BC Stroke Strategy

Evaluation of the Telestroke Prototype

July 13, 2010

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1.0 BACKGROUND

1.1 Telestroke

Telestroke has been defined as "the process by which electronic, visual, and audio communications … are used to provide diagnostics and consultation support to practitioners at distant sites, assist in or directly deliver medical care to patients at distant sites, and enhance the skills and knowledge of distant medical care practitioners."[1]

Telestroke programs were first introduced in the mid-1990s, primarily to address disparities in access to stroke services due to geographical barriers and limited specialized resources.Telestroke allows for audio and visual connections among health care providers and stroke patients, enables transmission of CT or MRI images, and is key to providing remote access to stroke expertise and guidance related to tissue plasminogen activator (tPA) therapy. Telestroke should not be viewed as a new form of therapy, but rather as a means of supporting the increased delivery of timely, evidence-based medicine for stroke cases in "neurologically underserved" areas of a region. Telestroke networks are typically designed with a stroke centre or consulting site at the hub and multiple local hospitals, or referring sites, connected to the centre. The next phase of telestroke implementation within British Columbia will be aligned with the Acute Cerebral Vascular Syndrome (ACVS) Plan which will clearly identify potential consulting and referring sites based on criteria established for the various hospitals in the province.

In 2008, the British Columbia Telestroke Working Group and the Heart and Stroke Foundation of BC and the Yukon embarked on a telestroke planning exercise to determine the best model for the province based on existing requirements for a telestroke program. The Telestroke Working Group identified the project purpose as:[2]

> *The telehealth project will improve access to care for stroke patients. It will demonstrate the effective use of technology to organize stroke services to improve rapid access to diagnosis and treatment for patients in health care facilities that do not have neurologists on staff. It will enable the right expertise to be available at the right time.*
>
> *The telehealth project will:*
>
> - *Demonstrate the effective use of telehealth technology to advance patient diagnosis and treatment*
> - *Facilitate physician access to neurologists for stroke diagnosis and care*
> - *Provide patients with access to best practices of stroke care*
> - *Build provincial capacity for stroke patient diagnosis and treatment*

The major deliverable products were identified as follows:

- *Experience and knowledge with the real-time application of telehealth to diagnose and treat strokes*
- *Proven methods for increasing capacity to treat stroke patients in BC*

- *Improved patient outcomes*
- *A business case for expanding the use of telehealth*

A total of $532,000 was allocated to the development of the prototype by the BCSS, of which $511,000 was utilized.

To maximize these types of assets over a reasonable time frame and within the allocated resources, a *Step-wise Service Model* was recommended for telestroke service development.[3] With little provincial experience in the complexity of emergency telemedicine, and little structure in place to support the full spectrum of functional requirements, this phased-in approach seemed prudent. It began with one consulting group on Vancouver Island (based at Victoria General Hospital) servicing two referring emergency departments (Nanaimo Regional General Hospital and Cowichan District Hospital), and another consulting group in the Lower Mainland (at Vancouver General Hospital) servicing two emergency departments within Fraser Health (Chilliwack General and Peace Arch Hospitals). This prototype model was designed as a strategy to maximize existing system assets and to assess their ability to meet the functional requirements of a telestroke network.

It is important to recognize that telestroke is unique compared with other telehealth services provided in B.C. in that it is an emergency telemedicine application that requires 24/7 on-demand response. As such, it requires a different technical system and clinical processes to ensure immediate connectivity between referring and consulting sites. Traditional telehealth processes and technical support mechanisms are not appropriate for telestroke and therefore new tools and processes were required.

A number of evaluations of telestroke have recently been published.[4,5,6,7] Most studies report that telestroke enhances access to tPA, and that both patients and providers are experiencing high levels of satisfaction with the process.

1.2 Tissue Plasminogen Activator

Approximately 80% of strokes are due to a blockage of an artery in the brain resulting from a blood clot. Prompt treatment with clot dissolving (thrombolytic) drugs can restore blood flow before major damage occurs. Thrombolytic therapy for acute ischemic stroke patients through the administration of tPA has been approved for use within 3 hours of the signs and symptoms of a stroke in the U.S. (since 1996) and in Canada (since 1999). More recently, research has suggested that the time window should be expanded from 3 to 4.5 hours after stroke symptom onset, with the promise of a modest but significant improvement in clinical outcome being maintained.[8] In 2008, the Canadian Best Practice Recommendations for Stroke Care expanded the time frame to 4.5 hours after symptom onset.[9]

Despite the positive results seen with this intervention, the use of tPA continues to be controversial in some quarters.[10,11,12,13] There are two primary reasons for this:

1. Strict criteria allow for only a small proportion of stroke patients being eligible for tPA

  - Only a minority of patients (22-30%) arrive at an emergency department (ED) in a timely enough fashion to receive tPA within the 3 hour time window.[14,15,16] With the expansion of this window to 4.5 hours, this proportion is now estimated to be closer to 35-40%.[16,17,18,19,20,21,22]
  - There are other exclusions for receiving treatment with tPA that do not involve time windows. This accounts for why a Canadian study found that just 27% of patients arriving at an ED within 3 hours received tPA.[23] The following table, developed from this study, summarizes the reasons for excluding patients from tPA even though they satisfied the time criterion:

Non-time-related Exclusions for tPA in Acute Ischemic Stroke Patients	
Reason for exclusion	**Patients presenting to ED <3 hours (n=314), n (%)**
Too mild	41 (13.1)
Clinical improvement	57 (18.2)
Significant comorbidity	25 (8.0)
CT scan/decision could not be made within 3 h	17 (5.4)
ED referral delay	28 (8.9)
Stroke not recognized by medical staff	6 (1.9)
Protocol exclusion	44 (14)
Too elderly (mean age 86 years)	4 (1.3)
Refused to consent	2 (0.6)
Other	6 (1.9)

2. Higher risk of a bleed

  - The use of tPA is associated with a 7.7% chance of bleeding in the brain (intracerebral haemorrhage) compared with a 2.1% risk in matched controls not receiving tPA. A significant proportion of patients with such bleeding die as a result.[24]

Largely because of the higher risk of intracerebral haemorrhage, thrombolytic therapy should only be given when a physician with expertise in stroke establishes the diagnosis, and a CT scan of the brain is assessed by a physician with expertise in this type of imaging. Many patients present at local community hospitals where such expertise is not available.

1.3 Benefits of tPA

What are the outcomes for those patients who are eligible for and actually receive tPA?

The results from a 2009 Cochrane review are summarized in the following table.[25] A total of 26 trials were included, comprising 7,152 patients. At the end of the study follow-up period (usually one year or less), 55.8% of acute ischemic stroke patients who did not receive thrombolysis (the

control group) were either dead or dependent. For those who did receive tPA (the treatment group), significantly fewer (51.8%) were dead or dependent. This is despite the fact that the rate of intracerebral haemorrhage was much higher (7.7% vs. 2.1%) within 7-10 days after treatment in the group receiving thrombolysis. These results equate to 50 fewer dead or dependent patients for every 1,000 patients treated with tPA. The authors of the review concluded that "thrombolytic therapy appears to result in a significant net reduction in the proportion of patients dead or dependent in activities of daily living."

Summary Results from The Cochrane Collaboration Review
Thrombolysis for Acute Ischaemic Stroke

Outcomes	Study Arm: Treatment	Study Arm: Control	Odds Ratio	95% CI
At End of Follow-up				
Death or Dependency	51.80%	55.80%	0.81	0.73 - 0.90
Dependency	32.50%	40.66%	0.67	0.61 - 0.75
Symptomatic (including fatal) ICH Within 7-10 Days	7.70%	2.10%	3.49	2.81 - 4.33
Death Within 7-10 Days				
Fatal ICH	4.45%	0.74%	4.40	3.21 - 6.03
All Other	6.97%	6.85%	1.08	0.85 - 1.38
Total Deaths	11.91%	7.67%	1.76	1.44 - 2.16
Death After 7-10 Days	7.57%	7.81%	1.05	0.84 - 1.31

Notes: ICH=Intracerebral haemorrhage, CI=confidence interval
Dependency is defined as a modified Rankin score of 3-5.

Based on such results, the Canadian Stroke Strategy (CSS) Best Practice Recommendations for Stroke Care states that "all patients with disabling acute ischemic stroke who can be treated within 4.5 hours after symptom onset should be evaluated without delay to determine their eligibility for treatment with intravenous tissue plasminogen activator."[26]

Cost-effectiveness studies of thrombolysis conducted over the last decade have also been positive, even suggesting cost savings in the long term.[27,28] In Denmark, for example, the Year One costs associated with tPA administration are estimated to be $3,300 (US$) but, over the patient's lifetime, savings of approximately $16,600 accrue.[28]

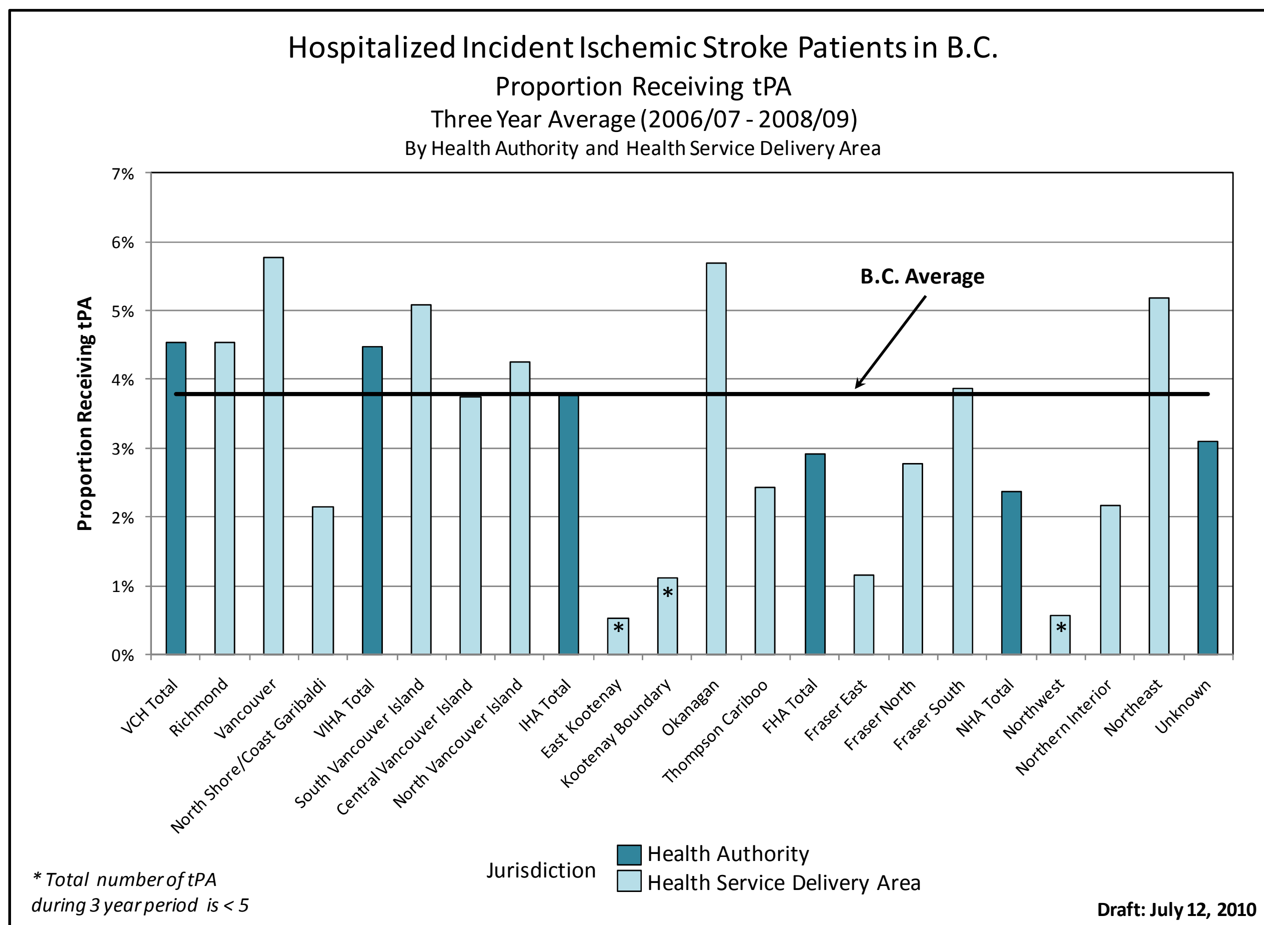
This type of analysis has been extended to the Canadian context. Estimated savings with appropriate administration of tPA have ranged from $600 per patient in the first year to a lifetime total of $3,800.[29,30] The modelling study by Sinclair et al. estimated that, in addition to the

