

BC Stroke Strategy Provincial Stroke Action Plan

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BC Stroke Strategy Provincial Stroke Action Plan

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Key messages/products of various working groups of the BC Stroke Strategy have been incorporated into this Provincial Plan. These groups include the following:

- The ACVS Clinical Consensus / Expert Group
- The ACVS Advisory Group
- The joint MoHS / BCSS Measurement & Evaluation Working Group
- The Rehabilitation and Reintegration Expert Advisory Group
- The TIA Rapid Assessment Advisory Group
- The Telestroke Advisory Group

In addition to individuals actively serving on BCSS Working Groups, numerous clinicians and operations managers at site levels have been involved in the identification of gaps in care and in strategizing on possible approaches/strategies to address these gaps. The input from these multiple sources is reflected in this Provincial Plan and detailed in the Regional Site Work Plans included in the Appendices. We would like to thank all those persons and organizations that contributed to this collaborative planning work.

Requests regarding access to Regional Appendices or to other documents referenced in this Provincial Stroke Action Plan should be directed to:

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Acknowledgements & Contributions

At the request of both the Ministry of Health Services and the Health Authorities, the Heart and Stroke Foundation of BC & Yukon has lead the BC Stroke Strategy Initiative (BCSS) over the last five years, working in partnership with agencies and organizations representing those involved in stroke prevention and treatment and advancing the planning and prototyping phases for a number of priority areas, some of which are incorporated in this provincial plan.

The BC Stroke Strategy would like to acknowledge all the organizations and individuals who contributed to this work. Key contributors involved in the development or review of the Stroke Action Plan include but are not limited to the following:

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Executive Summary

Purpose and Scope

The Provincial Stroke Action Plan (the Plan) is a key component of the broader BC Stroke Strategy (BCSS) which has been led by the Heart and Stroke Foundation of BC & Yukon over the last five years at the request of both the Ministry of Health Services and the Health Authorities. The Heart and Stroke Foundation has worked in partnership with agencies and organizations involved in stroke prevention and treatment and together, they have advanced the planning and prototyping phases for a number of priority areas. The Plan is a result of a cumulative and collaborative effort with a number of clinical experts and health authority personnel and identifies gaps in care and strategic directions for improving stroke care in BC. It summarizes expected financial and population health benefits of optimal stroke care and identifies the priority areas for immediate investment to achieve systematic, coordinated improvements in the operation and clinical organization of stroke care in BC at provincial, regional and site levels.

Background and Gaps in Care

Stroke is a leading cause of acquired long-term disability in adults in British Columbia. In 2008/09, there were 4,526 patients in the province who experienced an incident stroke that was severe enough to require hospitalization. Of these patients, 36% died within a year following their stroke, making stroke the third leading cause of death in the province. The majority of stroke victims who survive their attack remain affected by neurological disabilities over the long term and this fact underlies the important economic burden of stroke.

Stroke is a highly preventable and treatable disease with the interventions currently available. However, within British Columbia, stroke prevention and care is not well organized resulting in decreased quality of life for stroke survivors and significant costs to the health care system. There are a number of gaps identified for stroke care in BC including:

- There is no provincially-organized pre-hospital system for stroke assessment/care to ensure patients are transported in a timely fashion to the appropriate facilities for optimal stroke care;
- There is less than 50% of needed capacity to access TIA rapid assessment services and only 20% of patients are seen within the 48 hours needed to significantly reduce their risk of having a subsequent full blown stroke;
- Only 4% of hospitalized ischemic stroke patients receive the clot-busting tPA drug which has been shown to reduce the impact of stroke;
- Only 26% of beds (in five BC hospitals) occupied by stroke patients are clustered (co-horted) in a designated geographic area within an acute care facility for improved coordination and quality of care;
- Early acute rehabilitation resources and protocols are under-developed and inconsistently implemented across the province;
- There is a shortage of neurologists and internal medicine specialists willing to provide stroke care and work in a coordinated “on- call pool;” and
- There are limited resources to provide coordinated and consistent stroke education to nurses and allied health professionals working in acute care centers across BC.

The Plan

Key areas of priority focus include:

- Confirming hospital/facility functional capacity and role designation with respect to stroke care capacity across the province;
- Ensuring timely assessment of patient needs and expedited transport to the most appropriate facility through a coordinated pre-hospital assessment and triage system;
- Providing rapid assessment for all TIAs occurring in the province through a variety of models;
- Embedding integrated stroke care (order sets, care pathways, repatriation agreements and co-ordinated beds) into the clinical operations of BC facilities/hospitals;
- Developing provincial telestroke, and in the future tele-rehab and tele-TIA networks, to enable and support best practices in stroke care across the province;
- Enhancing and coordinating stroke rehabilitation and reintegration capacity within BC;
- Exploring opportunities to enhance capacity in stroke care for physicians, nurses and allied health professionals through structured education and knowledge transfer using elearning, webinars, mentoring and coaching and practice support programs for family physicians; and
- Establishing a system-wide network to oversee and support inter-health authority cooperation and coordination in implementing, monitoring, and sustaining stroke care improvements.

As a result of this planning process, there is consensus across health authorities that the priorities identified are the foundation to a systems approach for improvement in stroke care and that this is where BC must focus initial efforts/resources. Health Authority details are included in region-specific site plans attached as appendices to the Provincial Plan. Direction from the MoHS and HA executive levels is now required to finalize staging of work, confirm a manageable number of priority areas from which to incrementally build system-wide capacity and to develop implementation details and associated budgets.

Resource Investment Implications

The Plan sets out a three year time frame but recognizes that realistically the scope and nature of some of the improvements being proposed will require a substantially longer implementation and evaluation cycle. Consequently the Plan includes a seven year implementation horizon. It also recognizes that decisions will be required to invest in both one-time change management and ongoing operational changes that will be incurred with a system-wide commitment to provide optimal, evidence-based stroke care to British Columbians. Without an immediate resource investment the benefits of the demonstrated cost avoidance will not be realized and costs of providing sub-optimal care will continue to grow at an increasingly rapid rate.

It is anticipated that **change management investment** will be required at a minimum over the next three fiscal years to close the most significant gaps in the stroke care system. The anticipated provincial change management investments include:

- Secretariat support for the central oversight and operations management structure to centrally coordinate/facilitate implementation of the BCSS Provincial Stroke Action Plan and to ensure key stakeholders remain engaged;
- Facilitating the training of BCAS staff with respect to hot stroke and bypass protocols;
- Centrally coordinated activities to drive physician engagement and knowledge transfer;
- Coordination of the development and implementation of a provincial telestroke service; and

- Ongoing measurement and evaluation related to closing the care gaps through sustaining the provincial stroke registry tracking/ reporting system.

Regional resource investments are also essential for establishing change management stroke teams at the clinical interface. While the needs of individual Health Authorities will vary in terms of the skill sets/competencies required, for purposes of costing, the proposed functional composition of a change management regional stroke team should include:

- Project management and coordination to share best practices and processes amongst sites;
- Physician engagement, education and mentoring to increase the capacity of physicians skilled in stroke care;
- Clinical order sets and pathways to standardize and embed best practices;
- Clinical education and knowledge transfer to update and sustain best practice;
- Leadership in acute rehabilitation and community reintegration to improve current state; and
- Administration/logistics support to drive the projects forward.

The total anticipated investment to support change management over the three year period (provincial coordination and regional teams) is estimated at approximately \$13.4 million. Assumptions associated with this costing are detailed in Section Three of the Plan.

Regional resource investments anticipated for **implementing operational changes** at the front line include:

- Developing and sustaining the necessary capacity to ensure as many as possible high risk TIA patients receive care in a TIA Rapid Assessment Service within the requisite time window;
- Developing and sustaining a provincial Telestroke model which will support sites without access to stroke specialists and potentially support several other telehealth functions such as TIA assessment and tele-rehabilitation etc.
- Support the co-horting of inpatient stroke beds to ensure as many patients as possible receive care in a coordinated fashion; and
- Building a sustainable early home-supported discharge program.

Operational resources to move to optimal care in these areas will be incremental - some resources will be incurred in the first three years of implementing the Provincial Stroke Action Plan, while others will play out in subsequent years as foundational policy and practice changes are introduced or ramped up during the initial three years. Further, each health region is differentiated by the resources available in the health care setting and the clinical complexity of stroke patients it is able to manage. As a result, even though the Provincial Stroke Action Plan builds on a collaborative network model, each health region will have its own unique stroke care assets and its own set of challenges in providing the necessary components of optimal stroke care. Assuming an incremental ramping up of operational/ program activity, operational investments over the three year period are estimated at \$20 million.

In summary, over the three year period, change management and operational investments are estimated to total up to \$34 million. Ongoing operating investments will however benefit from system redesign and cost avoidance resulting from improvements in functional areas of stroke care.

Benefits and Potential Cost Avoidance of Optimal Stroke Care

Published evidence indicates that health and economic benefits of an adequately-resourced and system-wide approach to stroke care in British Columbia can result in:

- 80% reduction in the risk of a major stroke developing in those who present with a TIA or minor stroke;
- 9% reduction in admissions to residential care for those treated with the clot-busting drug tPA;
- A 20% reduction in acute care hospital days following stroke and a 5% reduction in admissions to residential care (stroke unit impact);
- A further 27% reduction in acute care hospital days following stroke and a 16% reduction in admissions to residential care for patients eligible for early home-supported discharge;
- In sum, approximately 37,000 fewer acute care days, 56,000 fewer residential care days with an estimated current annual direct care cost avoidance of approximately \$42 million. This \$42 million will increase to \$52 million by 2017/18 due to a 3% per year inflation adjustment; and
- Reductions in vascular dementia, cardiovascular disease, diabetes, and renal failure as spin-off benefits.

In summary, the estimated annual direct costs avoided associated with acute and residential care services, if optimal stroke care is implemented throughout the province, are substantial. Indirect costs avoided, however, are likely to be even more substantial. Not only would there be 250 fewer early deaths in the province each year, but optimal care is associated with about 3,300 life years saved. This represents both the early deaths avoided in stroke patients as well as the shorter life expectancy generally if an individual has a stroke. In addition, stroke is associated with significant disability and a reduced quality of life, primarily for the individual with the stroke but also for their caregiver(s).

