ONTARIO TELESTROKE PROGRAM

A REVIEW AND PLAN FOR MOVING FORWARD

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SUMMARY OF RECOMMENDATIONS

Governance, Administration and Policies

1. The Ontario Stroke Network (OSN) assume responsibility for the leadership and ‘governance’\(^1\) of Ontario’s Telestroke Program as a key part of the stroke care system. The Ontario Telemedicine Network (OTN) is responsible for the telemedicine component of the Telestroke Program. The Ontario Telestroke Steering Committee (OTSC) to be a committee of OSN with representatives of consulting neurologists, the regional networks, district stroke centres and non-designated hospitals that provide stroke care services including thrombolysis, and OTN. The position of Medical Director Telestroke should have reporting linkages to both OSN and OTN, with the position / role description of the Medical Director to be reviewed.

2. OSN and OTN jointly develop an inventory of Telestroke Program operational administrative functions and requirements indicating current owner, transition plan, issues requiring resolution, and future directions. All administrative functions should undergo a process review to assess for simplified approaches, appropriate technology supports, and whether other organizational infrastructure could be leveraged, e.g., telemedicine staff and stroke coordinators in the hospitals. Determine anticipated costs and funding sources if additional operational support resources are required.

3. OSN, through the OTSC, and the Telestroke Medical Director to develop policies with regard to Telestroke consultant neurologists: specifying minimum qualifications, recruitment processes, expectations, and accountabilities.

Planning for the Expansion of Telestroke to additional sites

4. As LHINs and Regional Stroke Networks examine opportunities and develop plans to improve access to thrombolysis and increase thrombolysis administration rates, Telestroke should be considered as a tool to broaden access to stroke neurologists. The planning for new Telestroke sites should aim to optimize best practices for both hyper-acute management and thrombolysis and continuing acute care in a stroke unit. Telestroke can provide support to existing and new stroke centres in the administration of thrombolysis. Telestroke should be considered at all new sites planning to administer thrombolysis as a supplement or back-up to existing resources.

5. OSN and the Ontario Telestroke Steering Committee: 1) develop the broad parameters to guide Regional Networks and District Centres in identifying opportunities for additional thrombolysis and Telestroke services balanced with access to other acute best practices including stroke unit care, 2) revise the Telestroke application process to incorporate both the clinical care parameters for best practices and technology and support requirements.

6. Ontario Regional Educators Group (OREG) to develop mechanisms and recommendations to support Regional Stroke Networks to strengthen expertise and build capacity in acute stroke assessment and management in Telestroke referring sites, e.g., education, mentoring.

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\(^1\) Governance includes the oversight of policies and procedures, performance measurement, quality improvement and stewardship of resources. Clinical accountabilities rest with the organizations participating in Telestroke. OTN is responsible for leadership, governance and adoption of telemedicine in Ontario.
Performance and Quality Monitoring

7. The Ontario Telestroke Steering Committee to explore, in more detail, thrombolysis performance indicators across hospitals with and without Telestroke to inform the planning for expansion of Telestroke sites.

8. The Ontario Telestroke Steering Committee revisit the Canadian Best Practice Recommendations for Stroke Care re Telestroke Performance Measures in light of the CIHI Project 340 to assess whether any further data capture can be added to this project to track Telestroke indicators.

9. OSN and the Regional Stroke Networks to assist Telestroke sites in developing performance monitoring, leveraging existing and new data collection tools.

10. Mechanisms to be developed by referring hospitals to provide Telestroke consultants with the appropriate patient information (e.g., 24 hour CT scan) and discharge summaries for those patients who have received a consult through Telestroke.

11. The Ontario Telestroke Steering Committee request the Ontario Regional Education Group (OREG) to consider a process to leverage provincial stroke rounds to include Telestroke patient case review (including the referring and consultant physician) as a component of the quality review process.

   The Telestroke Medical Director and consultant group to explore the feasibility of a provincial Telestroke case rounds or M&M rounds. Quality review processes should be shared across Regional Networks or made accessible through best practices mechanisms.

12. OTSC to review the data collected through CritiCall and identify any new data or streamlined processes to improve the information and metrics needed to monitor Telestroke.

Advancing Clinical Processes within Telestroke

13. Work with one or two District Stroke Centres with Telestroke to explore approaches to use CTA as part of the diagnostics for stroke patients. Expand the education, training and mentoring to assist in preparing sites for CTA use for stroke patients and with consultation through Telestroke.

   Expand information resources for Telestroke consultants to include information on the location of and access contacts for intra-arterial intervention services across the Province.

Facilitating Telestroke Site Participation in Stroke Research

14. Explore the opportunity and mechanisms of involving one or more of the Telestroke referring sites in stroke research with support through Telestroke.

Telestroke for Other Emergency Neurological Conditions

15. Revisit, at a future date, the opportunity of expanding Telestroke consults for Emergency patients beyond the population of ischemic stroke to be assessed for thrombolysis.
INTRODUCTION

Telestroke is an emergency telemedicine application that provides emergency physicians with immediate access to neurologists with expertise in stroke care who can support both the assessment and treatment of patients experiencing acute ischemic stroke symptoms. Using teleradiology to review Computerized Tomography (CT) images and videoconferencing solutions, the off-site neurologist can assess the patient and provide recommendations as to whether patients are candidates for thrombolysis and other interventions for acute stroke. The decision to use the thrombolytic (clot busting) agent tPA (tissue plasminogen activator) requires a physician with expertise in stroke management and the drug must be administer as soon as possible within the first 4.5 hours following stroke onset.

Telestroke is considered to be a key strategy to achieve equitable access to high quality care for stroke for all Ontarians. Without Telestroke, many patients living in and around communities lacking a neurologist would simply be denied the benefit of treatment with thrombolysis, or tPA, which is a best practice standard of care for acute ischemic stroke.

Telestroke was first introduced in Ontario as a pilot project in 2002. It began as a regional service model with neurologist consultants in three hubs providing consult services to hospitals in their respective regions. Today a single provincial Telestroke Program is supported by 13 neurologists who provide consult services to 20 referring hospitals in Ontario.

The Telestroke Program has expanded relatively quickly over the last three years and a number of potential new hospital sites have been identified. The Ontario Telestroke Steering Committee (OTSC) recommended a review of the Telestroke Program with attention to several areas: the planning process to determine needs and priorities for program expansion; alignment of Telestroke expansion with best practices in stroke care overall; program governance and accountabilities; policies and accountabilities for consultants; performance metrics and quality assurance; and, potential for expansion of the program beyond tPA/ stroke thrombolysis and within the emergency/ acute care services.

To address these issues and develop a plan for advancing the Telestroke Program, the Ontario Stroke Network (OSN), the Ontario Telemedicine Network (OTN), and the Ontario Telestroke Steering Committee(OTSC) undertook a process to complete a comprehensive review and plan. The review process is outlined in Appendix I. This plan builds on previous planning initiatives addressing Ontario’s Telestroke program:

2. Creating an Effective and Sustainable Provincial Telestroke Program, Recommendations of the LHIN Sponsored Telestroke Project Team, 2009

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STROKE CARE IN ONTARIO - SYSTEM CONTEXT

The Ontario Telestroke Program is part of and contributes to an organized system of stroke care services across Ontario.

The **Ontario Stroke Network (OSN)**, established in 2008, provides provincial leadership and planning for the Ontario Stroke System by measuring performance, partnering to achieve best practices and supporting innovations for stroke prevention, care, recovery and reintegration. The OSN delivers on its mission by establishing province-wide goals and initiatives to implement best practices across the stroke continuum, leading or supporting provincial initiatives, evaluating and reporting on the progress of the OSS, and administering the Ontario Stroke Network research and knowledge translation program.

The **Ontario Stroke System (OSS)** is a client-centered, collaboration of 11 regional stroke networks supporting the 14 Local Health Integration Networks (LHINs) and sharing the vision of **Fewer Strokes, Better Outcomes**. The goal of the OSS is to coordinate equitable access and improve outcomes for stroke survivors and their families across the life span through integration of stroke best practices across the care continuum. Each region has a Regional Stroke Centre and many have District Stroke Centre(s). Each stroke network is a collaborative partnership of health care organizations and providers that span the care continuum from prevention to community re-engagement.