economic savings, patients treated with tPA experienced an average net gain of 3.46 quality-adjusted life years compared with a non-treated group.

1.4 Utilization of tPA

The strict inclusion/exclusion criteria and delays in arriving at an ED mean that few ischemic stroke patients actually receive tPA. An estimated 1.4% of acute ischemic stroke patients in Canada received this treatment between 1999 and 2001.[31] In Ontario, just 3.9% of patients with acute ischemic stroke received tPA in 2004/05, despite the implementation of a comprehensive stroke system in that province between 2000 and 2004.[32,33]

In British Columbia, the utilization of tPA for incident ischemic stroke patients has increased from 3.4% in 2006/07 to 4.2% in 2008/09.[34] A significant amount of variation exists, however, based on the geographic location of the stroke patient (see following figure and map). Access to tPA, especially in neurologically underserved areas of the province, could be further enhanced through the use of telestroke.

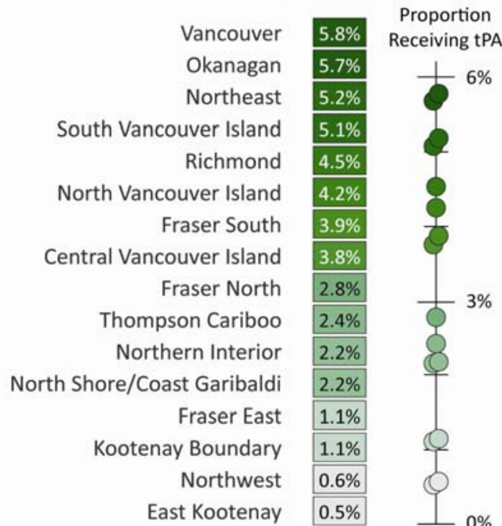


Hospitalized Incident Ischemic Stroke Patients in B.C.

Proportion Receiving tPA

Three Year Average (2006/07 - 2008/09)

By Health Service Delivery Area



2.0 EVALUATION OF THE BC TELESTROKE PROTOTYPE

2.1 Introduction

As noted earlier, the B.C. Telestroke prototype involved one consulting group on Vancouver Island (Victoria General Hospital) servicing two referring emergency departments (Nanaimo Regional General Hospital and Cowichan District Hospital), and another consulting group in the Lower Mainland (Vancouver General Hospital) servicing two referring emergency departments within Fraser Health (Chilliwack General Hospital and Peace Arch Hospital).

The Vancouver Island Program began in July 2009, while the Lower Mainland Program began in February of 2010. The present evaluation covers the 9-month period from July 2009 to March 2010 for the Vancouver Island Program, and the 4-month period from February 2010 to May 2010 for the Lower Mainland Program.

2.2 Implementation Environment

The contexts for implementing the prototype varied significantly between Vancouver Island and the Lower Mainland.

The Vancouver Island Health Authority was identified as a “least risk” operating context in which to initiate Telestroke. The planned service was contained within one jurisdiction that shared a consulting group of neurologists, used one Information Technology (IT) system (network), and had an island-wide Emergency Health Record, diagnostic imaging and telehealth support system. Lessons learned in this context were assessed on an interim basis and used in implementing the Lower Mainland prototype.

The Lower Mainland installation involved a group of consulting neurologists from one Health Authority providing Telestroke services to two sites in another Health Authority. It provided the “best-case test” of the feasibility of expanding the service across more than one IT network, and across different technical, diagnostic, clinical, and administrative operating contexts. This was fundamental to a “proof of concept” for the province as a whole.