Our BCSS analysis suggests that the intersection or breakeven point between resource investments and direct care costs avoided occurs in fiscal year 2014/15. Further, post 7 years, should see a steady state for both investment and costs avoided. The reduction in some investments (e.g. change management, telestroke implementation) will have largely already occurred by year 7. Other costs are linked to treatment volume so any increase in volume should lead to both increased costs and corresponding cost avoidance.

It should also be noted that in spite of the best efforts of BC stakeholders over the last three years, stroke care in BC lags behind Ontario and Alberta in many of the key areas. Ontario has recognized the full impact that stroke has on its health care system and implemented a comprehensive stroke strategy in June 2000 with a four-year investment of \$70 million followed by an annual investment of \$30 million. This has yielded significant improvements in stroke care and patient outcomes in Ontario. Similarly, the government of Alberta provided funding of \$44 million over a four-year period to enhance stroke care in that province. Priorities of the Ontario and Alberta stroke strategies are consistent with those proposed by BC and details of their strategies can be found on their websites. Several documents of particular note are the "Ontario Stroke Evaluation Report, April 2010" jointly sponsored by the Institute for Clinical Evaluation Sciences, the Canadian Stroke Network and the Ontario Stroke System. Alberta's "Provincial Stroke Strategy Pillar Recommendations" provides another informative resource on the significant gains made through these investments.

Measurement and Performance Monitoring

The joint BCSS/MoHS Measurement and Evaluation Working Group (MEWG) has identified five stroke-related performance indicators to be monitored on a regular basis. These measures are routinely tracked by the central Acute Cerebrovascular Syndrome (ACVS) Registry housed at the Ministry of Health. Performance targets have been identified for years 2009 – 2014. They are as follows:

- Increase the volume of TIA/non-hospitalized strokes processed in TIA Rapid Assessment Services by 50%;
- Increase the number of ischemic stroke patients appropriately receiving tPA to 10%;
- Reduce the age-standardized incidence rate of both ischemic and hemorrhagic stroke by 10% ;
- Reduce the proportion of patients who die in hospital or are discharged to long-term care after being admitted/discharged for ischemic stroke; and
- Reduce acute care days by 10% for admissions in which an ischemic stroke is the principal diagnosis.

Refer to Appendix A1 for a more complete listing of performance measures available through the Provincial ACVS Registry and to Appendix A3 for a listing of performance measures (mostly available through periodic chart audits and accreditation processes) linked to evidence-based best practices in clinical stroke care.

Requirements for an Oversight and Operations Management Structure

There is recognition by health system leadership that as the BC Stroke Strategy moves from planning and prototyping into implementation and operational stages of work, it is time to pass the provincial oversight role from the Heart and Stroke Foundation of BC and Yukon to a longer-term oversight and operations management structure within the health system. This is essential to drive any significant provincial and regional improvements in stroke care and to support change management activities.

Potential oversight and coordination roles and responsibilities for this provincial coordinating body include:

- Housing of Secretariat function to support the BC Stroke Strategy;
- Coordination of highly specialized health care services such as ACVS (acute cerebrovascular) stroke care and linkage with partners involved in the delivery of stroke services across the continuum of stroke care;
- Coordination of BC Ambulance Services in partnership with health authorities in order to facilitate expedited transport to appropriate centers for stroke care;
- Support and functional leadership for the Provincial Telestroke System in conjunction with system partners;
- Working with health authorities to prepare detailed budgets and implementation strategies for a manageable number of priority areas to incrementally build (year over year) towards optimal stroke care;
- Distribution of provincial stroke funds according to clearly defined deliverables outlined in agreements with health authorities;
- Fiduciary/Stewardship responsibility for provincial investments in BC Stroke Strategy initiatives;
- Monitoring and evaluating health authority performance against targets and service expectations;
- Working with health authorities to improve the data collection and reporting infrastructure/systems for monitoring of stroke incidence and prevalence and key indicators tracked as part of measurement of stroke system performance;
- Supporting a sustainable system of stroke surveillance for British Columbia, enhancing the data collection and reporting capabilities of the central stroke registry; and
- Ensuring alignment of the BC Stroke Strategy activities with other initiatives/system-wide commitments including provincial cardiac and renal services, the Canadian Stroke Network /Strategy, the MoHS Guidelines and Protocols Advisory Committee (GPAC), Tele-health BC, E-Health and the BC MoHS Clinical Care Management & Key Result Area (KRA) Processes etc.

Consultation with key stakeholders suggests that PHSA could provide the leadership and coordination of the BC Stroke Strategy and align the oversight role of stroke with other like programs such as cardiac and renal. However, discussions regarding PHSA's potential role are still ongoing and hence for the purpose of this document, the oversight body is referred to as the "Provincial Coordinating Body."

Moving Forward

Successful implementation of the Provincial Stroke Action Plan and its component parts requires the full support of the MoHS and HA Leadership to move toward optimal stroke care in the province. Specifically, the following support is required:

- A long-term commitment to the vision for improved stroke care across the care continuum as a foundation for the longer term strategy elements to achieve optimal clinical and financial gains.
- A decision regarding the proposed model for oversight and operations management of the BC Stroke Strategy (and this Plan) in the operating context of the health authority system. The new leadership/oversight organization taking over for the Heart and Stroke Foundation must take effect by the end of fiscal year 2010/11. Representatives from Heart and Stroke will continue to stay involved in their advocacy, patient support and health promotion role and can continue to provide historical continuity with the new structures by serving on the BCSS Steering Committee.
- A commitment to a system-wide approach to change management and improvement in stroke care through a collaborative/network model. This approach will minimize the duplication of effort, promote standardization, and facilitate the sharing of models that work and other lessons learned.
- Clearly establish the anticipated working relationship between the provincial structures providing operations oversight for Stroke Care and the Clinical Care Management/KRA processes (who also have an interest in improving stroke care at the front line). Clarification is required on respective roles, responsibilities, processes, deliverables and anticipated reporting of system performance.
- Utilize the Stroke Strategy Steering Committee structure to finalize priority areas for policy and system change in year 1 and prepare necessary documentation, detailed budgets, and implementation strategies.
- Explore criteria for accessing new funds available through “pay for performance” and “patient-focused funding.”
- Secure an approach to funding the change management and operations investment at both the provincial and regional levels and commence aligning provincial and health authority budgets with an agreed upon, manageable number of priority areas of focus.
- Adopt consistent, measureable performance targets for stroke care in letters of agreement/expectations of each Health Authority.

In conclusion, the \$7 million investment made by the Ministry of Health Services thus far in the BC Stroke Strategy, is indeed notable and has yielded some significant proof of concept models, a number of valuable stroke-related initiatives and products, and has developed strong and productive relationships across the health care system. The implementation of the Provincial Stroke Action Plan with adequate resourcing and the guidance and support of a provincial oversight and operations management structure, will lay the foundation from which health regions and partners can share information about their stroke services and develop common, coordinated, and cost-effective strategies to facilitate timely patient access to evidence-based stroke care in all communities across British Columbia.

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 - Incidence/Prevalence Statistics by HSDA and Region
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 - Role Designation/Functional Capacity
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- E Vancouver Island Health Authority**
 - Incidence/Prevalence Statistics by HSDA and Region
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Organization of the Document

Moving to optimal stroke care in BC is a complex and extensive undertaking. Given the scope and scale of issues to be addressed, coordination is required to share knowledge, expertise and lessons learned. The emphasis in this document is on key themes/change opportunities that are common to all health authorities and which consequently reflect provincial directions and priorities. These areas of focus are the foundation from which subsequent change can evolve. Region-specific issues are summarized in the appendices in the form of regional profiles/snapshots, site-specific work plans and summary tables of key themes and preliminary resourcing estimates. These appendices are extensive and are available on request.

- **Section 1** outlines the purpose of the document and provides a contextual background of the incidence and prevalence of stroke in the province in BC. This section also references the work of the BC Stroke Strategy and accomplishments to date.
- **Section 2** summarizes key findings and opportunities for improvement in stroke by stages of care on the stroke care continuum (i.e. secondary prevention, pre-hospital, emergency department, inpatient and acute inpatient rehabilitation care). For each level of care, subsections include a brief description of the current situation and gaps in care, benefits of optimal care, action required, resource investment implications and performance measures/targets.
- **Section 3** summarizes order of magnitude estimates for resource investment (both one-time change management investments and ongoing operating/ implementation investments for optimal stroke care) in moving the proposed change agenda forward over the next three to seven years. This section also presents a number of significant areas of cost avoidance/cost savings yielded from system redesign and resulting from the recommended system-wide improvements in functional areas of stroke care.
- **Section 4** outlines the proposed model for the oversight and operations management for the BC Stroke Strategy and identifies requirements of a new structure, features of the proposed model and suggested organizational roles and responsibilities.
- **Section 5** focuses on requirements for moving forward. It presents a summary of the priority areas of focus and a high level critical path for staging of work at both provincial and regional levels. This section concludes the document with critical success factors and requirements going forward.

1. Overview and Context

1.1 Purpose of Document

The purpose of this document is to provide the means to achieve key goals of the overall BC Stroke Strategy through systematic, coordinated improvements in the organization and practice of stroke care in BC at provincial, regional and site levels. Specifically, the Provincial Stroke Action Plan is intended to:

- Provide the rationale and strategic directions for improving stroke care in BC;
- Document the existing gaps in care in BC and the priority areas for future investment;
- Outline expected financial and population health benefits of optimal stroke care; and
- Present the proposed operational support structure (oversight and operations management) for the BC Stroke Strategy to transition from the current planning and prototyping stage of work, currently lead by the Heart and Stroke Foundation of BC & Yukon, to integration and alignment with the health service delivery and operations management regional structures in stroke care.

In 2003, the Heart and Stroke Foundation of Canada and the Canadian Stroke Network produced a national plan to reduce the burden of stroke on patients, their families and the medical system and urged each province to address gaps in care and to develop its own strategy. The Stroke Strategy in British Columbia (BC) has grown out of the national imperative. At the request of both the Ministry of Health and the Health Authorities, the Heart and Stroke Foundation of BC & Yukon has led the initiative over the last five years, working in partnership with all agencies and organizations representing those involved in stroke prevention and treatment and advancing the planning and prototyping phases for a number of priority areas.

