Endovascular Thrombectomy (EVT) Quality Performance Discussions: Summary Document

BACKGROUND

In Ontario, Endovascular Thrombectomy (EVT) is performed at 11 specialized hospitals across the province. In 2017, the Ministry of Health and Long-Term Care (now Ministry of Health) requested that CorHealth Ontario establish a framework for measuring, monitoring, and reporting on EVT performance to ensure alignment with best practices, improve system planning and drive quality/system improvements. To support development of this framework CorHealth Ontario leveraged the expertise of the provincial EVT Performance Measurement and Monitoring (PMM) Task Group (now Hyperacute PMM Task Group).

The baseline EVT Report (FY 2017/18), first released in 2018, included 9 key performance indicators which focused on timeliness, equity, and effectiveness (*Table 1: EVT Performance Indicators*). This report has since been released to EVT programs on a biannual basis, with the most recent report capturing data from quarters one and two of fiscal year 20/21.

Table 1: EVT performance Indicators

Quality Domain	Indicator
Timeliness	• Median time (in minutes) from Registration/Arrival at EVT Centre to qualifying CTA, CTP, or MRA • Median time (in minutes) from Registration/Arrival at EVT Centre to Arterial Puncture • Median time (in minutes) from Registration/Arrival at EVT Centre to Time of First Reperfusion
Equity	• Proportion of Ischemic Stroke Patients who Received an EVT Procedure
Effectiveness	• Proportion of Patients who Received CTA, CTP or MRA Prior to the EVT Procedure • Proportion of Stroke Patients Transferred from a DSC Hospital to an EVT Hospital who Received EVT • Proportion of EVT Patients Successfully Reperfused • 30-Day All-Cause Mortality • 90-Day Home Time

In addition to the EVT Report, CorHealth Ontario developed a Data Quality (DQ) and Compliance Program to ensure data is of high-quality and fit-for-use, with a focus on improving data at the source. The DQ and Compliance program includes:

- 9 EVT DQ indicators (*Table 2: EVT DQ Indicators*)
- A report showing the indicators compared against thresholds/acceptable values
- A quarterly process for review and feedback

Table 2: EVT DQ Indicators

#	Indicator Name	Indicator Definition
1	Appropriate Volumes	The number of cases submitted by each hospital should be verified to ensure accuracy/no missing cases
2	440 without EVT	Number of records where SP440 fields were completed for non EVT cases.
3	EVT without 440	Number of records identified as EVT but SP440 fields were not completed.
4	Special Project 440 completion rate	Percentage of records where at least one of the SP440 fields is blank.
5	Special Project 440 unknown rate	Percentage of records where at least one of the SP440 fields is unknown.
6	Door to CTA Appropriateness	Percentage of records where Door time and CTA time have been entered in the proper order.
7	CTA to Puncture Appropriateness	Percentage of records where CTA time and Puncture time have been entered in the proper order.
8	Puncture to Reperfusion Appropriateness	Percentage of records where Puncture time and Reperfusion time have been entered in the proper order.
9	Multiple EVT	Number of records that had multiple EVT codes during the same episode of care

EVT QUALITY PERFORMANCE DISCUSSIONS

In the Summer of 2021, CorHealth Ontario initiated a series of Quality Performance discussions with all EVT programs, Regional Stroke Networks, and the Ministry of Health (MOH). These calls leveraged CorHealth Ontario's EVT report, as well as the EVT Service Delivery Requirements, as a platform to discuss key factors contributing to performance, as well as strategies being used to drive quality improvement at the local and regional level. To support these discussions, the following questions were circulated to all sites in advance of the meeting:

- What have been your biggest challenges in establishing consistency with your EVT program and/or performance?
- What have been your biggest successes in establishing your program? What are you most proud of?
- What is your program's priority activity for improvement in the next 6 months?
- Are there particular actions or supports required?