Since the inception of the OSS in 2000, significant improvements have occurred in stroke prevention, diagnosis and treatment across the continuum of care. There have been positive impacts on access to stroke-related services, the integration and coordination of stroke care, treatment for stroke, and client and provider satisfaction.

ONTARIO’S ACTION PLAN FOR HEALTH CARE

*Ontario’s Action Plan for Health Care*, released by the Government of Ontario in January 2012, outlines several key principles and priorities for health care. The one principle highly relevant to providers treating patients with stroke is “the right care, at the right time, in the right place”.

The Action Plan references the need to harness telemedicine capabilities to achieve access:

> “Timely access to care is critical. It means patients having faster access to the care they need. We can achieve this by continuing to harness technological advances that allow patients to receive care more quickly, especially in rural and northern communities. For example, strengthening Ontario’s Telemedicine Network means more patients are able to benefit from faster care in their community, while accessing the most highly skilled specialists that our province has to offer. We will continue to drive our wait time strategy, so that more patients receive medically appropriate waits for their procedures.”

Ontario’s Telestroke Program is a leading example of leveraging telemedicine technologies to ensure timely access to critical health care services.
TELESTROKE PROGRAM HISTORY

Dr. Frank Silver founded Telestroke services in Ontario in 2001 with a grant from the Canadian Stroke Network and financial support from the Ministry of Health and Long-Term Care (MOHLTC). In the initial pilot study, neurologists from two of Toronto’s Regional Stroke Centres provided emergency stroke consultations to two referring sites, North Bay General Hospital (2001) and Sudbury Regional Hospital (2003). The pilot demonstrated that Telestroke could serve to provide access for stroke assessment and treatment recommendations at sites that lacked neurologists. In 2005, three additional pilot sites in the North East and Central East Regions (Timmins and District Hospital, Sault Area Hospital and Peterborough Regional Hospital) were established. Further expansion added three new sites in the Champlain, South West and Central South Regions.

These early initiatives were supported by three distinct, legacy telemedicine network providers funded by the MOHLTC. In 2006, the three legacy network providers merged to become a single entity: the Ontario Telemedicine Network (OTN). The establishment of a single provincial telemedicine network allowed for greater efficiencies and a standardized technical suite of supports, thus laying the foundation for more effective support for expansion of Telestroke services.

In 2009, the three legacy Telestroke programs that were based out of regional hospitals in Toronto / Hamilton, London and Ottawa transitioned to a model of one provincial pool of consultant neurologists. Currently, consultant neurologists are organized in a single pool with access to all Ontario referring sites. Two Telestroke neurologists are on call for each 24 hour shift, one as primary or first call and one as second call who serves as a back-up in the case of two simultaneous activations or when the first call neurologist cannot access the referring site because of technical problem.

Since 2008-09, eleven additional sites have joined the Telestroke Program for a total of 20 sites by the end of 2011-12.

GUIDELINES REGARDING THROMBOLYSIS AND TELESTROKE

Several guidelines and policy statements are relevant to planning services with regard to thrombolysis and Telestroke.

Canadian Guidelines

The Canadian Best Practice Recommendations for Stroke Care, a joint initiative of the Canadian Stroke Network and the Heart and Stroke Foundation of Canada, provides evidence-based best practice guidelines for the prevention and care of stroke patients across the continuum. The Recommendations specify that “All patients with disabling acute ischemic stroke who can be treated within 4.5 hours of symptom onset should be evaluated without delay to determine their eligibility for treatment with intravenous tissue plasminogen activator (tPA- Alteplase)”.

The Canadian Best Practice Recommendations for Stroke Care also provide guidance with respect to Telestroke: “Telestroke networks should be implemented wherever acute care facilities do not have on-site stroke care expertise to provide 24/7 acute stroke assessment and treatment with tissue plasminogen activator in accordance with current treatment guidelines.”

The Canadian Association of Emergency Physicians (CAEP) also provides guidelines: *Thrombolytic Therapy for Acute Ischemic Stroke.*“Stroke thrombolysis should be limited to centers with appropriate neurological and neuro-imaging resources that are capable of administering this therapy within 3 hours. In such centres, emergency physicians should identify potential candidates, initiate low risk interventions and facilitate prompt CT scanning. Neurologists should be directly involved prior to the administration of thrombolytic therapy”.

**American Guidelines**

The American Heart Association has issued a *Policy Statement: Recommendations for the Implementation of Telemedicine within Stroke Systems of Care.* Two recommendations are highlighted here:

- “Telestroke networks should be deployed wherever a lack of readily available stroke expertise prevents patients in a given community from accessing a primary stroke center (or center of equivalent capability) within a reasonable distance or travel time to permit access to specially trained stroke care providers. The use of telemedicine should be adopted within all stroke systems of care components to eliminate geographic disparities in care that may occur as a result of limited resources, manpower shortages, and long distances to specially trained providers.

- Whenever local or on-site acute stroke expertise or resources are insufficient to provide around-the-clock coverage for a healthcare facility, telestroke systems should be deployed to supplement resources at participating sites. This should be done within the context of a stroke systems of care model (SSCM) framework wherever possible. This includes the local adoption of the structural components necessary for stroke center capability, including stroke units, the use of standardized evidence-based stroke management and collection of state or national stroke quality measures, and the implementation of effective clinical and educational collaborations between spoke and hub facilities.”

These recognized guidelines provide clear direction that 1) thrombolysis is a standard of care in the hyper-acute management of ischemic stroke, and, 2) Telestroke should be implemented to facilitate access to the specialist resources required to support around-the-clock assessment and treatment with thrombolysis.

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4 www.strokebestpractices.ca/index.php/cross-continuum-topics-in-stroke-management/telestroke-new-for-2010
5 http://caep.ca/resources/position-statements-and-guidelines/thrombolytic-therapy-acute-ischemic-stroke
6 Recommendations for the Implementation of Telemedicine within Stroke Systems of Care: A Policy Statement from the American Heart Association; Stroke 2009; 40:2635-2660; http://stroke.ahajournals.org/content/40/7/2635.full.pdf
ONTARIO’S TELESTROKE PROGRAM - CURRENT OVERVIEW

Hospitals using Telestroke

The number of hospitals that have implemented Telestroke has grown from the 2 sites in 2002-03 to a total of 20 sites in 2011-12. The Telestroke referring hospitals are outlined in Appendix II. Telestroke supports 20 of 38 (53%) hospitals that currently provide thrombolysis.

<table>
<thead>
<tr>
<th>2011-12</th>
<th>Ontario</th>
<th>Regional Stroke Centres</th>
<th>District Stroke Centres</th>
<th>Non-designated Hospitals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of hospitals providing care for stroke patients*</td>
<td>142</td>
<td>11</td>
<td>17</td>
<td>114</td>
</tr>
<tr>
<td>Number of hospitals providing thrombolysis</td>
<td>38</td>
<td>11</td>
<td>17</td>
<td>10</td>
</tr>
<tr>
<td>Number of hospitals with Telestroke</td>
<td>20</td>
<td>2</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

*Number of hospitals from OSA 2008-09; hospitals with an annual volume of more than 10 stroke patients.

The use of Telestroke support generally falls in two categories:

1. Providing a supplement to existing stroke care expertise when access to a stroke neurologist consultation is desirable for more complex patients or when local stroke care expertise coverage is limited.
2. Providing access to stroke neurologist consultation for the majority of patients on acute stroke protocol who may be possible candidates for thrombolysis; local stroke care expertise is very limited.

The extent of support provided through Telestroke is highly dependent on the internal resources at a particular hospital and the scope of coverage available through existing resources. Several of the hospital sites have developed local expertise and have 24/7 coverage through internists or intensivists. Telestroke, in these hospital sites, has played a role in mentoring and building capacity such that local physicians develop the expertise for effectively managing the acute stroke phase. Consults through Telestroke are for more complex cases.

The following Figure 1 illustrates the locations of the Telestroke consulting and referring sites.
Ontario Telestroke Program: A Web Network Model

Different models exist for the organization of a Telestroke services across referring and consulting sites. The **Hub and Spoke** model is common in many jurisdictions, consisting of a single hub hospital which supports multiple stroke centres (spokes) in the assessment and management of stroke patients at the hyper-acute stage, assessing for thrombolysis treatment.