The BC Stroke Strategy (BCSS) has recently been adopted as a provincially-endorsed quality improvement initiative to disseminate best evidence stroke practices in British Columbia. Government has positioned stroke management as a strategic focus area (Key Result Area – KRA) for the health system for the years 2010/11 to 2012/13.

1.2 Stroke in British Columbia – A Devastating and Chronic Disease

Stroke is the number one cause of acquired long-term disability in adults in British Columbia. In 2008/09, there were 4,526 patients in the province who experienced an incident stroke that was severe enough to require hospitalization. Of these patients, 1,610 (36%) died within a year following their stroke (ACVS Registry), making stroke the third leading cause of death in the province. While the majority of stroke victims survive their attack, most remain affected by neurological disabilities over the long term.

Stroke is the result of either a disruption in blood supply to the brain (ischemic stroke) or bleeding into the brain due to a ruptured blood vessel (hemorrhagic stroke). A transient ischemic attack (TIA) is a short-term reduction in the flow of blood to the brain. Most episodes last less than 10 minutes, but they can last as long as 24 hours. Most TIAs do not cause permanent brain damage, and the symptoms may only last a short time. However, a person who has experienced a TIA is at an increased risk of having another TIA or a severe stroke requiring hospitalization. The time period immediately following a TIA is therefore a critical point of intervention in terms of preventing stroke. Both stroke and TIA are included under the term acute cerebrovascular syndrome (ACVS).

Some key indicators of stroke care in BC are identified in the graphs (Figures 1 and 2) below.

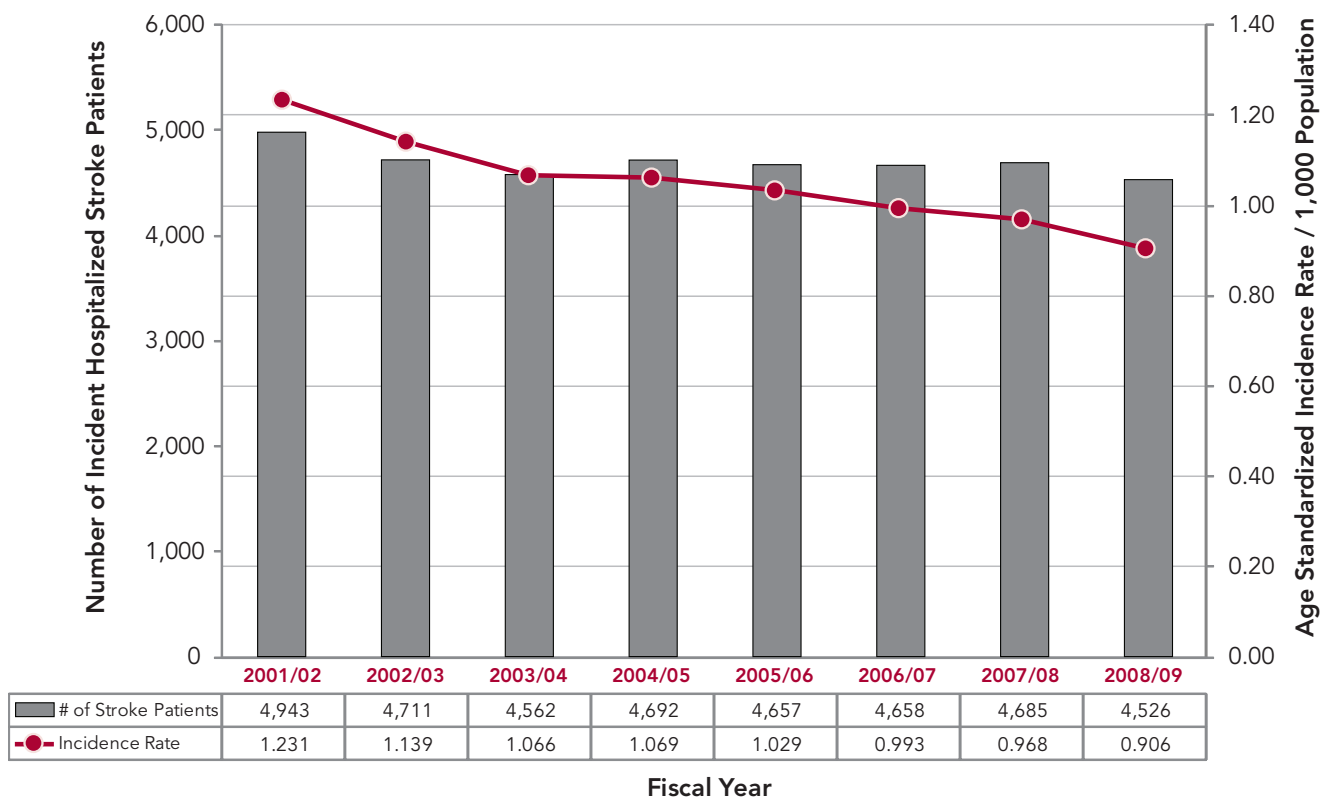
For additional metrics relating to stroke care in BC, refer to Appendix A1.

- Stroke is a leading cause of adult neurologic disability in Canada. Death within one year occurs in 36% of hospitalized incident stroke cases (ACVS Registry);
- In British Columbia, more than 4,500 people were diagnosed in 2008/09 with a first-ever stroke severe enough to be hospitalized; in that fiscal year, approximately 32,000 were living with the after-effects of their severe stroke (ACVS Registry);
- The direct health care costs associated with each individual living with stroke approach \$100,000 over their lifetime (BCSS, *Cost Avoidance Associated with Optimal Care*); and
- In British Columbia, over 6,000 individuals in 2008/09 were diagnosed with a TIA or a stroke that was not severe enough to require hospitalization but that placed them in a category of elevated risk for a severe stroke. Many of these patients did not receive preventative care (ACVS Registry).

FIGURE 1

Number of Incident (First Ever) Hospitalized Stroke Patients and Age-standardized Incidence Rate (Per 1,000 Population)

ACUTE CEREBROVASCULAR SYNDROME IN BC
2001/02 to 2008/09



(Source: ACVS Registry, 2010)

The substantial health and economic burden associated with stroke has led many jurisdictions around the world to prioritize initiatives to reduce the incidence of stroke and improve care for stroke patients. A review of the published literature by the Measurement & Evaluation Working Group indicates that the benefits of an adequately-resourced and system-wide approach to stroke care in the province can result in:

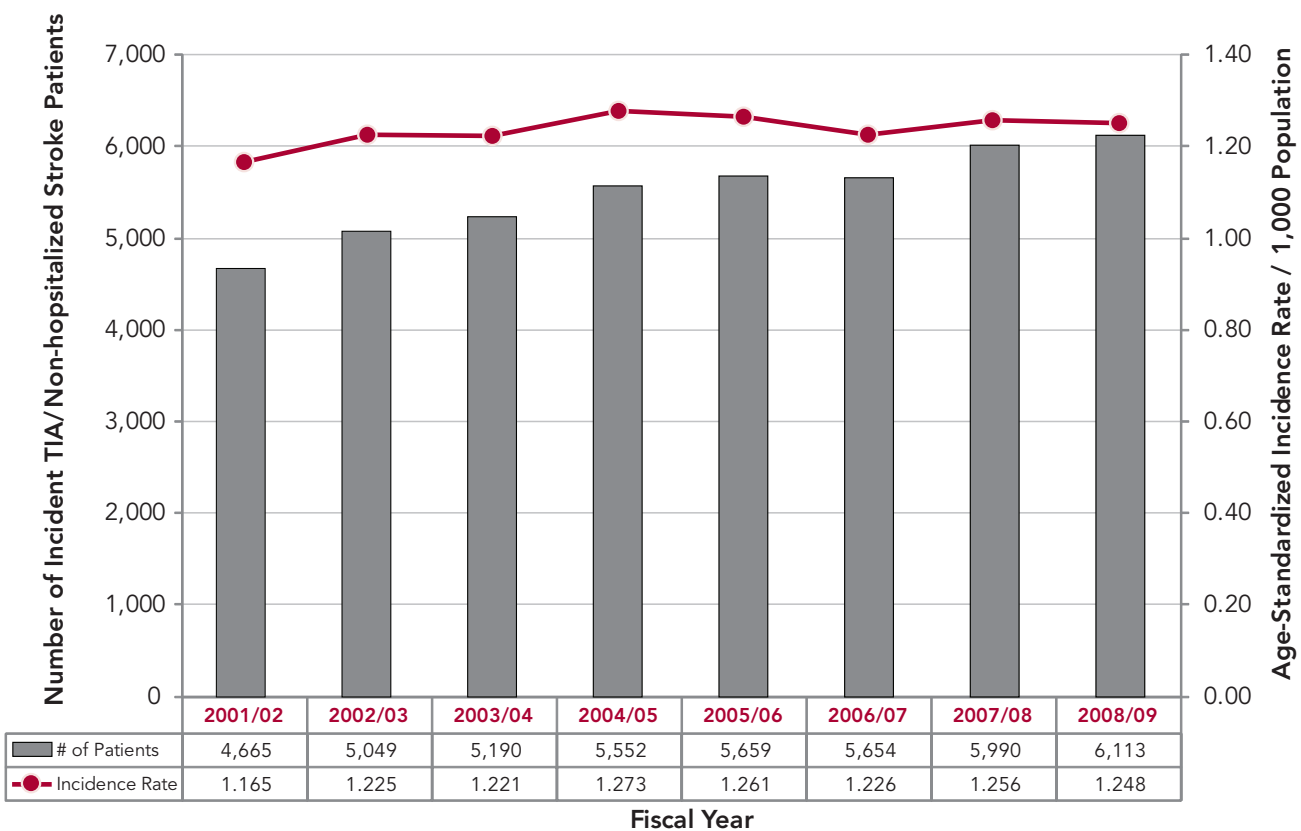
- An 80% reduction in the risk of a major stroke in those individuals who exhibit early warning signs through a TIA or minor stroke¹;
- An increase of 3.5 years in life expectancy while using \$3,800 less in health care resources per patient for eligible patients receiving tPA²;
- A 20% reduction in the average length of an acute care hospital stay for stroke patients³;
- A 20% reduction in the proportion of patients admitted to a long-term care facility following their stroke^{4,5}; and
- A reduction in related co-morbidities linked to stroke such as cardiovascular disease, diabetes, renal failure and dementia.