ABOUT THIS DOCUMENT

The information in this document represents an overview of the EVT Program Quality Performance discussions held in Q2 2021/22. Key issues and common themes which emerged during these calls are highlighted. This document is intended to support programs in sharing innovative strategies and quality improvement activities related to EVT.

KEY WORDS: Q1 20/21 EVT QUALITY PERFORMANCE DISCUSSIONS

The word cloud image illustrates the key phrases and words used during the quality performance discussions. The importance of each key word is shown by size – the bigger the word, the more times it was repeated during all the discussions.

KEY ISSUES AND CHALLENGES

As part of the EVT Quality Performance Discussions, program participants were asked to identify key barriers to establishing consistency within their program and/or performance. Findings from these discussions have been grouped into six key themes:

- Human Resources
- EVT Site Infrastructure (Technology and Space)
- Performance Data
- Regional Access/Referral Site Processes
- Processes of Care at the EVT Site
- COVID-19

The sections below provide a description of each theme, including examples of the specific challenges and barriers sites have experienced, as well as solutions and quality improvement ideas, from the context of the EVT site, and the referral site/regional perspective. Where available, accompanying resources, tools and examples have been offered as information sharing.

HUMAN RESOURCES

Many programs described challenges with respect to human resources including reduced availability of staff during off hours, limited access to trained specialists, and/or difficulty recruiting. These challenges were described by sites as having a direct impact on key performance metrics such as door-to-puncture and door-to-reperfusion times. Specific examples shared by the sites include:

- *"Physician trainee support is limited because we share residents with other hospitals in the area… sometimes we get early psychiatrist residents with very limited experience and awareness of stroke"*
- *"Recruitment is challenging… providers are hesitant because of geography, low volumes, limited opportunity to practice their skills and limited scope of practice (we do not do coiling)"*
- *"We were limited by the availability of anesthesia"*
- *"I [am able to] provide 60% of the calendar days' worth of coverage, but we cannot control when patients come"*
- *"We are looking at the possibility of having CT Technologists that can cross-over and get things started in the angio suite, but provincially there are some shortages in licensed radiologist technicians, so it is difficult to do the cross-training"*
- *"Interventional Radiology is becoming stretched as access and volumes increase"*

PROGRAM SHARING

- Optimizing the scope of practice of the Code Stroke RN (CSRN) enabled **Sunnybrook Health Science Centre** to utilize health human resources more efficiently. Specifically, the EVT Peri-Procedural Order Set was developed to enable the CSRN to autonomously monitor and manage stable EVT patients, enabling anesthesia to concurrently attend to other cases.

EVT SITE INFASTRUCTURE (TECHNOLOGY AND SPACE)

Inadequate or inefficient access to the technology and/or the equipment required to support patient selection (e.g., CT, CTP) or perform the procedure itself (e.g., anesthesia equipment, biplane angiography) was identified by several programs as a barrier to procedural efficiency and timely intervention. Impaired access was often attributed to equipment failure and/or hospital renovations resulting in the need to perform the procedure and/or access equipment in suboptimal locations. Specific examples shared by sites include:

- *"Our CT is 3 floors away from the ED"*
- *"Our main CT scanner went down in the fall requiring a longer travel time to use another"*
- *"Our main angio room is under construction…we have transitioned to a secondary room that is small in capacity…and much more awkward to work in… there is no room for anesthesia, so if there is an anesthetic need, we cannot provide care here [patients are transferred to another hospital]"*
- *"Having the single plane is a little bit painful but hope that we will soon move to biplane… to acquire biplane, [we need to] create a footprint to allow that size of equipment to come on"*
- *"We will be replacing our interventional suites with biplane units… replacement process will take approximately 4 months. We will do one unit at a time, so we will be down one unit for the next 8 months… this will impact our volumes"*
- *"We are in the process of getting CTP… until CTP software is in play, we are operating in a 12-hour window"*
- *"We only have one biplane angiosuite and it can take time between cases to clean up and get things ready"*