2.3 Evaluation Methods

Quantitative data that could potentially be tracked were identified through a literature search. The list of data elements was then reduced through an iterative consultation process in order to identify the final set that could realistically be tracked given the evaluation resources available for this project. The final set of data elements that were collected is included in Appendix 4.1.

Qualitative feedback for the evaluation was generated through a series of interviews with key individuals involved with implementing and/or operating the telestroke program on Vancouver Island and in the Lower Mainland. Prior to the interviews, a literature search was conducted on the key components of a successful telestroke program, with the results being summarized in a two-page document. This two page document (see Appendix 4.3) was sent to individuals as background information prior to the interview. The interview was semi-structured in that it

generally followed the format suggested in Appendix 4.3, with variation depending on the individual's expertise and role in the B.C. telestroke program. Open-ended questions were also posed to garner additional information that the interviewee thought would be helpful for the evaluation. The evaluator also attended a feedback meeting at Nanaimo Regional General Hospital; later, preliminary findings for the Vancouver Island Program were presented to the VIHA Telestroke Steering Committee. Additional information on the individuals consulted may be found in Appendix 4.2.

There will be an extended opportunity to review the Lower Mainland results in September of 2010, after an equivalent operating period to that of the Vancouver Island phase.

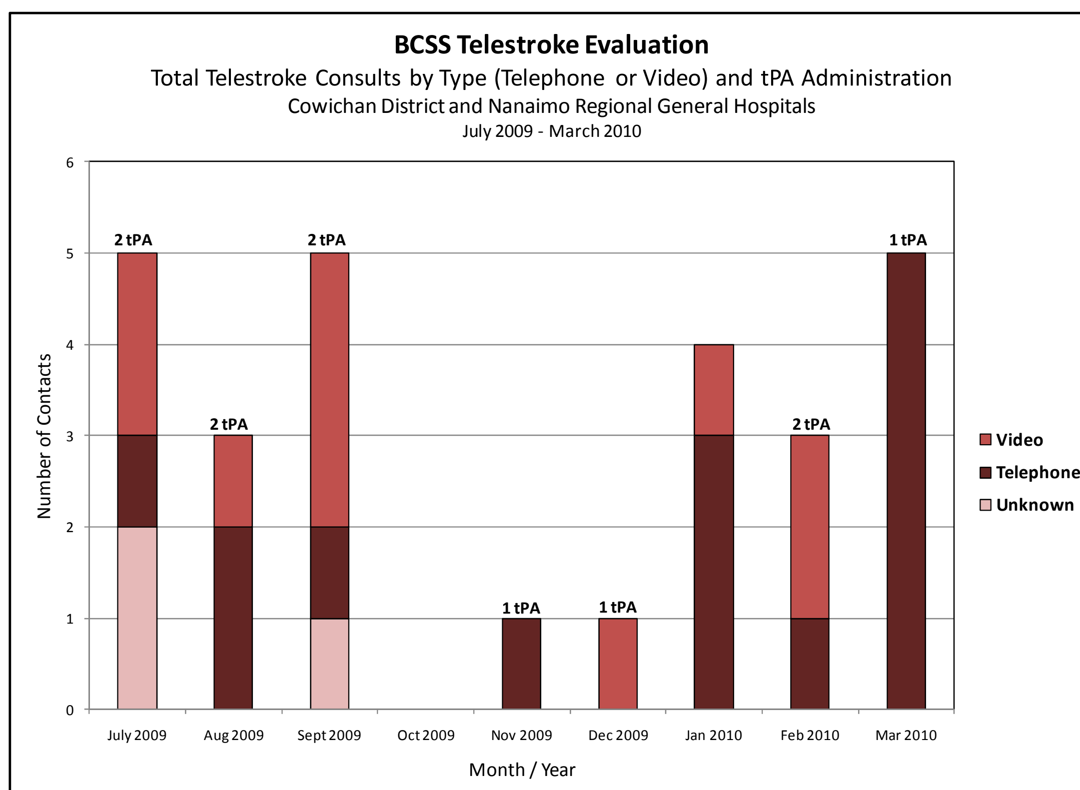
2.4 Evaluation Results

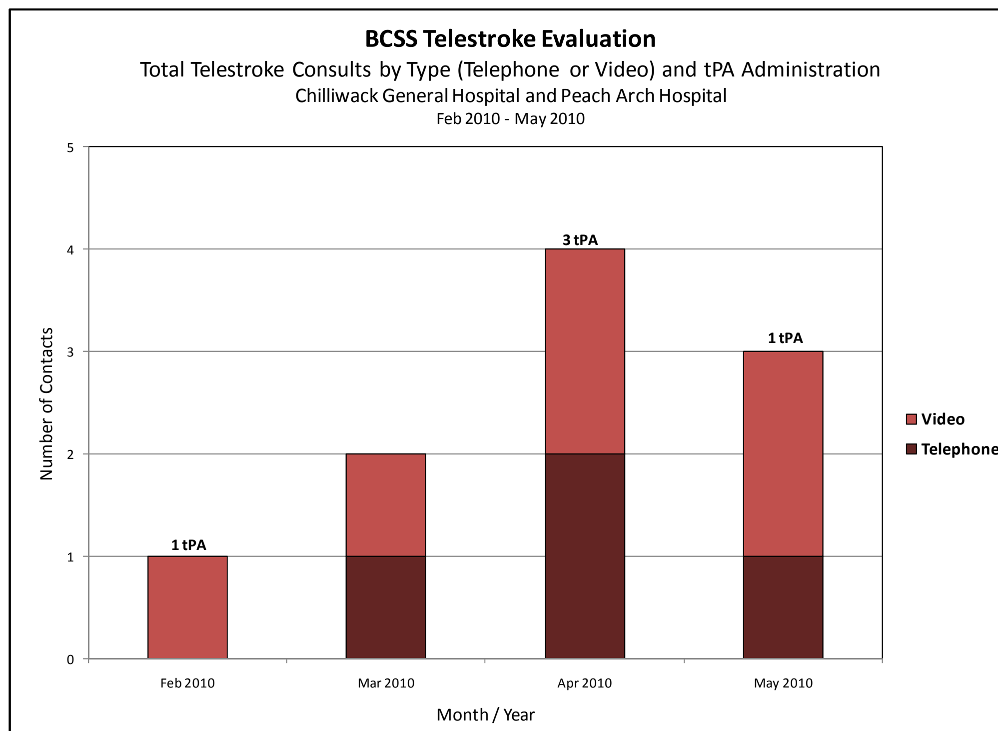
Quantitative

Volumes