FIGURE 2

Number of Incident TIA/Non-Hospitalized Stroke Patients and Age-standardized Incidence Rate (Per 1,000 Population)

ACUTE CEREBROVASCULAR SYNDROME IN BC

2001/02 to 2008/09



(Source: ACVS Registry, 2010)

- 1 Rothwell PM, Giles MF, Chandratheva A et al. Effect of urgent treatment of transient ischaemic attack and minor stroke on early recurrent stroke (EXPRESS study): a prospective population-based sequential comparison. *Lancet*. 2007; 370(9596): 1432-42.
- 2 Sinclair SE, Frighetto L, Loewen PS et al. Cost-Utility analysis of tissue plasminogen activator therapy for acute ischaemic stroke: a Canadian healthcare perspective. *Pharmacoeconomics*. 2001; 19(9): 927-36.
- 3 Stroke Unit Trialists' Collaboration. Organised inpatient (stroke unit) care for stroke. *Cochrane Database of Systematic Reviews*. 2007.
- 4 Early Supported Discharge Trialists. Services for reducing duration of hospital care for stroke patients. *Cochrane Database of Systematic Reviews*. 2004.
- 5 Stroke Unit Trialists' Collaboration. Organised inpatient (stroke unit) care for stroke. *Cochrane Database of Systematic Reviews*. 2007.

These benefits are in fact achievable in BC's Health Authorities if stroke services are provided in a comprehensive and optimal fashion according to best evidence practice and through the foundational work achieved by the BC Stroke Strategy over the past three years. Key components include:

- Further embedding integrated stroke care in the clinical operations of all Health Authorities in BC;
- Agreement on a provincial approach to the necessary inter-health authority coordination to implement, monitor, and sustain improvements; and
- Adequate funding to support system and clinical change management.

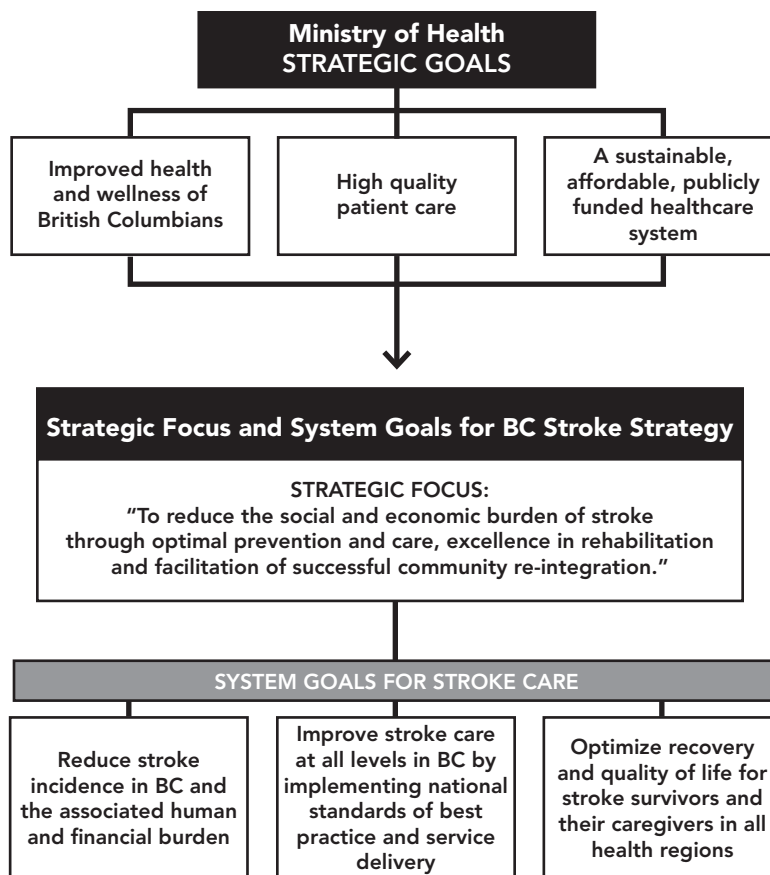
1.3 The BC Stroke Strategy

Closely aligned with and in support of overall strategic goals of the Ministry of Health Services, the long-term goals of the BC Stroke Strategy (BCSS) of improving stroke care across the province as seen below include:

- Reduce stroke incidence in British Columbia;
- Improve stroke care at all levels throughout BC by implementing national standards of best practice and service delivery;
- Optimize recovery and quality of life for stroke survivors and their care givers in all health regions; and
- Reduce the financial and clinical burden of stroke in BC.

FIGURE 3

Alignment of BC Stroke Strategy with MoHS Goals



Key principles of the BC Stroke Strategy include:

- **Comprehensive** – the strategy improves stroke services across the entire continuum of care.
- **Coordinated** – the strategy creates an integrated and coordinated system to prevent fragmentation and disparities in the delivery of programs and services to ensure cost-effectiveness and to maximize impact.
- **Evidence-based** – the strategy promotes the use of practices and care that are effective, supported by scientific evidence and considered the gold standard according to prevailing knowledge.
- **Province-wide** – the strategy ensures improvements in stroke programs and services benefit all British Columbians irrespective of their geographic location.

The last five years of work by the BC Stroke Strategy (BCSS), has focused on building a coalition of committed partners and a solid provincial foundation for systemic stroke care improvement. Between 2007 and the end of March 2011, the Heart and Stroke Foundation of BC & Yukon expects to receive \$7 million in grants from the BC government to advance a number of priority areas. This funding has been used to advance the stroke strategy on a number of fronts.

At the July 2009 Leadership Council meeting, the CEOs and MoHS Leadership endorsed the continued work of the BC Stroke Strategy including the development of a 36-month stroke action plan to embed better stroke care in the health care delivery system of BC. At the meeting, it was agreed that the Health Authorities would work with the resources of the BCSS to prepare this plan and to address and prioritize initiatives to operationally reduce gaps in stroke care across the province. This document is the product of this partnership.

The following table outlines the key initiatives that have contributed to the BC Stroke Strategy and its component parts.

Key Components of Work for the BC Stroke Strategy

BC Stroke Strategy — Strategic Planning & Performance Measurement Components 2008-2010

	Content Description
Providing Optimal Stroke Acute/ Cerebrovascular Syndrome Care in BC, 2008	<ul style="list-style-type: none"> • Clinical Consensus Statement identifying criteria/requirements for optimal stroke care • Framework for designating individual facility/hospital roles in stroke care • Endorsement by Leading Clinicians (Neurologists, Emergency Physicians, Regional Stroke Leads)
Directional Policy and Implementation Document – December, 2009	<ul style="list-style-type: none"> • Strategic document to set the context and direction for implementation of a province- wide, coordinated clinical care management system to improve quality and costs of stroke care in BC • Requested by the Ministry of Health Services-Strategic Focus and Key Result Area 2010-2013
Cost avoidance modeling for Stroke in BC - Final model completed October, 2010	<ul style="list-style-type: none"> • Model to determine cost avoidance reductions to the BC health system if best evidence, optimal stroke care is introduced in an integrated approach • Joint development by Ministry of Health Services and Measurement and Evaluation Working Group, BCSS
Acute Cerebrovascular Chronic Disease (ACVS) Registry & Provincial Indicators to monitor population stroke trends and improvements, August 2010	<ul style="list-style-type: none"> • A registry to track incidence, prevalence, mortality, recurrence and conversion rates for stroke in BC • A nationally recognized repository and algorithm for identification and tracking of TIA, minor stroke and full stroke cases in BC overtime, linked to MSP and hospitalization data • 5 provincial indicators adopted by the BCSS and BC MoHS (Primary Care Charter) for tracking stroke care and trends in BC • Forms the data source for the Cost Avoidance Model and Planning Metrics for stroke • Algorithm Document and MOHS sign off currently in process
CEO Stroke Primer, July 2010	<ul style="list-style-type: none"> • High-level provincial document developed at the request of the Health Leadership Council (July 2009) to outline a summary of the gaps in stroke care and to identify benefits of system and practice change • Precursor to development of the three year Provincial Stroke Action Plan • Includes baseline ACVS Metrics for BC
Provincial Stroke Action Plan, October 2010 (current document)	<ul style="list-style-type: none"> • A 36-month implementation plan to embed better stroke care in the health care delivery system of BC • Collaboratively developed at regional and provincial levels with all Health Authorities • Provincial and regional priorities for change management activity and investment in stroke based on existing gaps in regional and provincial care • Preliminary cost estimates for implementing the Plan over the next seven years • Proposed oversight and operations management structure for long-term support and integration of BCSS into the health system of BC
Other BCSS Documents prepared to inform, support or evaluate components of the BC Stroke Strategy planning work.	<ul style="list-style-type: none"> • BCSS Rehabilitation and Reintegration Service Delivery Framework and Addendum - March 2010 • Evaluation of Telestroke Prototypes in BC - July 2010 • Evaluation of Rapid Assessment/TIA Prototypes in BC - November 2010 • Telestroke Phase 2 - Plan and Cost Estimates - June 2010 • Education/Training Needs Assessment for Nurses and Allied Health Professionals - August 2010
Other BCSS Work not directly linked to the development of the Provincial Stroke Action Plan but key elements of the broader Stroke Strategy	<ul style="list-style-type: none"> • TeleLearning Series • Implementation of Protocols and Guidelines in Emergency Departments (Clinical Practice Indicator Initiative) • Participation in National Chart Audit