In Ontario, Telestroke services are organized in a ‘web network model’, engaging consultant neurologists in multiple centres, including Toronto, Hamilton, Ottawa, and others, in providing consult services to all Telestroke referring hospital sites in the province. The provincial web network model provides a number of benefits:
Figure 2: Telestroke Network Models

- Maximizes human resources by having on-call stroke neurologists covering a broader geographic area
- Additional referring sites and stroke physicians can be added to the network seamlessly
- Allows the most efficient use of Telemedicine technology

**Telestroke Utilization & Support of Thrombolysis**

Telestroke utilization has grown significantly since 2008-09 as additional hospital sites have implemented Telestroke. The number of consults has increased 127% over the past three years, proportionate to the increase in the number of referring sites. Telestroke consultation has supported District Stroke Centres to a greater extent than the smaller non-designated or rural and remote hospitals.

**Table 2: Telestroke Utilization: Number of Consults and Administration of Thrombolysis**

<table>
<thead>
<tr>
<th></th>
<th>Telestroke Sites</th>
<th>RSC/DSC</th>
<th>Non Designated</th>
<th># consults</th>
<th>%from RSC/DSC</th>
<th>tPA admin</th>
<th>% tPA</th>
<th>No. consultants</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006/07</td>
<td>9</td>
<td>9</td>
<td>0</td>
<td>228</td>
<td>100%</td>
<td>62</td>
<td>27%</td>
<td>9</td>
</tr>
<tr>
<td>2007/08</td>
<td>10</td>
<td>9</td>
<td>1</td>
<td>273</td>
<td>100%</td>
<td>64</td>
<td>23%</td>
<td>16</td>
</tr>
<tr>
<td>2008/09</td>
<td>9</td>
<td>8</td>
<td>1</td>
<td>268</td>
<td>96%</td>
<td>81</td>
<td>30%</td>
<td>9</td>
</tr>
<tr>
<td>2009/10</td>
<td>13</td>
<td>9</td>
<td>4</td>
<td>416</td>
<td>95%</td>
<td>146</td>
<td>35%</td>
<td>15</td>
</tr>
<tr>
<td>2010/11</td>
<td>17</td>
<td>10</td>
<td>7</td>
<td>450</td>
<td>82%</td>
<td>133</td>
<td>30%</td>
<td>10</td>
</tr>
<tr>
<td>2011/12</td>
<td>20</td>
<td>11</td>
<td>9</td>
<td>608</td>
<td>76%</td>
<td>203</td>
<td>33%</td>
<td>13</td>
</tr>
</tbody>
</table>

Figure 3 illustrates the significant growth of Telestroke activations and number of patients given tPA over the past three years. In 2011-12, a total of 33% of Telestroke consults resulted in the administration of tPA.
Ontario Telestroke Program – A Review and Plan for Moving Forward

Figure 3: Telestroke Activations and Number of Patients Given tPA

Telestroke assisted in 10% of all patients receiving thrombolysis in 2008-09 and 14% in 2010-11 (Table 3). The 2010-11 OSA identified 937 patients receiving tPA across acute hospitals in Ontario. According to OTN records, Telestroke was involved in 133 of the 937 cases. Telestroke provides considerable support to District Stroke Centres and non-designated hospitals, with over 30% and almost 50% respectively of tPA administration assisted through Telestroke.

Table 3: Thrombolysis supported by Telestroke

<table>
<thead>
<tr>
<th>Number of patients receiving tPA</th>
<th>2008-09</th>
<th>2010-11</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>RSCs (9)</td>
</tr>
<tr>
<td>All hospitals (OSA data*)</td>
<td>809</td>
<td>476</td>
</tr>
<tr>
<td>Telestroke engaged (OTN data)</td>
<td>81</td>
<td>0</td>
</tr>
<tr>
<td>% tPA administration supported</td>
<td>10%</td>
<td>0</td>
</tr>
</tbody>
</table>

*Ontario Stroke Evaluation Report Exhibit 1.7 (weighted numbers)

Telestroke Referring Sites - Environmental Scan

In the Fall 2011, the Ontario Telestroke Steering Committee surveyed the Telestroke referring sites to better understand individual organizational processes of care for acute stroke patients supported by Telestroke. A total of 18 of 20 hospitals provided responses. Table 4 provides a profile of the referring hospitals and use of Telestroke. The hospitals vary considerably in the annual volume of stroke patients, use of Telestroke, and admission and repatriation practices.
Table 4: Telestroke Sites Profile: Environmental Scan

<table>
<thead>
<tr>
<th></th>
<th>RSC/ DSCs</th>
<th>Non-designated hospitals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of hospital sites with Telestroke</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>Annual Stroke Volume</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 50</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>50 to &lt; 100</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>100 to &lt;200</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>&gt;200</td>
<td>8</td>
<td>-</td>
</tr>
<tr>
<td>% Calls to Telestroke to total stroke /TIA volume</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 10%</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>10 to &lt;30%</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>30 to 60%</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>&gt;60%</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Number of hospitals with Stroke Unit</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Admission / repatriation practices re patients receiving tPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Admit for Acute Care + Rehab</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Admit for Acute Care</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Admit 24-48hr then repatriate</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Transfer to Regional Centre</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Admission/ repatriation practices for patients not receiving tPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do not admit/ repatriate immed</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Admit for acute + rehab</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Transfer to Regional Centre</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

Most Regional and District Stroke Centres use Telestroke services for < 30% of the total stroke/TIA volume, whereas, non-designated facilities rely on Telestroke for > 30% of the stroke/TIA patients arriving at their hospitals.

Telestroke Referring Site - Models of Care Delivery

To provide greater understanding of existing Telestroke models of care delivery, a brief review of the literature revealed the following:

- **Drip and ship model**: involves smaller hospitals supported by remote stroke specialists regarding the decision to administer tPA, who then immediately transfer the patients to a comprehensive stroke centre post tPA for continuation of care.

- **TEMPiS**: is a cooperation of two academic stroke centres with community hospitals in Germany not providing specialized stroke care. Intervention consisted of: implementation of stroke wards, continuous medical education for the stroke teams and telemedical support. The two

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7 Appendix III outlines the respective benefits and implications of the Referring Site Models.
stroke centres provided 24/7 teleconsultation service according to identified criteria including: patients potentially eligible for tPA, ICH, NIHSS>10, reduced LOC, brain stem symptoms, progressive strokes and uncertainty re diagnosis or therapeutic procedures.

- **Telestroke System in Salzburg (TESSA)**\(^9\) links five regional hospitals with a specialized stroke unit via videoconference system. Regional hospitals range from 20-129 km away from the stroke unit. ED physicians initiate the consultation with the on-call stroke neurologist when a possible candidate for intravenous thrombolysis was identified. All patients are examined by the stroke neurologist who completes an NIHSS, reviews the tPA eligibility criteria, reviews the CT scan and provides recommendations on stroke treatment. After telethrombolysis the patient is transferred to the stroke unit for further management.

Telestroke in Ontario is not aligned with any single model. Hospitals using Telestroke provide care for patients following tPA administration with close monitoring in an intensive care unit, cardiac care unit or other specialized unit for the first 24 to 48, with subsequent care on a stroke unit or general medical unit. In fewer cases, the patients are repatriated to their home hospital for acute and rehabilitation care. The three hospitals in the Northwest using Telestroke transfer patients, once stabilized, to the Regional Stroke Centre.

The question of whether there is one ‘best’ model for Telestroke in Ontario has been raised. Best practice stroke care includes both 1) the use of Telestroke to facilitate rapid access to tPA for eligible patients, and, 2) stroke unit care to maximize patient care and outcomes. Ideally, all stroke patients would receive care in a specialized stroke unit. The most appropriate model will be dependent on local resources and expertise and may vary across the province. The planning for new Telestroke sites should aim to optimize best practices for both hyper-acute management and thrombolysis and continuing acute care in a stroke unit.