PROGRAM SHARING

- As a new EVT program, **Health Sciences North** developed a mentoring partnership with the team at **Toronto Western, University Health Network**. The knowledge, expertise and advice provided by UHN was described by the team at HSN as critical to gaining the confidence to proceed initially with single plane rotational angiography while they explored future plans to support a biplane angiosuite which would be more conducive to EVT.
- In terms of activity underway to build infrastructure at the treatment centres, two EVT programs (**The Ottawa Hospital, Trillium Health Partners**) described current work underway to acquire and/or implement CTP automated software (i.e., RAPID) at their site.
- Several programs are engaged in multi-year projects focused on upgrading angiography suite capacity and technology:
  - **Unity Health (St. Michael's Hospital)** is constructing a new angiosuite with biplane and is also in the planning stages of building an operating room equipped with biplane angiography as part of the new Brain & Heart Centre initiative.
  - **Kingston Health Sciences Centre** is working to secure funds to update equipment in their current angiography suites and to eventually add a third biplane angiography suite. This will take time due to the significant costs of the necessary renovations and equipment.
  - **London Health Sciences Centre** is working towards equipping both interventional suites with biplane units.

PERFORMANCE DATA

Several programs emphasized the need to exercise caution when interpreting indicator results due to the volatility of small numbers, data quality challenges, lack of risk adjustment and inability to capture "door time" for patients who bypass the Emergency Department. These limitations were described as key barriers to using the report to understand program performance and drive quality improvement at the site level. Specific examples include:

- *"More timely access to data would be helpful"*
- *"Without confidence intervals it is difficult to determine if the difference is statistically significant"*

- *"It is difficult to interpret some of the indicators without insight into the denominator"*
- *"Results lack key interpretation considerations that are important to keep in mind when reviewing results."*
- *"We see a lot of late windows, multi-morbid and/or malignancies. We need to understand patient complexity and build that into the analysis (i.e., risk adjustment)"*
- *"Risk adjustment would be helpful, even if only on an annual basis"*
- *"Low numbers may lead to inflated results"*
- *"Data quality is an issue. Q1 to Q3 data has been tidied up, but the team was unable to get to Q4 due to staffing constraints"*
- *"Challenges with respect to the definitions used by different sites to capture Door Time and CT slice time. Through conversations with other sites, it seems that many of these definitions have room for interpretation which may result in inaccurate comparisons"*

PROGRAM SHARING

DATA QUALITY

- To drive data quality, **Champlain Regional Stroke Network** met with representatives from health records/decision support teams to gain an understanding of coding practices for stroke projects. Findings from these engagements were used to develop a Regional Approach to Align Coding Practices, including implementation of a regional education process that provides standardized coding education to all 9 hospitals within the region on an annual basis. This education is provided through an annual "Coder Data Quality" webinar.
- To improve data quality and decrease data collection efforts, the team at **University Health Network, Toronto Western** is working collaboratively with their IT team to build EVT data elements into the Electronic Medical Record.

TIMELY DATA

- **Unity Health (St. Michael's Hospital)** uses data summaries to provide more timely information to the stroke team. A summary of key stroke metrics is provided to the core team ideally within 72 hours of any code stroke resulting in treatment with alteplase or EVT. Team members review data and provide feedback on the process, including what worked well and areas for improvement.

- **Windsor Regional Hospital** developed the Hyperacute Stroke Dashboard to enable timely review of key quality metrics during quality meetings.

REGIONAL ACCESS/REFFERAL SITE PROCESSES

Several programs identified processes of care at referral sites (i.e., tPA/non-tPA sites), including door in door out times, patient selection and transport protocols, as key barriers to optimizing access to EVT within the region. This challenge is further amplified by the expansion of EVT services in Ontario to include the 6-24 hour post stroke symptom onset time window. Specific examples include:

- *"We receive most of our patients through transfers [from tPA and non-tPA sites], so patient identification must be optimized at these sites. If these sites don't do a good job of case identification, we will see low treatment rates."*
- *"As more referring sites implement the RAPID AI[1] software, we are seeing an increase in EVT access and treatment rates in our region. [The software] is very helpful in supporting patient selection."*
- *"Transportation between facilities can be challenging. The availability of ORNGE as well as the availability of healthcare personnel to escort the patient can act as a major barrier to access."*
- *"Our region is growing, with new residential areas being built. Given this growth, it is likely that more sites will need to come on as Telestroke (tPA) sites."*
- *"Repatriation is an issue. Patients are waiting 10 days to go back to their home hospital – this is unacceptable…the repatriation agreements are not being followed."*
- *"CT Scanners [at referral sites], don't have the perfusion module needed for RAPID"*
- *"In our region, we have a huge interest in the Mothership Model. Too many hospitals providing care leads to care fragmentation and adds time."*
- *We are exploring mothership as an option but need to understand the volume impact first."*
- *"LAMS is working to identify patients, but they are not always eligible for EVT."*

[1] CorHealth Ontario has no affiliation with ISchemaView RAPID platform. RAPID AI is currently the only quantitative software discussed in current published clinical trials.

PROGRAM SHARING

- **Hamilton Health Sciences Centre, Health Sciences North and Windsor Regional Hospital (Hyperacute Stroke Team)** have worked with their respective referral sites to develop code stroke protocols to support patient identification and treatment decision-making for patients presenting in the 0-6 and 6-24 hour time window. Examples from a few of these sites can be found by clicking below:
  - Haldimand War Memorial Hospital
  - St. Joseph's General Hospital Elliot Lake
  - Windsor Regional Hospital
- At **Hamilton Health Sciences Centre**, they credit much of their success to strong partnerships and collaboration with referring sites. A *Regional Endovascular Evaluation Committee* has been established that focuses on improving performance and providing ongoing feedback to sites on performance and supporting the roll out of new processes. Click on the following links for a sample Terms of Reference and agenda of this committee.
- **The Ottawa Hospital** noted that the implementation of LAMS has led to improvements in patient identification, however, there continues to be room for improvement as not all patients transferred end up eligible for EVT. To support continued quality improvement, they have recently begun implementing a *Paramedic Feedback Project* to provide updates on outcomes of patients that were brought in under code stroke protocol. To learn more about this project, please connect with the Ottawa team.
- **The Ottawa Hospital** and **Hamilton Health Sciences Centre** have supported the implementation of RAPID AI software across their stroke regions using a hub-spoke model. Click to see a lessons learned document created by Hamilton Health Sciences Centre. Other regions who have or are in the process of rolling out RAPID AI across their regions include **Southeastern Ontario Stroke Network** and **Northwestern Ontario Stroke Network.**
- To support repatriation discussions, a reminder that **CorHealth Ontario** released a Repatriation Reference Document in summer 2021, which can be leveraged to help guide discussions and decision-making regionally.
- **Champlain Regional Stroke Network** is working with referral sites across the region to improve door in door out (DIDO). To support this work, the team has implemented a DIDO tracking sheet to identify potential patterns of time delays and barriers along the pathway. Key findings from this analysis will inform future quality improvement activities.

- To support the roll out of ACT FAST and the identification of patients who may be eligible for EVT in the expanded time window, Windsor Regional Hospital built the ACT FAST screen into the Electronic Health Record system.
- **Health Sciences North** created five self-learning e-modules, each version targeting a different audience (e.g., nurses, ED physicians), to support the roll out of ACT FAST at community hospitals. These e-modules provided participants with an overview of regional/local processes, as well as video demonstrating the application of the ACT FAST tool in practice (provided by the Champlain Regional Stroke Network). Completion of the education modules was mandatory, and certificates were sent to participants post completion. Click to view an example of one of e-modules developed for Emergency Nurses and/or ED Physicians

PROCESSES OF CARE AT THE EVT SITE

Delays during key process steps (e.g., door to CT, door to groin puncture), including challenges assembling and coordinating the team, especially during off-hours when several team members need to travel into hospital from off-site, was noted by several programs as a barrier to achieving timely intervention. Specific examples of what we heard include:

- *"Most of our cases happen after hours, so that takes time to call everybody in… Most of the lag is waiting for angio to set up…nursing and MRT are not on site… we are not sure how to speed that up."*
- *"It takes about 30-35 minutes just to get the whole team on site."*
- *"Communication among the team seems to happen more slowly in the after-hours"*
- *"We are still 'oiling the system'."*
- *"We are looking for opportunities to reduce times during late night/early morning activations."*
- *"The biggest improvement that we are hoping to see with the roll out of RAPID is the communication… we will gain time with communication… we will be able to communicate with the angiosuite before the patient even arrives."*

PROGRAM SHARING

ASSEMBLING THE TEAM

- **Sunnybrook Health Sciences Centre** implemented an early and standardized notification process ("Stroke Thrombectomy Pages,") that alerts the team to a potential EVT case en route, enabling the team to assemble and prepare early (e.g., "on-call" members make their way to the hospital, preparation of stroke angio kits/trays in the angiosuite, booking post procedural critical care bed to support flow).

COORDINATING THE TEAM

- **Sunnybrook Health Sciences Centre** established the Acute Stroke Coordinator (ASC) to support coordination of the team during a code stroke. Acting as the "quarterback," ensuring the patient moves from the door to the angiosuite in a timely and efficient manner. The ASC also takes on a key role in quality improvement and data collection.
- **Trillium Health Partners** developed a comprehensive co-management model that clearly articulates the accountabilities of different physician team members to optimize scope of practice/expertise, manage workload, improve efficiencies/quality, and ensure a standard and consistent approach to the co-management of patients through the hyperacute phase of care.
- **Health Sciences North** developed an acute stroke protocol for the Acute Stroke Physician On-Call, to support streamlining and consistency of workflow.
- **Sunnybrook Health Sciences Centre** documented the roles and responsibilities of each team member, from ED to the angiosuite, to ensure safe, timely and coordinated teamwork during all code strokes.
- **Sunnybrook Health Sciences Centre** created the Code Stroke Safety Briefing/Checklist to improve communication and team cohesion during Code Stroke process in the Emergency Department
- **Hamilton Health Sciences Centre** created the Clot Retrieval Nurse role to support coordination of the team and streamline processes during code stroke (Clot Retrieval Nurse Roles Quick Reference Tool and Clot Retrieval Nurse Roles and Responsibilities)

FINDING EFFICIENCIES (REMOVING DELAYS)

- **Trillium Health Partners** Developed a local "after hours" telestroke model which enables the Neurologist/ Neurointerventionalist to assess the patient and review images remotely, enabling initiation of tPA and/or

preparation of the angiosuite while the team is travelling into the hospital.

- **Kingston Health Sciences Centre** removed unnecessary delays at EVT and referral sites by implementing several changes when the EVT service began over 5 years ago. Their focus now is on sustaining positive performance metrics using the following key process elements and approaches:
    - Sustaining paramedic pre-notification to the stroke team for every stroke protocol (already in place);
    - Implementation of Quinte Health Care's use of the "Race Car Pit Stop" model to save time by keeping the patient on the paramedic stretcher until reaching the CT suite (click to view a video of the pit stop model being used at QHC-Belleville);
    - Forgoing awaiting blood work results unless clinically relevant;
    - Use of RAPID CT perfusion software for all acute stroke protocol cases to support timely treatment selection (in use at Regional and District Stroke Centres);
    - Sustaining streamlined consent process for administration of contrast dye in the CT suite;
    - Administration of tPA in the CT suite rather than returning to the ED;
    - Sustaining efficient communication and coordination at every step;
    - Neurologist presence from Door to IVR suite to expedite care, communication and maintain process oversight;
    - Use of conscious sedation for the majority of EVT cases versus general anesthesia;
    - Clarity of roles and responsibilities with engagement of all staff in process improvements;
    - Resources can be found on the Stroke Network of SEO Website-Hyperacute Best practices Section
- **Windsor Regional Hospital uses a** run chart at quarterly hyperacute meetings to visualize and identify trends/patterns in the door to needle/puncture process. This tool helped the team to not only identify delays in the process, but to also demonstrate to the team that a door to puncture time of 60 minutes is achievable (a few cases analyzed achieved this target)
- **Health Sciences North** created the Acute Stroke Protocol Patch Form to support the prenotification process and to ensure that team members at HSN receive the information needed to prepare for and facilitate rapid action.
- **Hamilton Health Sciences Centre** saves time by pre-admitting EVT cases being transferred from regional tPA sites. This reflects similar processes from their interventional cardiology program which found that bypassing the ED for stable patients significantly improves door to treatment times. Other programs exploring pre-registration/direct to CT