2. Provincial Stroke Action Plan

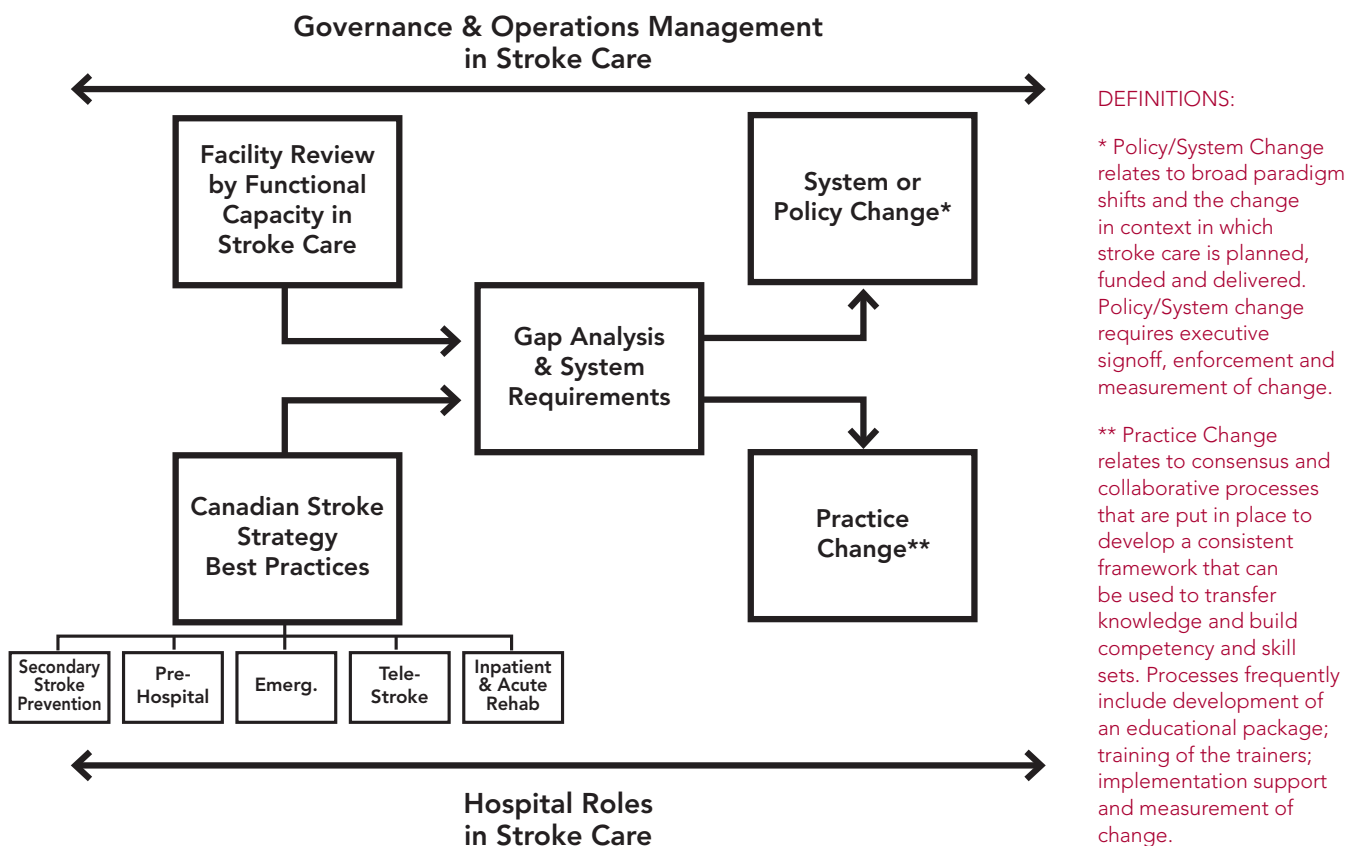
2.1 Purpose of the Plan

The purpose of the Provincial Stroke Action Plan is to ensure an ongoing, coordinated and integrated approach to building and managing stroke network capacity in the province and to:

- provide a provincial overview of functional capacity and gaps in acute stroke care;
- identify priorities for addressing the gaps, based on regional and province-wide input;
- recommend an approach to further organize provincial and regional efforts in order to achieve the needed benefits of system and practice change;
- identify preliminary resource investment requirements to strengthen stroke services and to build network relationships and required support systems; and
- identify the oversight and operations management structure required to facilitate decision-making in support of implementing the Plan.

FIGURE 4

Overview of Development of the Provincial Stroke Action Plan



2.2 Plan Development

The development of the BC Stroke Strategy and the associated Provincial Stroke Action Plan have been a result of a cumulative and collaborative effort over the last five years that has included the identification of needs and a current state assessment, has identified gaps in care relative to published best practices, and has piloted and evaluated various models/approaches to address some of these gaps in care.

There have been multiple sources of analysis and input to the development of the recent planning activity at the provincial, regional and site levels. Some of these activities include:

- Review of provincial and region-specific stroke prevalence and incidence data (ACVS metrics – BCSS Measurement & Evaluation Working Group) from the recently improved Provincial Stroke Registry;
- The Clinical Consensus Statement prepared in 2008 by key clinical leaders in BC on a role designation framework for stroke management and requirements for providing optimal stroke care to patients at the right time and at the right place;
- Identification of functional capacity/ role in stroke care for each acute care organization classified in one of four categories (comprehensive, regional, primary or non-tPA enabled sites);
- Review of clinical performance in secondary prevention, pre-hospital, emergency, inpatient and acute rehabilitation stages of care relative to best practices and evidence-based protocols/standards. This analysis has been partially supported through participation in a national stroke audit (chart reviews) and through health authority identification of gaps in current processes/procedures;
- Review of 2006 CPIP (Current Practice Indicator Project data) that outlines emergency department status and gaps in care. Additional information will be available in the forthcoming findings/analysis of the national stroke audit data collection (chart reviews of stroke patients);
- Review of lessons learned from the telestroke prototypes with four referring and two consulting sites;
- Piloting and evaluation of various models of expediting TIA rapid assessment/treatment in BC;
- Survey/needs assessment of education/training requirements for nurses and allied health professionals working with stroke patients;
- Preparation of Site Work Plans to address gaps in care and including a number of technical, human resource and process criteria relative to the current (or anticipated) facility role in stroke care;
- Development of a Service Delivery Framework for Stroke Rehabilitation and Re-integration. The framework sets out a clinical consensus document defining patient flow algorithms and the necessary standards of care for rehabilitation and reintegration of stroke survivors in BC; and
- Review of Key Result Area (KRA) documents prepared by each Health Authority and submitted to the MoHS. (note: it will be important, on an ongoing basis, to ensure alignment of these parallel processes and to confirm consistency of these regional KRA documents with the overall BC Stroke Strategy as both processes continue to evolve and take shape).

In summary, integration of the Provincial Stroke Action Plan into the strategic and operational mandate of the BC health care system is essential to achieve significant population and cost avoidance gains. The collaborative planning model will provide an opportunity to use consistent tools to lay the foundation from which health regions and partners can share information about their stroke services and develop common strategies to facilitate access to evidence-based care for optimal practice. The planning activities will need to continue to be a flexible and fluid process, subject to environmental readiness, to emerging priorities and opportunities, and to funding/resource availability.

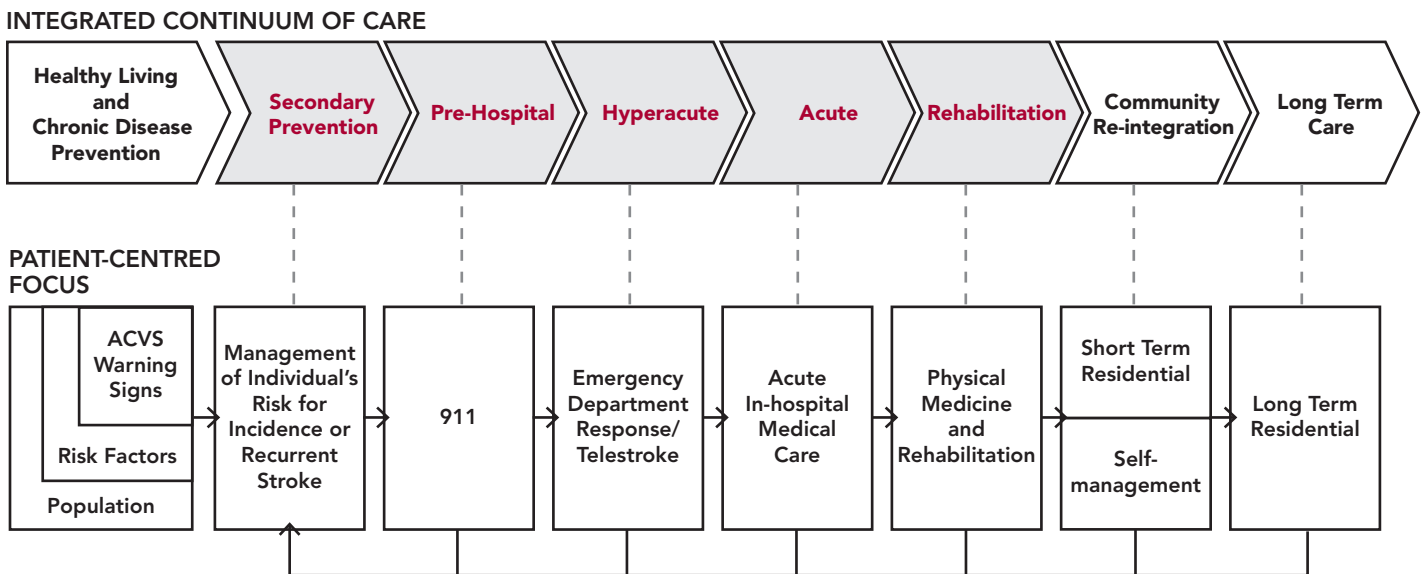
2.3 Continuum of Stroke Care

It is well recognized that any attempt to optimize stroke management and care should include a focus on the entire stroke care continuum using an integrated stroke strategy. This is defined as a strategy that closes the gap between evidence and practice by focusing on integration and coordination along the full continuum of care (prevention, treatment, rehabilitation, and community re-integration) with implementation of evidence-based best practice and an inter-disciplinary team approach. An integrated, coordinated commitment to the continuum of stroke care is fundamental to the BC Stroke Strategy as it moves from a planning and prototyping phase into operations and change management.

With this in mind, this document focuses on foundational elements of secondary prevention, pre-hospital care, emergency care and acute inpatient and rehabilitation care as priority levels of activity for a three-year improvement framework for stroke care. Emphasis on these aspects of the stroke continuum are considered the backbone of the strategy, as all long term improvements rely on effective prevention and treatment responses in the acute phase. These areas of focus are in the shaded areas in Figure 5.