**Telestroke Consulting Physician Remuneration**

Remuneration arrangements for Telestroke consulting physicians providing on-call services have varied over the years and continue to be managed on a year-to-year basis. Currently, the Ministry of Health and Long-Term Care Hospital On-Call Coverage (HOCC) Program is working towards a solution for sustainable remuneration for on-call coverage for the Telestroke Program.

**Perspectives of the Telestroke User Community**

**Referring Hospitals:** Practitioners and clinical administrators in the referring hospital sites provided resounding positive comments on the value of Telestroke for patients in their communities. The following reflect the general themes:

- *Great tool that enables increased access to tPA for the community*
- *Consultants are very good and very helpful; always accessible*

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• Telestroke highly valued; ‘every stroke is different’; access to stroke specialist through Telestroke is the only way that thrombolysis could be available, provided to their community

• Families are highly impressed with the access to stroke specialists remotely

• Emergency practitioners and staff see the benefits of tPA patients in the Emergency setting

• New referring sites report being very pleased with orientation, training, support in set-up; access to protocols, resources; great preparation and support

• OTN support has been very responsive in resolving technical issues

• Recognize that there are gaps in follow-up information regarding patient outcomes

• Considerable scope exists for expanding Telestroke to facilitate greater access

Telestroke Neurologist Consultants

The Telestroke specialist consultants further confirmed the value of Telestroke and identified areas for future attention:

• Telestroke is a very important program/service to enable access to thrombolysis

• “Highly rewarding work; many complex cases; making a real impact in people’s lives”

• Provincial on-call pool works well – improved from the regional model

• Concern with ensuring a sufficient pool of specialists for coverage

• Identified need for follow-up information on patients consulted on; discharge summaries; more quality monitoring

• Pointed to the need for other hospitals that should have Telestroke systems to enable sharing of CT scans for specialist consultation in complex cases

• Identified future opportunities – re computed tomography angiography (CTA), involvement in research; assist in facilitating access to more interventional services

• Looking to the day when the technology is quicker, easier, more mobile, more accessible

Telestroke Program Issues and Challenges

While there is broad agreement on the value of Telestroke, a number of challenges and operational issues have been identified that require attention together with the planning for further expansion of the program.

The following issues have been pointed out:

• Governance and accountability for Telestroke and clarity of roles of OSN, OTN, and LHINs

• Need for a plan, criteria, processes for identification and approval of new sites

• Aligning the expansion of sites offering thrombolysis (with Telestroke) with overall best practices in stroke care, specifically stroke units

• Consultants: recruitment and remuneration; accountabilities; call scheduling
Ontario Telestroke Program – A Review and Plan for Moving Forward

- Performance monitoring and quality assurance – ensuring appropriate data collection, quality reviews
- Information on Telestroke services in Ontario are not readily available, not profiled on any website
- Number of communities without access to facilities providing thrombolysis – outside EMS transport (particularly in the North); Air ambulance not always available
- Some communities struggling with local physician buy-in with providing thrombolysis – both Emergency physicians and internists
- Many smaller centres with CT but not operating 24/7, and having other human resources and infrastructure challenges
- Emergency transport – EMS not able to transport longer than 2 hrs – some patients not getting to tPA sites
- Some perceptions that Telestroke consultations would lengthen door-to-needle times.

Summary Overview

Ontario’s Telestroke Program has very effectively afforded many communities the ability to offer thrombolysis treatment for acute ischemic stroke and, thereby, improving outcomes for many patients. Overall, the Telestroke Program has seen a number of changes in the recent years.

- Telestroke is in use at 11 of 28 Regional or District Stroke Centres and 9 of 114 non-designated hospitals
- Number of Telestroke sites has doubled over the last three years from 9 sites to 20; Telestroke consults have increased 127% over last three years; 33% of consults result in tPA administration
- In 2010-11 Telestroke has supported tPA administration in 14% of all patients who received thrombolysis; 32% of patients treated with tPA in District Stroke Centres and 48% of patients treated in non-designated hospitals.
- Opportunities exist for improved governance, performance and quality monitoring and expansion to new sites and ensuring that there is access to all aspects of best practice acute stroke management.
TELESTROKE PROGRAM - A PLAN FOR MOVING FORWARD

Telestroke in Ontario is now marking a major milestone – its 10 year anniversary. Telestroke as a program has matured and reached a stage of recognition by hospitals, practitioners and the Ministry of Health and Long Term Care as a valuable mechanism for improving access to thrombolysis in the management of stroke. A number of hospitals have been identified as potential new sites for Telestroke in the coming years.

Telestroke has evolved, however, incrementally over the years, without a deliberate or intentional roll-out strategy to place Telestroke sites in specific or strategic high-need areas. The issue of ownership and governance of the Telestroke Program has been unclear and, as a result, there is lack of clarity as to the leadership, planning and performance monitoring of the program.

The following plan outlines specific recommendations that aim to lay the foundation for the Telestroke Program to move forward over the next few years.

Governance and Accountability

The oversight and coordination for the Telestroke Program has taken different forms over the years. In earlier years, the Ontario Telemedicine Network established the Acute Phase Telestroke Task Team to facilitate the development of the provincial Telestroke model and oversee site designation, education and quality monitoring. This Committee has now transitioned to the Ontario Telestroke Steering Committee (OTSC) under the Ontario Stroke Network, and includes broad representation of stakeholders in the Telestroke and government community.

OTN has provided leadership to the Program and assumed many of the required coordination and administrative functions, however, OTN’s mandate is the provision of telemedicine solutions that enable clinical service delivery.

It has been pointed out in several reports that a clear governance structure is required.¹⁰ ¹¹

- “Currently there is no ownership for the Provincial Telestroke Program.”
- “Governance and stewardship of the Ontario Telestroke Program is a shared responsibility among multiple partners and requires further clarification”

The Ontario Stroke Network has a mandate to provide provincial leadership and coordination of the Ontario Stroke System and is well positioned to provide the governance and leadership for the Telestroke Program as a critical part of Ontario’s stroke services. The Ontario Stroke Network, established in 2008, operates with a Board of Directors, several committees but has a very modest management team (Executive Director and two other staff-Best Practice Lead and an Administrative

¹¹ Creating an Effective and Sustainable Provincial Telestroke Program, Recommendations of the LHIN Sponsored Telestroke Project Team, 2009.
Ontario Telestroke Program – A Review and Plan for Moving Forward

Assistant). However, it does have the structure and mechanisms in place to provide the governance and oversight for Telestroke. OSN’s current mandate does not include any direct operational, clinical or service responsibilities. It should be noted that a significant shift in organizational mandate and significant additional resources would be required for OSN to assume any operational responsibilities.

**Recommendation #1:**

| | The Ontario Stroke Network assume responsibility for leadership and governance of Ontario’s Telestroke Program as a key part of the stroke care system. The Ontario Telemedicine Network (OTN) is responsible for the telemedicine component of the Telestroke Program. The Ontario Telestroke Steering Committee to be a committee of OSN with representatives of consulting neurologists, the regional networks, district stroke centres and non-designated hospitals that provide stroke care services including thrombolysis, and OTN. The position of Medical Director Telestroke should have reporting linkages to both OSN and OTN, position/role description of the Medical Director to be reviewed. |

**Telestroke Administrative Support**

OTN has, over the years, provided administrative in-kind support to the Telestroke Program with many of the functions falling outside OTN’s scope of Service and Product offering to Members. OTN has long been concerned with the ongoing sustainability of providing some of the administrative functions, particularly in areas beyond their area of expertise and accountability. These include, and are not limited to, development and maintenance of the on-call schedule; communication of the on-call schedule to system participants; initiation of an escalation process for Telestroke service cancellation; and managing the payment of on-call stipends.

Some of the administrative roles may appropriately transition to OSN. It is recognized, however, due to OSN’s limited resources detailed planning should be undertaken to ensure the best placement of administrative functions across OTN and OSN. There may be funding and infrastructure implications that will require some attention.

OTN may be of assistance in building or finding technology solutions to streamline or simplify some of the administrative functions.

