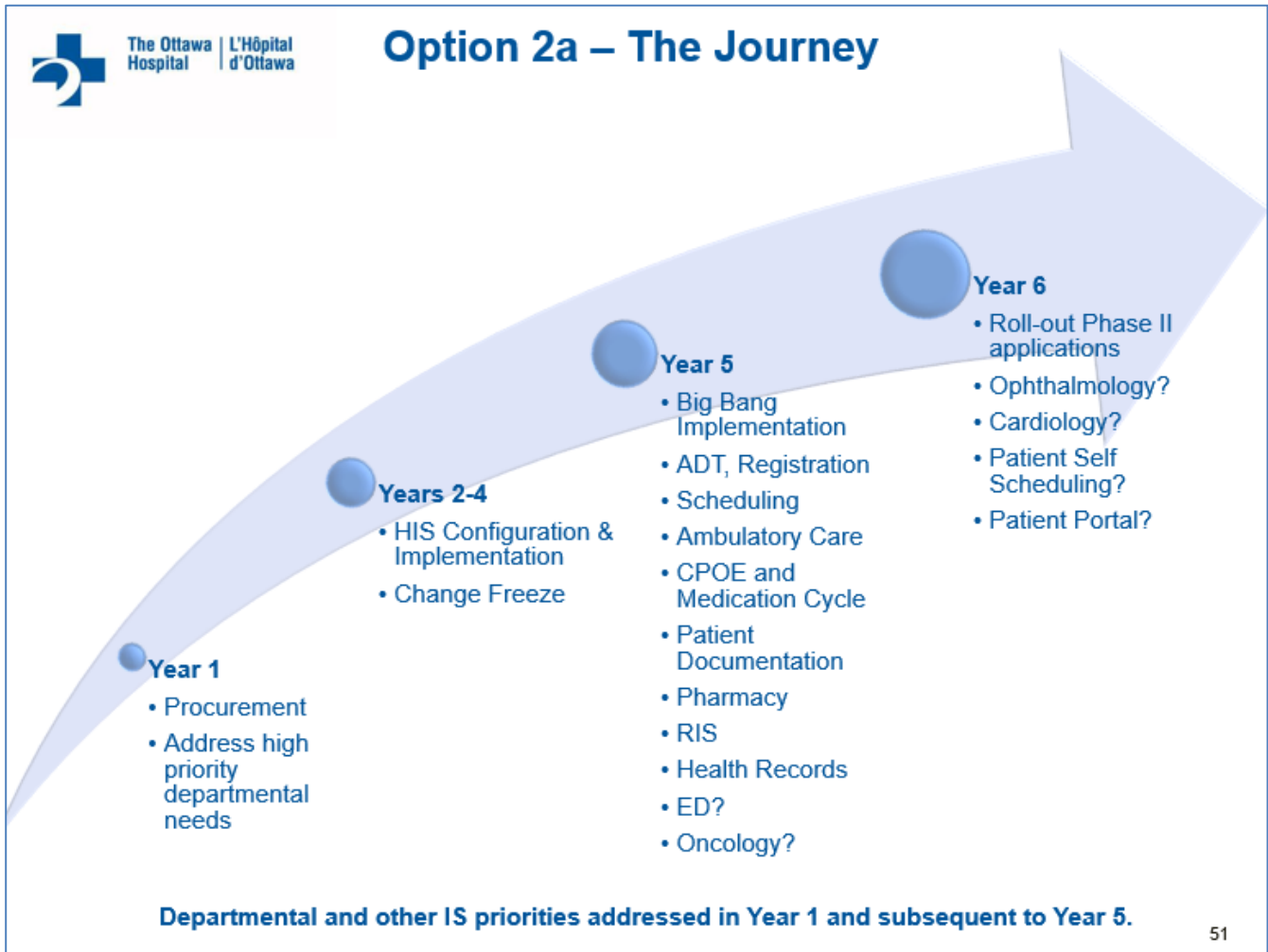
As a first step, TOH reached out to the Champlain LHIN and other health services providers in the region to seek interest in joining this effort. The proposed strategy is to have TOH become a regional hub for the HIS, and be in a position to provide benefits to the region across the continuum of care (primary care, acute and long-term care) - very much in sync with the Ontario's Patients First Action Plan. The response has been very positive: the LHIN officially endorsed TOH and its future HIS as one of two strategic hubs for the region, and to-date four partners have joined TOH for the procurement process: Hawkesbury District General Hospital, University of Ottawa Heart Institute, Ottawa Hospital Academic Family Health Team, and the Renfrew Victoria Hospital. Other potential partners are also following our progress carefully, and will join once that implementation has been completed and they have obtained their own internal approvals.