FIGURE 5

Continuum of Stroke Care and Foundational Elements for the Provincial Stroke Action Plan



2.4 Components of the Plan and Common Themes

This section summarizes key findings and shared opportunities for improvement in stroke by stage and level of care along the foundational stages of the stroke care continuum. The stages of care shaded on the above continuum of care figure will be discussed in turn. For each stage of care, subsections include:

- a brief description of the current situation and gaps in care;
- benefits of optimal care;
- action required;
- resource investment implications; and
- performance measures/targets endorsed by the BCSS Measurement and Evaluation Working Group (MEWG).

Secondary Prevention – TIA (Transient Ischemic Attack) Rapid Assessment

Background

Stroke prevention occurs at a number of levels including population health, primary and secondary prevention. Health promotion encourages populations to adopt healthy lifestyles and take control of their health. Generally, all individuals who experience a stroke have at least one risk factor. The most significant long-term impact from enhancements in stroke care and prevention will come from strategies aimed at reducing stroke incidence. While prevention strategies are focused on otherwise healthy people with modifiable risk factors, secondary prevention is a clinical approach targeted at preventing high risk individuals (TIA, post-stroke and other high risk) from having recurrent or more serious events.

If primary prevention fails in an individual, a key 'warning sign' of an impending stroke is a TIA. If rapid TIA follow up by a practitioner skilled in stroke care is accessible in a timely manner, then the risk of a patient proceeding to a complete stroke is decreased by 80%. In fact, the window for optimum benefit is within only 2 to 3 days of the patient experiencing a TIA. If, for example, warning signs are experienced on a Friday afternoon, responding on Monday morning may be too late. A coordinated approach involving patients, family, physicians, emergency departments and specialists in stroke care is required to make optimal use of TIA Rapid Assessment Services and prevent the onset of stroke.

Current Situation and Gaps in Care

- All health regions have a mandate for population health promotion and wellness. A variety of approaches are in place to promote health and prevent the development of risk factors for stroke.
- BCSS metrics indicate that over 6,000 individuals are diagnosed annually with a first-ever TIA or stroke that is not severe enough to require hospitalization (ACVS Registry). Many of these patients, however, do not have a clear follow-up plan once diagnosed.
- Initiatives of the Health Authorities and the BCSS have resulted in a doubling in access to TIA Rapid Assessment Services over the past two years. To provide coverage to the over 6,000 incident TIAs, however, requires at least a further doubling in clinic/service access.
- Another current gap is that just one out of every five visits in BC occurs within the optimal 48 hours of symptom onset. Optimal care requires that all potential TIA patients have access within 48-72 hours.

Benefits of Optimal Secondary Prevention Care

- Currently, approximately 215 (3.6%) of the 6,000 individuals diagnosed annually with a TIA experience a full stroke requiring hospitalization within one year. With timely access to a TIA Rapid Assessment Service, this could decrease to about 1.4% or approximately 80 individuals. (BCSS, *Cost Avoidance Associated with Optimal Stroke Care.*)
- Moving to optimal care in BC would mean that roughly 148 strokes could be avoided per year.
- These statistics represent a considerable reduction in burden; each stroke patient stays in hospital for an average of 26 days, 13% will require a subsequent hospitalization for a recurring stroke, and roughly 15% will be discharged to a residential care facility.

(Source: ACVS Registry)

Action Required

Policy/System Changes:

- Provide coordinated rapid assessment coverage for every TIA patient in the province (regardless of geographic location) through a variety of models including tele-TIA.

Practice Changes:

- Expand the hours of operation (as volumes/demand warrants) and sustain existing services; and
- Increase the proportion of patients seen within 48 - 72 hours to at least 80%.

Resource Investment Implications

- Embedding existing capacity established for TIA services;
- Reviewing high needs/high volume areas for potential expansion of the “clinic” model;
- Adapting the ER triage/“holding model” to less concentrated centers where access to neurologists is feasible; or
- Adapting Tele-TIA to improve access for rural and remote communities.

Performance Measure/Target from Central ACVS Registry (MEWG approved)

- Increase the volume of TIA/non-hospitalized strokes processed in TIA Rapid Assessment Services by 50% between 2009/10 and 2012/13.

Pre-hospital and Emergency Department Care

Background

Effective emergency response through optimal pre-hospital assessment and rapid transport to the most appropriate hospital is critical to improving stroke outcomes. Time is brain, and care processes within both the pre-hospital and emergency departments require sustained improvement efforts to achieve optimal care. If resources are not adequate to allow for pre-hospital paramedic training, ambulance protocols and stroke-tuned emergency departments to be established and maintained, then highly effective, brain-saving tPA (clot-busting therapy) will not be administered within the required 4.5 hour time window of stroke onset.

Further, in order to clearly identify the capacity each facility has or should have in the delivery of stroke care it is essential to adopt a stroke care hospital functional capacity and role designation system. Facility role designation for stroke care is especially important in large metropolitan areas with multiple hospitals offering different levels of service. Categorizing the hospitals aids in streamlining care and provides emergency medical services a framework for prioritizing stroke patients for transport to the most appropriate facility within tight time frames.

Building on population distribution, community needs, and the work of the Clinical Consensus Document of 2008, the functional capacity/role designation framework for facilities providing ACVS care in BC is outlined below. These designations form a cornerstone to the provincial strategy and regional plans. Many elements of the plan hinge around implementation of the functional capacity of these sites, as will be seen in subsequent sections of this document.

Comprehensive Stroke Center (e.g. Vancouver and Victoria General Hospitals) these sites serve as the key link for BC Bedline and referral destination from other hospitals for unique or highly skilled services. These sites have the expertise of subspecialty trained stroke neurologists, neuro-radiologists, neuro-interventionalists, sophisticated vascular and neurosurgery, stroke training and education.

Regional Stroke Center (e.g. Royal Inland, Prince George Regional Hospitals) these sites serve as a regional referral facility by accepting referral responsibilities from within their respective regions and participate in regional stroke care. All sites are CT and tPA-enabled 24/7 while working toward the goal of having neurologists on call 24/7.

Primary Stroke Center (e.g. Nanaimo, Peace Arch Hospitals) these sites provide CT, tPA and organized emergency care and may be a referral center for local community hospitals but not for the region. Sites may be telestroke supported and include sites which are CT equipped but not tPA enabled.

Non-tPA Enabled Center (e.g. Bulkley Valley, Creston) these sites do not provide CT or tPA care, but utilize rapid triage and hospital-to-hospital transfer protocols, if geographically possible and are knowledgeable about criteria for immediate transfer of tPA eligible stroke patients to a primary, regional or comprehensive stroke center.

It should be noted that these role designations reflect the current capacity for acute stroke care in each center but does not include the acute inpatient rehabilitation component. Additional work is required to assess current state and requirements to meet established industry standards of optimal rehab care in the acute and long-term care stages of the continuum. Preliminary discussions are underway as reflected in rehab facility descriptions attached in Appendix A2.

Current Situation and Gaps in EMS and Emergency Department Care

- The functional capacity and associated role designations of facilities/hospitals with respect to stroke care are not always clearly understood by the presenting public or supported by health service professionals working in the system.
- EMS bypass protocols and assessment protocols are inconsistently available across the province or partially applied within individual health regions.
- Some regions have specific stroke protocols while others use general guidelines.
- Agreements are required for cross-border movement (inter and intra HA movement) and repatriation of patients to home communities after specialized care is complete (hyperacute, acute, rehabilitation).
- Best estimates are that 5-10% of patients with a first-ever ischemic stroke would arrive in a timely fashion at an Emergency Department and be clinically eligible to receive tPA. In 2008/09, 4.27% of first-ever ischemic stroke patients received tPA in the province. This is an increase from 3.38% in 2006/07 and 3.50% in 2007/08
Source: ACVS Metrics, BCSS CEO Primer 2010
- In 2007, the BCSS supported the implementation of protocols and guidelines in the Emergency Departments and several years ago undertook the baseline audit referred to as the Current Practice Indicator Project (CPIP). The national stroke audit led by Dr. Patty Lindsay, is currently auditing a sample of both emergency and inpatient charts in BC and will measure the extent to which these guidelines have been embedded into emergency department practice, identifying areas where further work/effort is still required.

Benefits of Optimal Pre-Hospital and Emergency Care (Source: ACVS Metrics, BCSS CEO Primer 2010)

- Facilitating early arrival of the patient at the emergency department and ensuring a timely and accurate diagnosis are important ways to increase the use of tPA.
- For every 1,000 patients who receive tPA therapy, 110 fewer will be dependent following their stroke than if no tPA was given.
- On average, receiving tPA will reduce health care costs by approximately \$3,800 per patient over their lifetime.
- Eligible patients receiving tPA will have their life span increased by an average of 3.5 years.
- A key initiative for increasing the application of tPA therapy among eligible patients is the use of Telestroke; this technology provides access to specialists for facilities lacking the necessary stroke expertise to provide tPA therapy. The BCSS has piloted Telestroke programs in four hospitals in the Lower Mainland and Vancouver Island regions. A separate evaluation and report has been published on the lessons learned from the initial prototypes.

Action Required

Policy/System Change:

- Formal sign-off, endorsement and communication of health facility/hospital role designations in stroke care;
- Introduce standard bypass and transport protocols for the BC Ambulance Service (BCAS);
- Formalize repatriation agreements for cross-boundary and cross-border referrals (inter and intra health authority movement of patients); and
- Strengthen facility stroke “teams” in Emergency Departments with cross-training of personnel (or staff with enhanced knowledge in centers with smaller volumes with formal consultation links to comprehensive and regional stroke centers).

Practice Change:

- Develop and Introduce protocols for handling “walk-in” patients that do not arrive at the Emergency Department by ambulance;
- Develop and/or embed order sets and pathways into clinical practice through ongoing formal, standardized education programs;
- Increase telestroke-enabled acute care hospitals by implementing phased development of a sustainable province wide system of telestroke, in the context of improved stroke services; and
- Leverage telestroke for mentoring and support between sites.