**Recommendation #2**

| | OSN and OTN jointly develop an inventory of Telestroke Program operational administrative functions and requirements indicating current owner, transition plan, issues requiring resolution, and future directions. All administrative functions should undergo a process review to assess for simplified approaches, appropriate technology supports, and whether other organizational infrastructure could be leveraged, e.g., telemedicine staff and stroke coordinators in the hospitals. Determine anticipated costs and funding sources if additional operational support resources are required. |

12 Governance includes the oversight of policies and procedures, performance measurement, quality improvement and stewardship of resources. Clinical accountabilities rest with the organizations participating in Telestroke. OTN is responsible for leadership, governance and adoption of telemedicine in Ontario.
Policies re Telestroke Consultants

Telestroke consultant coverage model shifted from a regional model to a provincial model in 2009. Telestroke consultants participate in Telestroke call as individual specialists and are not doing call as a role requirement of their hospital organization. The Medical Director for the Telestroke Program is responsible for recruiting the consultants. The Telestroke Program should have appropriate policies documented with regard to the consultants, including qualifications, recruitment mechanisms, participation in quality processes, expectations and accountabilities. OSN, as the governing body, will need to take a lead role, with the Medical Director, in developing such policies.

| Recommendation #3 | OSN, through the OTSC and the Telestroke Medical Director to develop policies with regard to Telestroke consultant neurologists: specifying minimum qualifications, recruitment processes, expectations, and accountabilities. |

Planning for the Expansion of Telestroke to additional sites

The Need for Additional Telestroke sites

The most compelling evidence that points to the need for expansion of Telestroke is the need for significantly improved rates of thrombolysis in ischemic stroke. The Ontario Stroke Audit reports the thrombolysis rate for ischemic stroke in Ontario for 2008-09 to be 8.4%. Data for 2010-11 report the rate to be 9.6%. The Quality of Stroke Care in Canada Report 2011 suggests that the thrombolysis rate in Alberta in 2008-09 was 12%. Ontario has a way to go to improve thrombolysis rates in ischemic stroke patients – the suggested target is 15 to 20%.

The Ontario Stroke Audit data also reports on the number and percentage of eligible ischemic patients who received tPA; eligible patients defined as those arriving within the treatment window and without contraindications. In 2008-09, a total of 29.6% of eligible patients received thrombolysis (benchmark rate – 58.9%). In 2010, a total of 41.3% of eligible patients received tPA (benchmark 61.2%). With less than half of the eligible patients receiving thrombolysis, there is room for improvement overall. The OSA data provides the analysis at the level of Stroke Region and LHIN, allowing for the identification of priority areas for improvement (Appendix IV).

Discussions with Regional Stroke Directors and District Stroke Coordinators have pointed to a number of planning initiatives to better organize stroke care services in their areas, including plans for consolidation of stroke care to specific hospital sites, expanding stroke care capacity to additional new sites, improved flow of stroke care and others. Others have identified hospital sites that are geographically distant from Regional or District Stroke Centres and where the implementation of Telestroke may improve access to emergency stroke care and thrombolysis. In many cases, the planning for improvements in stroke care services or the organization of services is a joint effort of the Regional Stroke Network and the LHIN. Potential future sites identified for Telestroke are outlined in Appendix V.

Overall, the drivers for expanding Telestroke include:

1. Regions need to improve hyper-acute management and increase rates of thrombolysis;
2. Stroke regional planning for reconfiguration of stroke services or improved distribution of stroke services;
3. Support for current centres that provide thrombolysis and might benefit from stroke neurologist consultation for more complex cases; and,
4. Geographically distant hospitals, where there is opportunity to improve local access to hyper-acute care.

Every Stroke Region and/or LHIN varies in the needs and plans for improving thrombolysis in acute management of stroke or in improving access for geographically remote communities. The Regional Stroke Networks have the responsibility for planning improvements in stroke care services within their regions and are in the best position to identify and recommend new Telestroke sites.

**Recommendation #4**

As LHINs and Regional Stroke Networks examine opportunities and develop plans to improve access to thrombolysis and increase thrombolysis administration rates, Telestroke should be considered as a tool to broaden access to stroke neurologists. The planning for new Telestroke sites should aim to optimize best practices for both hyper-acute management and thrombolysis and continuing acute care in a stroke unit. Telestroke can provide support to existing and new stroke centres in the administration of thrombolysis. Telestroke should be considered at all new sites planning to administer thrombolysis as a supplement or back-up to existing resources.

**Guiding Principles for New Telestroke Sites**

The discussion around establishing new Telestroke sites frequently raises the issue of care of patients post-thrombolysis, as stroke unit care is well recognized as a best practice. Several current Telestroke sites do not have a stroke unit, although many have interprofessional stroke care teams and cluster stroke patients to optimize care. A tension exists in balancing the need to expand sites to ensure access to thrombolysis and stroke units for continued acute care.

As new hospital sites are considered for Telestroke services, it will be important to understand how the patients’ care will be optimized with best practices across the care continuum. The OSN and the Ontario Telestroke Steering Committee should outline guiding principles to assist in planning for future Telestroke sites. The following are proposed as a starting framework for such principles:

New Telestroke sites should:

- Address need for more distributed capacity for stroke care or address geographic challenges to accessing optimal emergency care and thrombolysis locally
- Include plans for continuum of stroke care, locally or virtually; leveraging or complementing local or district capacity
- Support critical mass to foster best practices
Ontario Telestroke Program – A Review and Plan for Moving Forward

- Integrate within the Regional or District Network to address all aspects of stroke care (e.g., rehab, secondary prevention)
- Consider the impact on other local stroke care centres
- Incorporate the data collection and quality review processes important for performance and quality monitoring
- Consider telemedicine options to access specialist resources as needed – Tele-consults, Tele-Rehab.

Recommendation #5

| Recommendation #5 | OSN and the Ontario Telestroke Steering Committee: 1) develop the broad parameters to guide Regional Networks and District Centres in identifying opportunities for additional thrombolysis and Telestroke services balanced with access to other acute best practices including stroke unit care, 2) revise the Telestroke application process to incorporate both the clinical care parameters for best practices and technology and support requirements. |

Building Capacity and Expertise in Thrombolysis

Telestroke provides a valuable vehicle to assisting referring site stroke care teams in strengthening their knowledge and expertise in the management of acute stroke. Some referring sites may, over time, develop the expertise to provide hyper-acute stroke management and thrombolysis more independently, using Telestroke for complex cases. As Regional Stroke Networks work to improve stroke services overall in the Region, opportunities should be considered to build capacity and expertise in hyper-acute stroke management in Telestroke sites.

Recommendation #6

| Recommendation #6 | Ontario Regional Educators Group (OREG) to develop mechanisms and recommendations to support Regional Stroke Networks to strengthen expertise and build capacity in acute stroke assessment and management in Telestroke referring sites, e.g., education, mentoring. |
Ontario Telestroke Program – A Review and Plan for Moving Forward

Summary - Roles for Planning Future Telestroke sites – OSN, Regional Stroke Networks and OTN

Ontario Stroke Network, Regional Stroke Networks and OTN Roles in planning Telestroke expansion:

<table>
<thead>
<tr>
<th>Provincial Level – OSN</th>
<th>Regional Stroke Networks</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Set the framework for enhancing stroke system capacity and access to stroke care best practices</td>
<td>• Planning with network of hospitals to broaden/ strengthen capacity for stroke care</td>
</tr>
<tr>
<td>• Highlight the role of Telestroke for mentoring, consultation, support</td>
<td>• Advocate Telestroke for new sites providing thromboysis (as well as for existing sites)</td>
</tr>
<tr>
<td>• Outline priority areas for improving thrombolysis rates based on performance indicators</td>
<td>• Identify and address geographic challenges to best practice care in the Region</td>
</tr>
<tr>
<td>• Assist Regional Networks in setting targets</td>
<td>• Address gaps in performance metrics</td>
</tr>
<tr>
<td>• Promote quality monitoring processes</td>
<td>• Lead and encourage participation in quality monitoring / quality assurance processes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ontario Telemedicine Network</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Leverage current changes in e-technologies that are virtualizing health care services and provide lower cost solutions to improve and simplify Telestroke</td>
<td>• Provide ongoing education and mentoring on assessment and management of acute stroke and administration of thrombolysis</td>
</tr>
<tr>
<td>• Provision and management of a reliable, secure and monitored network infrastructure</td>
<td>• Consider telemedicine options for facilitating remote consults in the broader stroke care continuum for Telestroke sites</td>
</tr>
<tr>
<td>• Support fully integrated conferencing solutions supporting education and meetings; webconferencing; webcasting.</td>
<td></td>
</tr>
<tr>
<td>• Work with planned sites to ensure technical plan implementation</td>
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</tr>
</tbody>
</table>

Performance and Quality Monitoring

The development of mechanisms and processes to monitor the performance and quality of the Telestroke Program should be priority in moving forward. Currently, a Telestroke Utilization report is generated that compiles the stats on number of Telestroke activations and number of patients receiving tPA. Several new data tools are becoming available and these, as well as currently available audit data, should provide a more robust performance monitoring framework.