In parallel with the procurement preparation work, TOH conducted a detailed benefits analysis for the acquisition of an HIS compared to other options available. Some of the anticipated benefits of the HIS include:

- Elimination of paper via automation of clinical documentation
- Improved supply chain and order management for Pharmacy, Lab Automation, Diagnostic Imaging, reducing duplication and waste
- Efficiencies gained with automated clinical workflow and communication, centralized scheduling, automated coding assistance
- Decreased clinical variability, process improvement
- Improved Patient Engagement and Self-Service capabilities
- Reduced Length of Stay
- Healthier Population Management with more powerful analytics
- A foundation for advanced clinical capabilities such as genomics and precision medicine

A 10-year Total Cost of Ownership (TCO) was prepared in collaboration with the TOH Finance department and a team of industry experts. The TCO was presented to the TOH Board of Directors for final approval in early October 2016, prior to the release of the RFP.

A sample high-level and tentative HIS implementation plan was included in the 2014 IS/IT Strategic Plan:



On the provincial front, as healthcare organizations join their forces in implementing larger and larger HIS solutions that span across the healthcare continuum, Health Information Exchange solutions will have to adapt to a new reality, and look to expand to other jurisdictions, for example a national EHR.

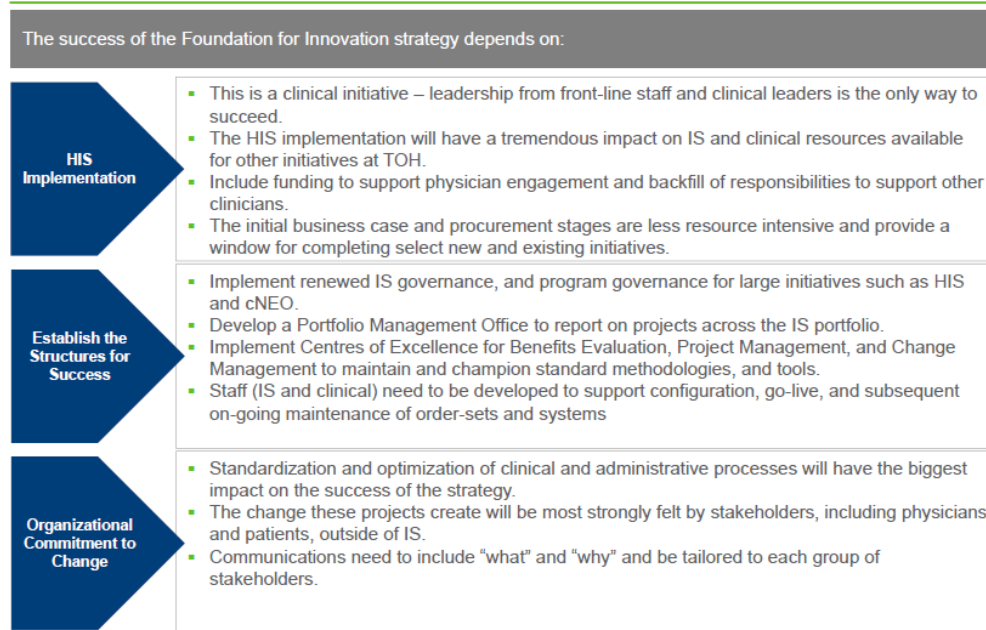
#### 4. Moving Forward: Success Factors and Enablers

The TOH IS/IT team is focused on two main strategic objectives for the coming years:

- Move from a “best-of-breed” model to a Best-in-class Commercial off the Shelf (COS) HIS, and become a HIS hub and service provider for the region
- Continue to contribute to ConnectingOntario’s goal to implement a provincial EHR

Some key success factors for the HIS were identified in the 2014 IS/IT Strategic Plan:

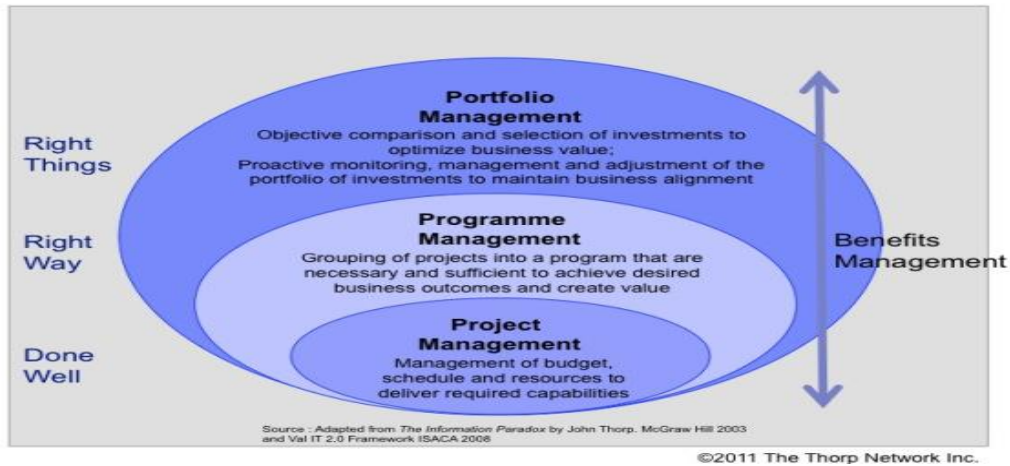
## Implementation Considerations



In this context, some of the key enablers would include:

1. **Establish a clear line to decision makers at MOHLTC:** Today, there appears to be many different paths (and opinions) to navigate. These include the HIS - Implementation Task Force, Advisory Council, eHealth Ontario, eHealth 2.0, Sustainment and Investment Board, MOH, etc. A more direct decision path would allow TOH and its partners to more easily respect timelines, contain costs and keep momentum. Similar concerns apply to the partnership between eHealth Ontario and TOH and other stakeholders in the ConnectingOntario program.
2. **Clarify the financial implications of the HIS acquisition:** As much as the HIS transition makes sense for TOH and its partners, there are concerns about how this expense will impact hospital operating costs and funding in the Health System Funding formula.
3. **Maintaining Focus:** The transition to an HIS for TOH and its partners is going to be one of the single largest projects ever undertaken in our region. With this initiative and the ConnectingOntario project running in parallel, it will be important for TOH (and not just the IS/IT team) to avoid “distractions” with new IS project requests. To that end, the Ottawa Hospital Leadership Team introduced a Portfolio Management Office (PMO) in 2015 to help streamline our processes for approvals, budgeting, tracking hours, reporting progress, etc. The PMO will ultimately transition to a larger corporate role which will include, not just IS/IT projects, but other corporate initiatives, ensuring the financial sustainability of our capital priorities.





## 5. Conclusion

The next four to six years will be a transformative time for TOH, the Champlain region, and the province of Ontario, not only in terms of IS/IT solutions made available to clinicians, but the fundamental impact these solutions will have on clinical care processes, improving quality and access at less cost, improving patient and clinician engagement, and improving population health.

As a regional hub and a service provider, TOH is positioned to offer Software as a Service (SAAS) tier one solutions, from back end Financials, Human Resources, Logistics through the partnership for HIS renewal, allowing for regional partners to focus on health care services and leverage a common information management infrastructure.

In the end, the technology is truly an enabler towards achieving TOH's corporate vision to become a top 10% organization in quality and safety. This foundation will provide the essential tools and data to enable Population Health improvement, an excellent experience for both patients and providers, and the best possible value-based care for the region.

The TOH IS/IT team is excited and proud to be part of this transformation for the benefit of the community we serve.