Resource Investment Implications

It is assumed that the majority of these requirements can be supported by the Provincial Stroke Secretariat and the Regional Stroke teams proposed in Section 3 of the plan. Additional advisory support will be required from BCAS.

- Development and approval of bypass and repatriation protocols/guidelines;
- Training of BCAS personnel on the updated protocols;
- Embedding protocols into practice/change management; and
- Consolidation of staffing/cross training of personnel.

Performance Measures/Targets from Central Stroke Registry (MEWG approved)

- Increase the number of ischemic stroke patients appropriately receiving tPA to 10% between 2008/09 and 2013/14; and
- Reduce the age-standardized incidence rate of both ischemic and hemorrhagic stroke by 10% between 2008/09 and 2013/14.

Telestroke as an Enabler to Optimal Emergency Care

Background

The ability of emergency departments throughout the province to offer high-quality assessments and initial brain-saving treatments depends on having the right specialist staff using current standards of care and procedures in hub/regional centers and broader access to such resources through a telestroke network.

In developing this plan, it is recognized that not all individuals will need the same level of care and it is not feasible or desirable for all settings to have similar levels of service or expertise. In areas where components of optimal stroke care are not available, provisions need to be made to have patients transferred or linked via telestroke to services in other geographic locations, including other health regions.

Telestroke or tele-medicine for stroke care is a technology that has emerged within the past decade that allows audio and visual connections amongst health care providers and stroke patients. It is supported by transmission of CT or MRI images and is a key enabler in providing remote access to stroke expertise and guidance to physicians in the use of tPA therapy. Telestroke networks are established with a central stroke center or consulting site at the hub and multiple sites/hospitals (or referring sites) connected to it.

In British Columbia, an incremental step-wise telestroke model has been adopted with prototypes based on Vancouver Island (Nanaimo Regional and Cowichan District as referring sites and Victoria General as the consulting site) and in the Lower Mainland (Peace Arch and Chilliwack General Hospitals as referral sites and Vancouver General as the consulting site) testing various components of the model. The prototype experiences have informed service design, policy and procedures and have identified the service requirements for a provincial model.

Current Situation and Gaps in Care

This section broadly outlines current state and the service requirements to move to a provincial telestroke service. A detailed Phase Two Plan for Telestroke implementation has been separately developed from this document and is available to support next stage pre-implementation work.

- Administrative structure: the BCSS managed Phase 1 of prototyping telestroke from June 2008 – June 2010. This phase is now complete and new organizational provisions and resources are required to plan for and execute the provincial telestroke plan.
- Policy and process: policy and processes were developed for Phase 1. Further work is required to refine this work for a provincial model.
- Telestroke on-call agreement: VIHA and VCH neurologists currently operate within existing on-call agreements. In moving to a provincial model for telestroke, an appropriate administrative structure, appropriate compensation for on-call physicians, and a committed provincial pool of neurologists willing to take call will need to be negotiated and developed.
- Referral management: there is a provincial mechanism in place to support coordinated on-demand videoconference interaction. BC Bedline currently provides this service to the two prototypes, but current service level agreements, including service documentation, will need to be refined.
- On-demand videoconferencing connectivity between consulting sites and ACVS designated telestroke sites is in place for sites participating in prototype testing. In moving to a provincial model for telestroke the following will be required:
 - List of all referring and consulting sites;
 - Completion of Privacy Impact Assessments (PIAs) to support cross regional sharing of patient information specific to the telestroke consult; and
 - IM/IT Departments, eNG staff and SSO aware of service and have approval to support the functional requirements of a provincial service.

Telestroke as an Enabler to Optimal Emergency Care, cont'd

- On-demand access to Diagnostic Imaging (DI) for designated ACVS telestroke sites – DI solutions are in place for Phase 1 prototypes using BC Bedline's image express. For a provincial model to be effective, further discussion is required to move to one DI solution for the province.
- Alternative Points of Care: Home access for consultants providing service 24/7 was not achieved with the prototypes. Home and office access solutions will be required for a provincial model so that neurologists can be on-call from alternate points of care.
- Technical Support Services 24/7: For the prototype phase, a technical support solution was developed during regular business hours. Future provisions will need to be negotiated with appropriate technical support partners such as SSO (the Shared Services Organization).
- Data reporting and performance management: prototypes were evaluated and lessons learned are documented in a summary report (available on request). Moving forward, further discussion is required on data, sources, collection, monitoring, support and ongoing evaluation requirements.

Benefits of Telestroke Support

- A provincial telestroke service will contribute to a tPA-enabled health system with effective rapid assessment and management of stroke as part of the Provincial Stroke Strategy and ACVS care.
- In the prototype phase, administration of tPA met expected rates and improved clinical decision making/ case management.
- Service providers and clients expressed satisfaction with the service.

Action Required

There are a number of steps/ areas of focus that need to be addressed to support the effective use of provincial telestroke services:

- Confirm and communicate hospital/facility functional capacity and role designation in stroke care to a diverse set of stakeholder groups;
- Ensure pre-requisites for telestroke are in place (e.g. transport by-pass protocols, emergency department order sets, patient care pathways, etc.);
- Organize Neurology consultants in either regional pools or a provincial pool and formalize provisions for appropriate compensation for "on call" consultation;
- Facilitate and centrally support on-demand point-to-point videoconferencing connectivity between referring sites and consulting sites;
- Formalize clinical supports, education and mentoring relationships to support stroke care at all levels and in all settings (including the use of this technology in ambulatory and inpatient settings);
- Provide technical support to consulting stroke neurologists to seamlessly access CT imaging from designated sites across the province;
- Consider requirements for home and office access solutions so that neurologists can be on-call from alternate points of care; and
- Introduce a reliable data collection and performance monitoring system for provincial telestroke services.

Resource Investment Implications for Telestroke

During the next three to four fiscal years, the plan is to add up to five telestroke consulting sites and seventeen referral sites to the telestroke network. A detailed spreadsheet of the resource implications for telestroke implementation is available on request. Highlights are included in Section 3 of this document.

Implications for Tele-Rehab

Although the focus in this document is on telestroke to support “on demand” timely intervention for acute stroke, it should also be recognized that scheduled tele-medicine/tele-health would also be beneficial for tele-rehab. Despite the many improvements that have been made in the realm of acute stroke care, most stroke patients will experience functional deficits after stroke. Accessing stroke rehabilitation expertise can be difficult in rural areas. Tele-rehabilitation can bridge some of these gaps by providing rehabilitation assessment, treatment, education, training and support using telephone and videoconferencing across distances. It can be used not only for access to rehabilitation professionals, but also to access exercise classes and chronic disease management programs, and other services that are not available in the stroke rehabilitation client’s community.

Acute Inpatient Care – Patient Co-horting & Stroke Units

Background

The co-horting of stroke patients in a specific geographic area with dedicated beds and staff (and ideally an interdisciplinary team) has been demonstrated to lead to a dramatic reduction in both deaths in hospital and the length of time the patient stays in hospital. Co-horting of patients facilitates post hyperacute care (after 48 hours) and facilitates support for early rehabilitation team approaches to stroke care that enhance recovery outcomes and builds the necessary foundation and connections for long-term rehabilitation and community re-integration, as appropriate.

Current Situation and Gaps in Care

- In British Columbia, co-horted beds have been established at Vancouver General, Victoria General, Surrey Memorial, Royal Columbian and Campbell River hospitals. In 2008/09, these five hospitals treated 26.2% of the province’s inpatient stroke cases.

Benefits of Optimal Acute Inpatient Care

- On average, co-horting beds or accommodating patients in dedicated, interdisciplinary stroke units, results in the patient’s stay in hospital being decreased by 20%.
- Patients treated in designated stroke care beds are 20% less likely to die while in hospital or be discharged to institutional care than if they were cared for in a general medical unit.

Action Required

Policy/System Change:

- Introduce stroke units or geographically designated beds; and
- Leverage tele-health for mentoring and multi-disciplinary support between sites, particularly for sites that are challenged with the geographic distribution of available professionals.

Practice Change:

- Implement protocols and education for stroke care across all inpatient centers, not just stroke units;
- Strengthen inter-disciplinary stroke teams with enhanced knowledge of stroke care and a mandate to coordinate care;
- Enhance discharge protocols and early discharge planning to ensure smooth transitions and appropriate and timely access to service, integrating community support services where available; and
- Improve knowledge and linkages to community programs that support stroke survivor long-term rehabilitation and re-integration.

Performance Measures/Targets from Central ACVS Registry (MEWG approved)

- Reduce the proportion of patients who die in hospital or are sent to a long-term care facility after being admitted/discharged (principal diagnosis) for ischemic stroke. If only one composite measure is used to assess progress in stroke care, it would be this overall measure of death and dependency; and
- Reduce acute care days (this includes a combination of reduced admissions and reduced average length of stay) for admissions in which an ischemic stroke is the principal diagnosis by 10% between 2008/09 and 2013/14.

Resource Investment Implications

It is assumed that the majority of these requirements can be supported by the Provincial Stroke Secretariat and the Regional Stroke teams proposed in Section 3 of the Plan with some additional advisory support from operational/unit leads in each facility. In addition, there will be:

- Costs associated with setting up dedicated stroke units/co-horting of beds in geographic areas; and
- Introducing/training inter-disciplinary stroke teams (where feasible and appropriate).

Acute Inpatient Rehabilitation Care

Background

Services for rehabilitation and community re-integration consistently lag behind those for acute stroke and treatment and could be characterized as the “poor cousin” in stroke care. The recent improvements seen in other aspects of the continuum of care have not yet been matched by changes in the rehabilitation arena. Clearly, funding and planning resources are keys to bridging current gaps to coordinating the patient flow and care for increasing numbers of stroke patients requiring rehabilitation and supportive care. Timely and intensive access to rehabilitation professionals knowledgeable in stroke care is important for the stroke survivor, as most will experience some level of neurological impairment. Improved functional outcome is closely linked to how early the stroke survivor begins the rehabilitation process.