Ontario Stroke Audit

The primary mechanism for performance monitoring of stroke care in Ontario is the Ontario Stroke Audit (OSA). The Stroke Evaluation and Quality Committee (SEQC) of the Ontario Stroke Network is responsible for measuring, monitoring, evaluating and reporting on the progress of the Ontario Stroke System.
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The Ontario Stroke Evaluation Report 2011 provides data on several indictors related to thrombolysis care, including:

- Thrombolysis administration rates for all ischemic stroke patients
- Thrombolysis administration rates of eligible patients, those presenting to hospital within the treatment window, and having no contraindications
- Door-to-needle times for the administration of thrombolytic agents (tPA)

Data is provided at the provincial level and by Stroke Region and LHIN.

The Ontario Stroke Evaluation Report 2011 includes an Ontario Stroke Report Card 2010/11 for each LHIN which outlines performance and benchmarks on 20 indicators. One indicator specifically addresses access to thrombolysis: The proportion of ischemic stroke patients who arrived at the ED less than 2.5 hours from symptom onset and received acute thrombolytic therapy (tPA) (excluding those with complication). Benchmark 58.9%

The Ontario Stroke Audit (OSA), in the past, has not specifically separated out Telestroke sites in examining indicators related to thrombolysis. The most recent 2010-11 OSA audited all stroke/TIA cases seen at Telestroke referring hospitals that were operational for the entire 2010/11 year. If the medical chart indicated Telestroke was initiated, the case was identified as a Telestroke case and performance indicator data was collected. This allows comparison of thrombolysis performance across hospitals with and without Telestroke support. The upcoming 2011/12 SEQC Evaluation report includes thrombolysis performance indicators across all Telestroke sites.

**Recommendation #7:** The Ontario Telestroke Steering Committee to explore, in more detail, thrombolysis performance indicators across hospitals with and without Telestroke to inform the planning for expansion of Telestroke sites.

**Canadian Best Practice Recommendations for Stroke Care – Telestroke**

The Canadian Best Practices Recommendations for Stroke Care (2010) have outlined specific performance measures for evaluating Telestroke quality of care. The performance indicators are listed below:

1. Percentage of patients who arrive at a designated referring hospital with stroke symptoms who receive access to stroke expertise through telestroke as (a) the proportion of total stroke cases treated at the referring site and (b) the proportion of patients with acute ischemic stroke arriving at the hospital within 3.5 hours.
2. Proportion of telestroke cases where an urgent follow-up is required with the stroke specialist due to complications or unexpected events.
3. Time to initiation of Telestroke consult from
   a. stroke symptom onset (last time patient was known to be normal)
   b. arrival in emergency department
   c. completion of the CT scan
4. Number of Telestroke referrals where stroke specialists were inaccessible or access was delayed due to
   a. multiple conflicting calls (telestroke and other)
   b. technical difficulties preventing video-transmission
5. Percentage of telestroke consults who are treated with tPA.
6. Proportion of stroke patients managed with telestroke who received tPA, who had a symptomatic secondary intracerebral hemorrhage, systemic hemorrhage, died in hospital, were discharged to long-term care vs. home or to rehabilitation.
7. Percentage of patients managed with Telestroke where the Telestroke consultant’s note is found in the patient’s chart.

There are multiple sources for the data for the above indicators and new data and tools are becoming available (outlined below). As Ontario’s Telestroke Program moves forward, it will be timely to review these performance measures and determine which are important to track and monitor, and whether any further data capture can be added to new tools to track Telestroke indicators.

| Recommendation #8 | The Ontario Telestroke Steering Committee revisit the Canadian Best Practice Recommendations for Stroke Care re Telestroke Performance Measures in light of the CIHI Project 340 to assess whether any further data capture can be added to this project to track Telestroke indicators. |

**New Data Tools**
Two new data tools could provide additional data for performance monitoring.

**1. CIHI - Canadian Stroke Strategy Performance Improvement Project (Stroke Project 340)**
In 2009/10, CIHI and the Canadian Stroke Strategy developed a special project to monitor key elements of acute stroke care and includes thrombolysis administration. As of 2010/13 these data elements have become mandatory data for the CIHI DAD and NACRS-ED records. The recording of the specified information will facilitate timely reports to assist in quality reviews and process improvements. Telestroke hospitals may seek to consult with OSN and Regional Stroke Centres on the types of reports that will be important in monitoring performance.

**2. SPIRIT: Continuous web-based data collection on prospectively identified patients**
SPIRIT Acute Care is a prospective data entry initiative developed through the Institute of Clinical Evaluative Sciences (ICES) and in use at Ontario’s eleven Regional Stroke Centres. Near real-time data is entered for all suspected stroke/ TIA patients. The system is available to any hospital wishing to perform continuous, prospective data entry for the purpose of continuous quality improvement. Telestroke hospitals may seek the assistance of OSN and Regional Stroke Centres in exploring the feasibility and opportunity for the SPIRIT data collection.

Overall, Telestroke hospitals may seek to review the performance indicators and data available for monitoring performance in stroke management. New data tools may provide additional data sources. OSN and Regional Stroke Centres may be helpful in providing advice on accessing data, what reports may be available through hospital Decision Support offices and developing regular monitoring processes.

| Recommendation #9 | OSN and the Regional Stroke Networks to assist Telestroke sites in developing performance monitoring, leveraging existing and new data collection tools. |
Follow-up on Telestroke Consults

The Telestroke stroke consultants provide a formal clinical consultation on patients in referring hospitals. Consultants have identified the requirement for follow-up information on the clinical course and outcomes of the patients they consult on. It has been suggested that a CT scan image at 24 hours post-tPA administration would be desirable. Processes and mechanisms need to be established for referring hospitals to provide patient follow-up information and discharge summaries to the consultant neurologist. Ideally, in future, development of an electronic real-time consult would be followed with reports on patient outcomes.

**Recommendation #10**

Mechanisms to be developed by referring hospitals to provide Telestroke consultants with the appropriate patient information (e.g., 24 hour CT scan) and discharge summaries for those patients who have received a consult through Telestroke.

Quality Assurance/Quality Improvement Processes

The Regional Stroke Networks have a responsibility for the monitoring and quality improvement of stroke services in their regions. The role descriptions for the Regional Network Medical Directors generally include quality as part of the responsibility or mandate. Several Regional Stroke Centres and District Stroke Centres have implemented quality review processes including, for example, regular case reviews and report cards with indicator measures for patients assessed for thrombolysis. The possibility of Morbidity and Mortality (M&M) rounds at a regional or provincial level has also been suggested. The involvement of Telestroke sites in such quality processes at the Regional level is reported as mixed. Opportunity exists to build on some of these quality review mechanisms and share processes across Regions and Districts.

**Recommendation #11**

The Ontario Telestroke Steering Committee request the Ontario Regional Education Group (OREG) to consider a process to leverage provincial stroke rounds to include Telestroke patient case review (including the referring and consultant physician) as a component of the quality review process. The Telestroke Medical Director and consultant group to explore the feasibility of a provincial Telestroke case rounds or M&M rounds. Quality review processes should be shared across Regional Networks or made accessible through best practices mechanisms.
Other performance monitoring improvements
Several other indicators have been identified for monitoring including the response time by consultant from the time the call was placed to CritiCall Ontario and the number of calls/consults that do not proceed with full Telestroke interface, or are telephone consults only. There may be additional fields in the consultation form completed by the Telestroke consultants that would assist with monitoring additional indicators.

| Recommendation #12 | OTSC to review the data collected through CritiCall and identify any new data or streamlined processes to improve the information and metrics needed to monitor Telestroke. |

Advancing Clinical Processes within Telestroke
An increasing number of hospitals have access to computed tomography angiography (CTA), a technology that provides additional diagnostic capability to facilitate improved patient evaluation and decision making with respect to stroke care management. Several of the Telestroke hospitals have CTA technology and, with appropriate education, training and protocols, could be using this technology for stroke patients. The Telestroke Program will need to assist the referring sites in preparing to use this diagnostic tool and a site-by-site approach may be most appropriate.