A total of 37 contacts were recorded – 27 for the Vancouver Island Program and 10 for the Lower Mainland Program. During these 37 contacts, the video equipment was used 16 times, while the telephone was used 18 times (with 3 sessions not recorded).

tPA was given to 16 patients: 11 times in the 9-month period of the Vancouver Island Program and 5 times in the 4-month period of the Lower Mainland Program (see the following figures). The video equipment was used 63% of the time when tPA was actually given (10/16).





The number of times that tPA was given was in line with expectations. Pre-implementation planning based on admissions in each (referring site) hospital for acute ischemic stroke and estimates for the proportion of patients who would arrive at the hospital ED in a timely fashion ***and*** be eligible for tPA suggested that tPA would be utilized 12 times during a 9-month period for the Vancouver Island Program and 7 times during a 4-month period for the Lower Mainland Program, for a total of 19. Actual utilization of tPA was 11 (92% of expected volumes) and 5 (71% of expected volumes), respectively, for the two regions of the prototype initiative.

Use of Telestroke Videoconferencing Equipment

As noted, the telestroke video equipment was used a total of 16 times during the 37 contacts (43% of the time). Equipment problems were experienced three times (19% of video uses). The problems entailed an inability to view CT images, a delay in loading the CT images, and a 45-minute delay in video connection. It should be noted that the diagnostic imaging issues are independent of the video connectivity problems. Both Fraser and Vancouver Health were also piloting a new diagnostic imaging web solution in parallel to the testing of the telestroke system.

Time Frames for tPA Delivery

The two regional programs of the prototype initiative were asked to track the following four time-related events:

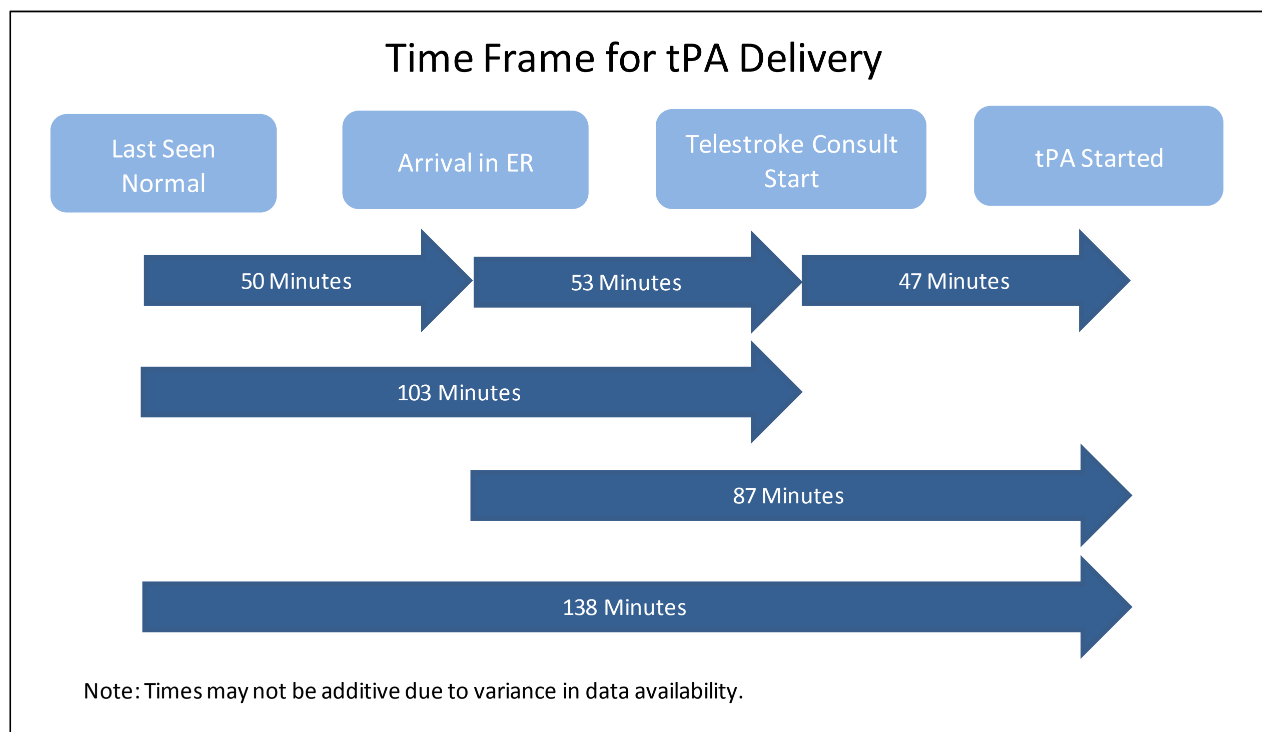
- Time that the patient was 'last seen normal'
- Time of the patient's 'arrival at ED'