processes include **Sunnybrook Health Sciences Centre** and **Unity Health (St. Michael's Hospital).**

COVID-19

The negative impact of COVID-19 was consistently heard across programs. Several programs noted the impact of the pandemic on program performance and volumes. Time-related metrics were affected by the re-deployment of staff, as well as the introduction of new infection prevention and control (IPAC) protocols aimed at curbing the spread of COVID-19 (e.g., donning, and doffing PPE, COVID-19 testing/screening, deep cleaning of angiography suite between patients). COVID-19 also negatively affected patient care, as the risk of COVID exposure when patients were a suspected or confirmed case resulted in a higher threshold to treat. Specific examples include:

- *"The clot retrieval nurses were redeployed during COVID. These team members are critical to ensuring collaborative teamwork and managing the needs of the patient."*
- *"COVID has had a negative impact on our performance times in 20/21 due to enhanced IPAC protocols, and critical care bed pressures."*
- *"COVID is likely the biggest factor that impacted our times. It takes time in between cases to clean the single biplane angiosuite and CT."*
- *"A drop in volumes makes it difficult to implement process improvements, especially during the pandemic where new PPE measures were required. When volumes are so low, it is a different team dealing with each case."*
- *"We have struggled with low numbers, and COVID has exacerbated that issue."*

As programs and teams continue to provide EVT service through this pandemic experience, and COVID-19 related challenges continue to impact EVT performance, it may be helpful to connect with other teams to share successful strategies. At the time of the performance calls, no specific strategies were shared related to COVID-19.

ON THE "WATCHLIST"

As a relatively new technology, the EVT system of care continues to mature as regions work together to address gaps, as well as to push boundaries to reflect new and emerging evidence with respect to patient selection and eligibility. This continued growth and evolution was raised by several EVT programs as having potential implications on future volumes and performance. Specific examples include:

- "*Patients are becoming more complex as we move into the expanded time window. Many of these patients have tandem lesions which makes the procedure longer and more complicated."*
- *"ACT FAST implementation will lead to an increase in patient volumes. We want to look at surge capacity planning to be able to accommodate these patients appropriately."*
- *"We have not reached a "steady state" in terms of volumes. As we improve regional access, expand selection criteria and push boundaries we do anticipate continued program growth."*
- *We anticipate slow, but continuous growth in our volumes. Our district stroke centre has not had formalized walk-in protocols historically – these are being developed and will include the extended treatment window."*

Continued dialogue with programs will be critical to monitoring and understanding the impact of these factors on key performance metrics. CorHealth will continue to engage sites as described in the Next Steps.

NEXT STEPS

Based on feedback received from these performance discussions, CorHealth Ontario will be engaged in the following activities over the next 6-12 months:

- Explore feasibility of including risk adjustment and/or confidence intervals for key indicators in the report
- Explore opportunities to improve the EVT Report to reflect patient complexity and the evolving stroke system
- Support referral sites through the integration of program sharing and/or QI discussions at the biannual Telestroke Knowledge Exchanges

Additionally, CorHealth Ontario will be hosting the next round of EVT Program Discussions in the Fall/Winter of 2021/22. These discussions will focus on year end performance results (i.e., FY 20/21 EVT report) as well as EVT volume projections for fiscal year 2022/23.