Several of the Telestroke consultants pointed out that some stroke patients may be best managed by intra-arterial and interventional approaches, which are offered at major academic centres. Timely patient transfers will be required in these cases and information on location and contacts for these centres across Ontario should be available to consultant neurologists.

| Recommendation #13 | Work with one or two District Stroke Centres with Telestroke to explore approaches to use CTA as part of the diagnostics for stroke patients. Expand the education, training and mentoring to assist in preparing sites for CTA use for stroke patients and with consultation through Telestroke. Expand information resources for Telestroke consultants to include information on the location of and access contacts for intra-arterial intervention services across the Province. |

Facilitating Telestroke site participation in Stroke Research
Many of the Regional Stroke Centres and the Telestroke consulting neurologists are involved in multi-centre stroke research. It may be possible for Telestroke referring sites to participate in select multi-centre stroke research through the Telestroke consultation process. To participate, the referring sites may be required to provide some local infrastructure and supports, for example, data collection and data entry. These supports may already be available if the centre participates in other trials, e.g., cardiac studies.
Recommendation #14 | Explore the opportunity and mechanisms of involving one or more of the Telestroke referring sites in stroke research with support through Telestroke.

Telesstroke for Other Emergency Neurological Conditions

Several Telestroke referring centres identified needs for accessing stroke neurologists for patients with conditions or presentations other than that of ischemic stroke and potential thrombolysis candidate. These cases might include dissection and other general stroke events. Several referring sites traditionally access the neurologist on-call at their Regional Hospital and obtain advice without the benefit of interactive video with the patient.

The Telestroke consultants report receiving calls (less than 10% of calls) for patients who are not in need of assessment for thrombolysis. The consultants vary in their views as to whether the Telestroke consult service should be expanded to include patient conditions other than assessment for tPA.

Recommendation #15 | Revisit, at a future date, the opportunity of expanding Telestroke consults for Emergency patients beyond the population of ischemic stroke to be assessed for thrombolysis.

Telemedicine support for the broader stroke care continuum

Telemedicine technologies are in place in every Ontario hospital and many other provider locations. The Ontario Telemedicine Network (OTN) believes that telemedicine is well on its way to becoming a mainstream channel for health care delivery and education. The technology is in place and broadly used for many clinical consultations. OTN has existing and planned strategies to adopt new technologies that would simplify use, lower cost and facilitate continued growth in telemedicine use for clinical care.

Telemedicine approaches can be highly valuable in supporting virtual care delivery across the stroke continuum of care. Examples include:

- Consults for complex patients in the days after acute episode
- Consults for patients with TIA or minor stroke (Tela –TIA, as used at Victoria Hospital, BC)
- Stroke clinic assessments
- Virtual stroke unit (Tempis model)
- Secondary prevention consultations
- Rehabilitation consultations
- For nursing and allied health expertise across sites
- Complex case review by health care providers across multiple sites

Regional Stroke Networks, in their ongoing planning, might explore the use of telemedicine technologies to facilitate virtual consults across regional or district centres and more distant centres in their region.
CONCLUDING NOTES

The Ontario Telestroke Program is a highly valuable and successful program in facilitating access to the best care for stroke patients. The program supports emergency care of stroke patients through engaging stroke specialists in the assessment for and delivery of thrombolytic treatment. The program has grown to 20 referring hospitals in Ontario with additional hospitals identified as potential future sites.

The recommendations outlined in this report aim to provide the structures and processes that lay a solid foundation for moving the Telestroke Program forward. Clarity with respect to governance and administration of the program, strengthening of performance and quality monitoring processes, and approaches for planning program expansion should position the Telestroke Program for increasing its impact on stroke care into the future.
Appendix 1: Telestroke Program Review Process

The Ontario Telestroke Steering Committee engaged Susan Tremblay Consulting to complete the review and plan. The review process included a review of Ontario Stroke Audits, relevant literature, previous reviews of the Telestroke Program, and interviews. The following individuals were interviewed:

| OSN                      | Christina O’Callaghan
                          | Linda Kelloway
                          | Ruth Hall
|------------------------|---------------------|
| OTN                    | Ed Brown
                          | Angela Nickoloff
                          | Jennifer Mills-Beaton
                          | Laurie Poole
| Regional Stroke Network Directors | Cally Martin
                          | SEO
                          | Sharon Mytka
                          | SWO
                          | Cheryl Moher
                          | Central East
                          | Darren Jermyn
                          | North East
                          | Beth Linkewich
                          | North and East GTA
                          | Jim Lumsden
                          | Champlain
                          | Sandra Homeniuk
                          | North West
                          | Jacqueline Willems
                          | Southeast Toronto
                          | Louise MacRae
                          | Central South
| District Stroke Coordinators / Consultants | Amy Maebrae-Waller
                          | Lakeridge Health
                          | Irene Murray
                          | Huntsville District Memorial Hospital
                          | Jennifer White
                          | Peterborough Regional Health Centre
                          | Tammy Tebbutt
                          | Grand River Hospital
                          | Christianne Lewis
                          | Belleville – Quinte Health System
                          | Holly Woermke
                          | Pembroke Hospital
                          | Gwen Stevenson
                          | Thames Valley
                          | Doris Noble
                          | Stratford General Hospital
| Non-designated Telestroke Site Consultants | Dianna Harrison
                          | Rouge Valley Health System
                          | Dr. F. Silver
                          | Medical Director
                          | Dr. D. Sahlas
                          | Hamilton Health Sciences Centre
                          | Dr. M. Bussiere
                          | The Ottawa Hospital
                          | Dr. D. Gladstone
                          | Sunnybrook Health Sciences Centre
                          | Dr. W. Oczkowski
                          | Hamilton Health Sciences
| Referring Physicians | Dr. R. Kvas
                          | Timmins and District Hospital
                          | Dr. M. Troughton
                          | Peterborough Regional Health Centre
| LHIN Reps | Mimi Lowi-Young
                          | Central West
                          | James Meloche
                          | Central East
| CritiCall | Leanne Yonev
| Alberta | Colleen Taralson
                          | Alberta Provincial Stroke Strategy
                          | Marnie Gazankas
                          | Alberta Health
                          | Judy Treppel
                          | Alberta Health
| MOHLTC | Christine Sham
                          | Lauren Dunn
| EMS | Doug Socha
| Other Networks | Helen Angus
                          | Ontario Renal Network
## Appendix II: Telestroke Referring Hospital Sites