- Time of the 'telestroke consult start'
- Time that 'tPA was given'

The collection of this time-related data was inconsistent for both Programs. Full information for the four time-related events was only available for 4 patients given tPA, while partial data was available for a further 5 patients. Based on these very limited data, the results suggest that tPA was given within the 3-hour time window.

- The average time from 'last seen normal' to 'arrival at ED' was 50 minutes (n=7)
- The average time from 'arrival at ED' to 'telestroke consult start' was 53 minutes (n=7)
- The average time from 'telestroke consult start' to 'tPA given' was 47 minutes (n=5)
- The average time from door (arrival at ER) to needle (tPA started) was 1 hour and 27 minutes (n=4), or 87 minutes.
- The average time from 'last seen normal' to 'tPA given' was 2 hours and 18 minutes (n=4), or 138 minutes.

The following figure provides a visual representation of the time frames for tPA delivery.



Physician/Patient Feedback

Physician feedback was available for 11 of the 37 (30%) contacts, while patient feedback was available for 9 of the 37 (24%) contacts. All 9 patients noted that their experience with the telestroke consultation was “satisfactory.”

One of the questions physicians were asked was whether “the telestroke consultation resulted in changes or additions to the patient’s management.” All 11 replies to this question were “yes.” Physicians were also asked to “rank the degree to which the telestroke consultation assisted in the medical management of this patient,” using a scale of 1(not at all) to 7(significantly). The mean score was 6.1 (range 4-7). Finally, physicians were asked: “In your opinion, how important was it that this patient receive a telestroke consultation?” The answer was again based on a scale of 1(not important) to 7(very important). The mean score was 6.2 (range 5 - 7).

Qualitative

Key Successes

- ✓ The telestroke prototype programs were implemented during a time of significant fiscal restraint
- ✓ Expected tPA volumes were achieved for both prototype programs
- ✓ The technical feasibility of an emergency, on-demand telehealth service was demonstrated in BC
- ✓ The original review of the elements involved in implementing a successful telestroke program indicated that new models and codes for the reimbursement of telestroke services should be developed. New MSP telestroke fee codes were developed and implemented in a timely fashion. BC’s telestroke fee codes are considered the best in Canada.
- ✓ Emergency department physicians expressed their appreciation for the enhanced Neurology “back-up”
- ✓ There was a positive response from all provider groups regarding the education/training provided
- ✓ There is a legacy set of documented processes, checklists, and tools from the prototypes which can be adapted for generic expansion of telestroke across the province

Challenges

- ➢ **Better understanding of site readiness**. This area of challenge encompasses a number of aspects. As outlined earlier, the use of tPA remains somewhat controversial, with the result that 40-50% of Emergency Room Physicians (ERPs) question the effectiveness/value of tPA. While the Cochrane review quoted above concluded that

"thrombolytic therapy appears to result in a significant net reduction in the proportion of patients dead or dependent in activities of daily living", the reviewers also noted the following outstanding questions:[35]

- How big is the overall benefit of providing tPA in reducing death and dependency for ischemic stroke patients?
- What is the latest time window in which the treatment is still beneficial?
- Which grades of stroke severity and which types of stroke, as judged clinically and on brain imaging, are more likely to respond favourably to treatment?
- Should patients aged over 80 years receive thrombolysis?
- Which types of patients are most likely to be harmed by, and which to benefit from, treatment (e.g., with or without other major medical conditions such as cardiac arrhythmias, diabetes, and hypertension, as well as concomitant medications)?

An important component to establishing site readiness involves understanding the views of the ERPs in the referring hospital with respect to the utilization of tPA.

A second issue associated with 'site readiness' noted by informants was the fact that the implementation of the telestroke program became a catalyst for the development of new order-sets (to better reflect best practices) and improved clinical algorithms (to support more efficient service delivery). Ideally, this type of change should take place within the context of a comprehensive service delivery model, rather than being forced within tight time frames by the implementation of a telestroke program.

- **Stakeholder involvement.** A number of the informants noted that all key stakeholders were not identified and involved from the outset of service implementation. Once all key informants are identified, communication between the various stakeholders should be formalized. Access to physician time for involvement with a telestroke program was also noted. A key issue here is reimbursement for the physician's time involvement in helping establish and manage a telestroke program.

- **ERP involvement.** ERPs noted a number of challenges. First, there was the introduction of a new procedure into an already busy ED, which at times took longer than originally planned. ERPs noted that they only have a limited amount of time available per emergency patient. Second, several ERPs noted the low volume of cases as an issue (e.g., there are more ERPs at NRGH than potential tPA patients in a given year), suggesting an ongoing level of unfamiliarity with the process. Finally, concerns about informed consent and legal liability were raised, particularly when the ERP questioned the effectiveness/value of tPA.

- **Neurologist involvement.** The ability of the Neurologist from the consulting site to link in remotely was raised as an issue if the Telestroke service is truly to be available 24/7. Home-based video access would enhance the willingness of the consulting Neurologist to take calls in the middle of the night.