<table>
<thead>
<tr>
<th>LHIN</th>
<th>Location</th>
<th>Hospital Site Name</th>
<th>Date Telestroke Launched</th>
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<tr>
<td>2</td>
<td>Goderich</td>
<td>Alexandra Marine &amp; General Hospital</td>
<td>Feb-11</td>
</tr>
<tr>
<td>4</td>
<td>Brantford</td>
<td>Brant Community Healthcare</td>
<td>Feb-06</td>
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<tr>
<td></td>
<td></td>
<td>Greater Niagara General Hospital</td>
<td>Feb-06</td>
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<tr>
<td>9</td>
<td>Ajax</td>
<td>Rouge Valley Health System-- Ajax</td>
<td>Sep-11</td>
</tr>
<tr>
<td></td>
<td>Oshawa</td>
<td>Lakeridge Health Corporation</td>
<td>May-09</td>
</tr>
<tr>
<td></td>
<td>Peterborough</td>
<td>Peterborough Regional Health Centre</td>
<td>Mar-06</td>
</tr>
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<td></td>
<td>Scarborough</td>
<td>Rouge Valley Health System, Centenary</td>
<td>Sep-11</td>
</tr>
<tr>
<td>10</td>
<td>Belleville</td>
<td>Quinte Health Care – Belleville</td>
<td>Dec-10</td>
</tr>
<tr>
<td></td>
<td>Cornwall</td>
<td>Cornwall Community Hospital</td>
<td>Dec-10</td>
</tr>
<tr>
<td>11</td>
<td>Hawkesbury</td>
<td>Hawkesbury &amp; District General Hospital</td>
<td>Jan-11</td>
</tr>
<tr>
<td></td>
<td>Pembroke</td>
<td>Pembroke Regional Hospital</td>
<td>Oct-05</td>
</tr>
<tr>
<td>12</td>
<td>Barrie</td>
<td>Royal Victoria Hospital</td>
<td>Jan-12</td>
</tr>
<tr>
<td></td>
<td>North Bay</td>
<td>North Bay General Hospital</td>
<td>Jul-02</td>
</tr>
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<td></td>
<td>Sault Ste. Marie</td>
<td>Sault Area Hospital</td>
<td>Aug-05</td>
</tr>
<tr>
<td>13</td>
<td>Sudbury</td>
<td>Sudbury Regional Hospital</td>
<td>Mar-03</td>
</tr>
<tr>
<td></td>
<td>Timmins</td>
<td>Timmins &amp; District Hospital</td>
<td>Sep-05</td>
</tr>
<tr>
<td></td>
<td>Temiskaming Shores</td>
<td>Temiskaming Hospital</td>
<td>Mar-10</td>
</tr>
<tr>
<td>14</td>
<td>Dryden</td>
<td>Dryden Regional Health Centre</td>
<td>Dec-09</td>
</tr>
<tr>
<td></td>
<td>Fort Frances</td>
<td>Riverside Health Care Facilities Inc.</td>
<td>Mar-10</td>
</tr>
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<td></td>
<td>Kenora</td>
<td>Lake of the Woods District Hospital</td>
<td>Feb-08</td>
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### Appendix III: Overview of Telestroke Referring Site Models of Care Delivery

<table>
<thead>
<tr>
<th>Description of Model</th>
<th>Benefits</th>
<th>Implications</th>
<th>Other Considerations</th>
</tr>
</thead>
</table>
| • Acute care hospital that has a CT scanner & telestroke infrastructure to administer tPA  
  • The hospital does not have a “designated” stroke unit however patients remain there for post stroke care | • Rapid access to thrombolysis  
  • Less timely assessment & access to rehab  
  • Longer LOS  
  • Increased risk of complications due to lack of expertise &/or best practice protocols in place | | |
| • Acute care hospital that has a CT scanner & telestroke infrastructure to administer tPA  
  • Patients remain at the hospital which has a “designated” stroke unit with key elements in place:  
    o Rapid access  
    o Interprofessional team  
    o Protocols: dysphagia screening, early rehab assessment (Alpha FIM), early mobilization, secondary prevention  
  • “TEMPiS model”                                                                 | • Rapid access to thrombolysis  
  • Pt transitions across best practice care continuum to ensure optimal outcomes  
  • Reduced length of stay  
  • Earlier access to rehabilitation  
  • Development of stroke expertise  
  • Determine critical mass  
  • Determine impact of dedicated team on organization  
  • Need to establish protocols  
  • Determine training needs of staff | | • Examine need and capacity for development of ongoing access to telemedicine consultation support during patient admission? |
| • Acute care hospital that has a CT scanner & telestroke infrastructure to administer tPA  
  • Patients given tPA and transferred immediately to a designated centre for post stroke care  
  • “Drip & Ship model”                                                                 | • Rapid access to thrombolysis  
  • Access to best practice care to optimize stroke outcomes  
  • Requires inter-hospital transfer agreements  
  • Increased number of pts to designated centre  
  • Access to transfer services such as ORNGE for remote areas  
  • Timelines for safe transfer of pt  
  • Examine impact of increased patient volumes at designated centres.  
  • Repatriation agreements | | |
Appendix IV: Thrombolysis rates and Percentage of Eligible Patients receiving Thrombolysis

<table>
<thead>
<tr>
<th>Ontario Stroke Audit Data 2008-09</th>
<th>Ontario</th>
<th>Southwest</th>
<th>Central South</th>
<th>West GTA</th>
<th>Toronto West</th>
<th>Toronto Southeast</th>
<th>Toronto North &amp; East</th>
<th>Central East</th>
<th>South East</th>
<th>East Champlain</th>
<th>Northeast</th>
<th>Northwest</th>
</tr>
</thead>
<tbody>
<tr>
<td># Strokes seen in ER or admitted</td>
<td>19,477</td>
<td>2,791</td>
<td>3,347</td>
<td>2,067</td>
<td>1,412</td>
<td>1,014</td>
<td>1,377</td>
<td>3,004</td>
<td>910</td>
<td>1,970</td>
<td>1,099</td>
<td>477</td>
</tr>
<tr>
<td>No sites giving thrombolysis(TS)</td>
<td>29(9)</td>
<td>6</td>
<td>4(2)</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>5(1)</td>
<td>2</td>
<td>2(1)</td>
<td>4(4)</td>
<td>2</td>
</tr>
<tr>
<td>% ischemic within 2.5h</td>
<td>7939(35.3)</td>
<td>39.5</td>
<td>36.6</td>
<td>32.4</td>
<td>27.9</td>
<td>30.8</td>
<td>28.9</td>
<td>33.8</td>
<td>39.9</td>
<td>39.9</td>
<td>42.7</td>
<td>30.3</td>
</tr>
<tr>
<td>Thrombolysis % in ischemic</td>
<td>8.4</td>
<td>6.5</td>
<td>7.1</td>
<td>12</td>
<td>5.6</td>
<td>6.9</td>
<td>12.2</td>
<td>8.7</td>
<td>12.4</td>
<td>9.4</td>
<td>5.4</td>
<td>4.7</td>
</tr>
<tr>
<td>Number eligible to receive tPA</td>
<td>2735</td>
<td>487</td>
<td>401</td>
<td>385</td>
<td>159</td>
<td>134</td>
<td>184</td>
<td>360</td>
<td>147</td>
<td>240</td>
<td>173</td>
<td>64</td>
</tr>
<tr>
<td>tPA Given</td>
<td>809</td>
<td>97</td>
<td>126</td>
<td>139</td>
<td>47</td>
<td>33</td>
<td>83</td>
<td>121</td>
<td>44</td>
<td>82</td>
<td>30</td>
<td>7</td>
</tr>
<tr>
<td>% eligible pts receiving tPA</td>
<td>29.6</td>
<td>19.9</td>
<td>31.4</td>
<td>36.1</td>
<td>29.6</td>
<td>24.6</td>
<td>45</td>
<td>33.6</td>
<td>29.9</td>
<td>34.2</td>
<td>17.3</td>
<td>11</td>
</tr>
<tr>
<td>Gap to meet prov benchmark of 58.9%</td>
<td>801</td>
<td>190</td>
<td>91</td>
<td>88</td>
<td>46</td>
<td>26</td>
<td>91</td>
<td>43</td>
<td>59</td>
<td>72</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Number of hospital (sites)</td>
<td>142</td>
<td>34</td>
<td>22</td>
<td>8</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>19</td>
<td>9</td>
<td>13</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>Number of hospitals with high stroke volume (&gt;100)</td>
<td>70</td>
<td>10</td>
<td>14</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>13</td>
<td>3</td>
<td>7</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Stroke unit on site</td>
<td>26</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Data Source: Evaluation Report 2010/11  Exhibits 1.3 1.5 and 1.7.
Appendix V: Potential Future Sites Identified for Telestroke

Multiple sources have identified opportunities for implementation of Telestroke (regional planning, district planning, Telestroke consultants). These sites have only been suggested and should not be taken as confirmed expansion sites.

1. Access to stroke neurologists for more complex case consultation – e.g., Grand River Hospital; potentially other District Stroke Centres currently without Telestroke; Joseph Brant Hospital

2. More stroke centres planned; more distributed model for stroke care e.g. Thames Valley (potential sites – St. Thomas Hospital, Woodstock General); maybe Orillia (Soldiers Memorial Hospital);

3. Enhance geographic access - capacity & support in communities that are distant from regional or district centres - e.g., Cobourg, Sioux Lookout, Parry Sound, Bracebridge