- **On-demand referral management.** Concerns related to the use of bcbedline as a mechanism to connect with the consulting telestroke neurologists was raised by the referring sites within each of the prototypes. These concerns are related to the redundancy in process and the perceived delay in contacting the neurologist compared to the usual consultant access routes within established health authority based neurology or “hot stroke” on call programs. A provincial Telestroke model may require a central approach for contacting “on call” telestroke physicians, who may not be based in the same health authority as the referring site. Consequently, the bcbedline call access route, which is a provincial referral management service, was tested in the prototype.
- **Most Responsible Physician.** Identifying the patient’s ‘most responsible’ physician was raised as a key issue. In a telestroke consult there are often three key physicians involved, the ERP, the Neurologist on call, and the Intensivist on duty when the patient is transferred to the hospital’s Intensive Care Unit after receiving tPA.
- **Data collection.** The collection of a minimal set of data (see Appendix 4.1) was challenging both in the Vancouver Island and Lower Mainland prototype programs, with a substantial degree of missing or incomplete data received by the evaluator.

Lessons Learned

- A Telestroke Program should be developed within the context of a comprehensive and coordinated stroke strategy that includes designated stroke centres, pre-stroke intervention processes, ambulance re-direct policies, and adoption of standardized stroke protocols. The implementation of such a strategy is currently at various stages of completion. More complete implementation of the strategy would assist in addressing some of the key issues identified herein (e.g., ordering scans, patient priority in the ED, availability of video & IT support 24/7, deciding who will care for the patient after tPA is given, general facility with videoconferencing, etc.), and thereby facilitate the overall implementation of the Telestroke Program.
- Discussions with ERPs are required prior to fuller implementation, especially regarding their views and comfort levels on the utilization of tPA for ischemic stroke patients that arrive in their ED.
- All stakeholders at both the consulting and referring sites should be identified and included from the beginning of the process to ensure successful adoption and sustainability. Regular, formal face-to-face meetings or teleconferences should be convened as part of this process.
- The issue of reimbursement for physician involvement (both in the planning/administration of a telestroke program and while ‘on call’ for a provincial service) should be further addressed.
- Consideration should be given to ways to reduce the ERPs’ time involvement in the ED.

- A unified process for contacting the Neurologist on call that is acceptable to all parties should be identified and adopted.
- The importance of collecting a minimal amount of data needs to be reconfirmed and implemented in such a way as to reduce the proportion of missing/incomplete data.

3.0 CONCLUSION

While much has been learned in Phase 1, moving to a comprehensive provincial service will require significantly more commitment and resources from all telestroke stakeholders. This begins with fully understanding the scope of effort required to successfully implement a complex emergency telemedicine application such as telestroke.

Generating the momentum to move forward strongly in British Columbia depends on three principles and two pieces of evidence.

The compelling principles are as follows:

- Patients from all areas of the province deserve access to comprehensive and optimal stroke care
- An approach to meeting this priority that has demonstrated both effectiveness and efficiency in other jurisdictions should be supported by policymakers and funders
- The identified challenges to improving and expanding a telestroke initiative in British Columbia (see Lessons Learned in the preceding subsection) are not insurmountable

The compelling pieces of evidence are as follows:

- The first phase of telestroke implementation has been completed with good process results in terms of rates of timely tPA administration and strong measures of patient/provider satisfaction
- Consistent use of telestroke for all indicated patients in British Columbia (including timely and appropriate administration of tPA) promises to increase quality-adjusted life years for some stroke patients, with cost savings to the health care system over the long term

For these reasons, British Columbia should continue to be one of the leaders in telestroke implementation in Canada, contributing to a growing international reputation for being at the forefront of comprehensive stroke care.

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4.0 APPENDICES

4.1 Data Elements Collected

Evaluation of Telestroke:
Relevant Questions / Information Required

Process Evaluation

1. **Time of onset of signs and symptoms**

   Date ______________________ Time __________________

2. **Time of patient arrival at the Emergency Department**

   ____

3. **Time of the call to initiate telestroke videoconference**

   ____

4. **Were you (the neurologist) able to successfully connect and complete the consultation via videoconference to/with the referring site?**

   Yes No

5. **If no, why not?** (please identify the key reason(s))

   _______ Technical problems at referring site
   _______ Technical problems at consulting site
   _______ Network not operating
   _______ Lack of technical documentation/help desk at consulting and/or referral site
   _______ Other (please identify) ____
   ____

6. **Was tPA given to the patient?**

   Yes No

7. **If yes, time when tPA started**

   ____

8. **If no, why not?** (please identify the key reason(s))

   _______ Diagnosis other than stroke
   _______ Clinical contraindication(s)
   _______ tPA could not be administered within the 4.5 hour window
   _______ Other (please identify) ____
   ____

Provider Evaluation (To be completed by both the local physician and the consulting neurologist)

9. **Did the telestroke consultation result in changes or additions to the patient's management?**

   Yes No

   If yes, please explain ______________________________

   ____

   ____

10. **Please rank the degree to which the telestroke consultation assisted in the medical management of this patient:**

    Not at all 1 2 3 4 5 6 7 Significantly

11. **In your opinion, how important was it that this patient receive a telestroke consultation?**

    Not important 1 2 3 4 5 6 7 Very important

Patient Evaluation (Local physician to ask the patient)

12. **Was your experience with the telestroke consultation satisfactory?**

    Yes No

Other Comments

____

____

____

____

4.2 Consultations

Consultations were held with the following individuals/groups:

- Diane Layton, Manager, BC Stroke Strategy – February 2, 2010
- Helen Truran, Telestroke Clinical Coordinator, BC Stroke Strategy – February 2, 2010
- Dr. Allan Holmes, President of Global Medical Services – February 5, 2010
- John Rowlandson, Telestroke Coordinator, BC Stroke Strategy – February 10, 2010
- Attend feedback meeting with NRGH Emergency Physicians, Intensivists and Neurologists – Feb 11, 2010
- Dr. Wayne Shtybel (Medical Director and Department Head, Neurosciences Regional Program, Nanaimo General Regional Hospital) and Leighanne MacKenzie (Director, Neurosciences Regional Program, Nanaimo General Regional Hospital) – February 25, 2010
- Teleconference with Dr. Shtybel and Victoria Neurologists (Drs. Penn, Martin and Saly) – March 3, 2010
- Liz Santos – April 7, 2010
- Kevin Harrison, Regional Stroke Coordinator, Fraser Health Authority – April 7, 2010
- Bev Mitchel – April 8, 2010
- Norm Morrison – April 9, 2010
- Jill Henderson - Project Analyst, Centre for Telehealth, VIHA Information Management / Information Technology – April 9, 2010
- Madhu Sharma – April 12, 2010
- Teleconference with Dr. Tracey Stephenson, Emergency Physician, Cowichan District Hospital – April 23, 2010
- Presentation to the VIHA Telestroke Steering Committee – April 23, 2010

4.3 Key Components of a Successful Telestroke Program

There are two key components of a successful telestroke program that are consistently referred to in the literature. These are:

- **Local physician endorsement**

  In telemedicine adoption and diffusion, the physician may be considered a "gatekeeper." It is important that clinicians have an active role in telestroke implementation and that they have ownership of the service. Collaboration among the hub and spoke staff is also important in ensuring enthusiastic participation.

- **Education**
  - ✓ It is essential that ongoing stroke/telestroke education is provided for physicians in both the hub and spoke sites. Due to high employee turnover in emergency departments, it is important to give refresher courses and orientation for new staff in order to maintain competencies with telestroke technology.
  - ✓ Another facet to the education theme is the need to increase public awareness of stroke symptoms and pre-hospital stroke care; this is an essential component of strategies for increasing the proportion of patients receiving thrombolytic therapy.

The following is a summary of recommendations for the implementation of telestroke outlined in a policy statement from the American Heart Association (except where otherwise referenced).[36] Schwamm et al. surveyed U.S. and European telestroke projects; for components of the stroke care system with sufficient evidence, recommendations were presented. They are categorized below as Organizational, Technical, and Educational.

- ***Organizational***
  - ✓ Telestroke systems should be implemented within the context of a stroke system of care framework. This includes stroke units, the use of standardized, evidence-based stroke management, and the collection of national stroke quality measures.
  - ✓ Develop standardized routines to support collaboration and communication between the hub and spoke (or satellite) hospitals. These may include committees and protocols related to responsibilities and roles in problem-solving and improvement.[37]
  - ✓ When developing a hub-and-spoke telestroke network, key stakeholders should be included from the beginning of the process to ensure successful adoption and sustainability. This would include multi-disciplinary representation from physicians, nurses, neurology, radiology, administration, and information technology at both the hub and spoke sites. For larger-scale networks, additional stakeholders may include stroke task force or advisory panel members, legislative staff, and Ministry of Health officials.
  - ✓ Spoke hospital physicians and nurses should play active roles in the implementation of the program at the hospital.

- ✓ New models and codes for reimbursement of telestroke services should be developed.

- ➢ ***Technical***
  - ✓ Provide a standard implementation package for new satellite hospitals[38]
  - ✓ Equipment should be used or tested at least monthly
  - ✓ Ensure that sufficient hospital technical staff is available 24/7[39]
  - ✓ Technology providers should adhere to widely accepted industry standards. This will aid in promoting interoperability of systems across institutions.
  - ✓ Technology should include easy-to-use standard features, such as:
    - Camera at the spoke facility, permitting independent operation by the telestroke consultant
    - Audio transmissions involving algorithms for reduction of echo and distortion
    - Mechanisms for documenting circumstances of inadequate technical quality, and protocols for addressing these situations
  - ✓ Ease of use of the technology is vital to a telestroke program's success. Often, successful telestroke programs have more sophisticated technology at the hub sites and lower-cost, user-friendly systems at the spoke sites.

- ➢ ***Educational***
  - ✓ Continuous quality improvement activities for telestroke should include assessment of adoption and use of the technology, rates of technical and human failures related to the system, and need for training and maintaining competency. The results of assessments should be shared across the network.
  - ✓ Evaluation of the telestroke system is necessary to ensure the effectiveness of the program is being measured; aspects of evaluation should include feasibility, clinical effectiveness, user satisfaction, and cost-effectiveness.[40]
  - ✓ Collaboration between hub and spoke health care providers is essential for a successful telestroke program; this may include ongoing professional and educational interactions.
  - ✓ Especially important is the collaboration between emergency medicine and neurology practitioners.[41]
  - ✓ Training of end users and physicians should occur at regularly scheduled intervals. Standard training packages should be provided to staff at the implementation stage and subsequently.[42]
  - ✓ Provide community education about clinical warning signs and symptoms, treatment availability, and the window of opportunity for treatment.

5.0 ENDNOTES

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