The BC Stroke Strategy has supported the development of a Service Delivery Framework for Stroke Rehabilitation and Reintegration in the province, which provides the clinical consensus foundation for optimal navigation of stroke survivors through stages of rehabilitation & community reintegration. The document has now been released by the BCSS and is currently available along with its Addendum on its website (www.bcstrokestrategy.ca). The framework is designed to orchestrate future allocation of stroke-related rehabilitation and reintegration resources in a continuous “sequence” of care for stroke survivors from the stroke event to living in the community post-stroke and its key components are organized as follows:

- stages of stroke care and associated rehabilitation and reintegration requirements;
- criteria for facility designations across BC's Health Regions organized to support levels and stages of stroke care;
- a continuous Service Provision Model for stroke care which maps decision-making and patient flow algorithms to support stroke survivors and their caregivers across the levels and stages of care; and
- recommended, evidence-based guidelines for best practice stroke rehabilitation and reintegration activity.

Early supported discharge from acute care for patients with a mild to moderate stroke can be a cost effective alternative for select rehabilitation patients, provided that appropriate community rehabilitation supports are available. Although there are no current community-based programs in BC, evidence in the literature suggests that during the life cycle of the current Provincial Stroke Action Plan, health authorities should work towards support and development of this transition and care model.

Current Situation and Gaps in Care

- Rehabilitation resources are scarce and are not well organized within regions for optimal access to post-stroke care. Limited rehabilitation personnel in rural and remote communities has resulted in gaps in basic rehab care for stroke patients not referred out to larger centers (e.g. swallowing screens, early mobilization, activities of daily living/cognitive testing, discharge planning, etc.).
- There does not appear to be a system/screening tools in consistent use to determine impairments and the minimum level of rehabilitation required to meet best practice standards.
- There are currently no (or limited) early discharge programs in BC (e.g. therapy, education support, follow-up instructions, primary care arrangements) and access to rehabilitation services is limited and sporadic, particularly in more isolated rural and remote communities.

Benefits of Optimal Inpatient Rehabilitation Care

- Reduction in the patient's stay in the acute care hospital by 27%.
- Reduction in the proportion of patients that go into residential care following discharge by 16%.
- Approximately a dozen home support visits are required on average, but the cost of these visits is more than offset by the savings in acute and long-term care costs.
- Reduction in the financial, emotional and physical burden on family and care givers.
- Early intervention frequently results in improved patient outcomes.

Action Required

Significant planning and service coordination within and between health authorities will be needed over the next several years to improve the flow and levels of rehabilitation support available to stroke survivors in BC.

Policy/System Change:

- Introduce and support a BC-wide, standardized system for screening to determine impairments and most appropriate level of rehabilitation and involve rehab staff earlier in the care pathway;
- Consider introduction of "rehab case navigators" to assist with navigation/case management;
- Build tele-rehabilitation service capacity to address gaps in stroke expertise in isolated and remote areas of the province; and
- Promote partnerships between health care providers and community/NGO agencies, such as the Stroke Recovery Association of BC, to facilitate supports for stroke survivors and their care givers and to expedite reintegration into community and activities of daily living.

Practice Change:

- Introduce cross-training of health professionals to ensure minimum requirements, especially in rural and remote areas of the province, for optimal patient care are addressed/met (e.g. swallowing screens, mobilization, activities of daily living etc.);
- Embed minimum requirements for acute rehabilitation care to meet best practice standards;
- Develop and/or implement rehabilitation plans to ensure early, intensive and coordinated interdisciplinary stroke rehab – recovering movement, daily activities and communication;
- Introduce rehab protocols and formal education, mentoring and tele-consultation relationships;
- Where appropriate rehabilitation services are not available locally, identify regional and provincial referral, repatriation and/or housing processes to support necessary post stroke rehabilitation care when indicated; and
- Invest in prototyping and evaluation of early supported discharge programs for appropriate stroke patients.

Resource Investment Requirements

- Alignment of clinical care pathways within the inter-professional team;
- Development and testing of new protocols/guidelines;
- Embedding protocols into practice/change management;
- Consolidation of staffing/cross training of personnel; and
- Support for early discharge programming/trials.

2.5 Building Capacity in Stroke Care in BC

Physicians

Key considerations that relate to all levels of care in the Provincial Stroke Action Plan are the need for enhanced capacity and coverage of physicians providing stroke care, and particularly for acute stroke care and coverage in secondary prevention clinics. Although experts agree that optimally patients should have ready access to a stroke neurologist regardless of their geographic location, this is not realistic given the current physician capacity challenges in BC. A provincial telestroke program would certainly assist in building capacity but a concerted effort is required by key stakeholders to ensure there would be a sufficient pool of physicians for a sustainable service model. The reality is that BC, like all provinces in Canada, has an ongoing shortage of qualified stroke neurologists and internal medicine specialists willing to provide stroke care. There are major although different recruitment and retention challenges for both tertiary care stroke centers, major urban hospitals, and for community hospitals. Some of the challenges of building physician stroke care capacity are outlined below.

Sub-specialty Stroke Neurologists at Tertiary Care Teaching Centers

Tertiary care hospitals with large stroke volumes, a high percentage of complex cases, regional or provincial mandates or expectations, and training/education demands, require subspecialty trained stroke neurologists.

- There is a very limited pool of new recruits for sub-specialty trained stroke neurologists in Canada – educational programs graduate only a handful of new stroke neurologists every year (perhaps 2-4/year), most of whom have pre-arranged job offers or commitments.
- There is intense competition for new graduates and they tend to gravitate to geographically desirable urban centers leaving all but a few large cities in BC under-serviced. Most specialty trained stroke neurologists gravitate to major stroke programs and hospitals with organized programs, academic support, protected time for research, and accommodations to reduce the burden of on-call work and high-stress activities.
- There is little or no opportunity for academic funding at the present time. BC is at significant risk of losing some of the current academic neurologists. The BC Stroke Program has lost stroke neurologists to both Alberta and Ontario, due in part to the salaries and support they receive that far exceed what is offered in BC.
- The current Alternate Payment (APP) contract grid for neurology is inadequate to recruit neurologists for acute hospital work. Moreover, an Alternate-Payment-Plan (APP) for stroke neurologists is exceptionally difficult to negotiate in the current fiscal climate.

Major Urban and Community Hospitals

Many hospitals across BC, including the lower mainland, have no neurologists on staff. Some on the other hand, have neurologists on staff but the number is inadequate and as a result cannot provide complete 24/7/365 coverage.

Although the recruitment issues are different for urban/ lower mainland hospitals than for community hospitals – both have major challenges.

- Hospitals must provide support and incentives to recruit and retain neurologists.
- The sub-specialty of stroke neurology has rapidly evolved resulting in many practicing neurologists choosing to focus on other areas of practice. “Cold” neurology (as opposed to “hot stroke”) is much less demanding than acute and on-call neurology and it is better compensated. It is more financially advantageous for a physician to do office-based neurology (e.g. multiple sclerosis, seizure management, movement disorders etc). Demanding on-call work is difficult and many try to avoid it.
- Urban and community hospitals should focus on recruiting well-trained general neurologists with competence and interest in vascular neurology and acute stroke management.

Unless these issues are addressed in the tertiary, major urban and community hospital settings, this shortage will continue despite sustained efforts at recruitment and retention. Provincial leadership and coordinated efforts will be necessary, as one-off solutions result in competition for scarce resources.

Requirements for Building Medical Capacity

Despite efforts in recruiting new stroke neurologists to the province, there is not sufficient medical human resource capacity from the training programs to supply the current need/demand for services. Due in part to the historical shortage of stroke neurologists in the province, a system has evolved whereby stroke and TIA patients in BC may be managed by several types of physicians, depending on their geographic location (including neurologists, internal medicine physicians, emergency physicians, physiatrists and family physicians). While these physicians certainly have an interest in managing stroke/TIA patients, standardized training and approach to management is needed.

In addition to Stroke Neurologists, Physiatrists who specialize in rehabilitation medicine, essential to stroke follow up, are limited in number and are usually located in urban or larger regional centers in BC. Recent efforts to obtain telephysiatry fee codes by the Physiatry Section of the BCMA may extend the reach of existing practitioners, in those health regions committed to support telerehabilitation developments over the next few years.

Further, to continue to build the capacity of physician expertise in stroke care, targeted planning efforts are required. Capacity must be built within the current physician pool in BC and a number of initiatives considered including a commitment to:

- Re-doubling the efforts to attract new graduates or practicing stroke neurologists to locate in BC. The VGH/ UBC neurology residency program is now the largest in the country. There are 28 residents in the program and graduate approximately five Canadians per year. All residents that graduate from the program are very capable in acute stroke care and would make excellent additions to any hospital. Every effort must be made to keep as many residents as possible in BC once they complete their training.
- Recruiting hospitals in BC have to court potential candidates early in their residency and consistently throughout their residencies and then provide adequate incentives at least for the first 2-3 years of practice to secure the relationship bond. St. Paul’s Hospital has been very effective with this approach and can be a model for others. Recruitment strategies and funding models need to be enhanced. Hospitals and regions have to provide incentives.
- Ensuring the Alternative Payment (APP) funding contracts for tertiary care/major teaching hospitals is competitive with Alberta and Ontario. Unfortunately, it is difficult for smaller hospitals to create a viable business case for APP funding.
- Developing a robust telestroke program has the potential to provide smaller hospitals with stroke expertise and back-up. This strategy has proven successful in Alberta, Ontario and in many other countries. The lessons

learned from the Ontario experience are that it is not possible to support multiple small telestroke networks. A telestroke network supported by a provincial pool of stroke neurologists would be a new service but would be a cost-effective way to provide sophisticated care to smaller hospitals and communities that are unlikely to be able to acquire the personnel or develop local expertise in acute stroke care.

- Providing the necessary incentives and support (including a structured educational program) to train or re-train neurologists and internal medicine physicians currently practicing in BC and who have an interest in stroke management to provide best practice stroke and TIA care is essential.
- Having the necessary incentives and support (including a Practice Support Program) for Primary Care Physicians in place to maximize awareness and patient education relating to primary and secondary prevention of stroke/TIA is required.
- Utilizing a pool of interested physicians with a specialization in stroke care in a provincial support and mentoring role through the use of various technologies including webinars, focus groups, E-learning, telestroke and tele-TIA would also contribute to building capacity.

In summary, concerted efforts to build a physician resource plan with input and consensus from key physicians, health authority and ministry representation is an essential step in addressing the current lack of stroke care capacity in BC.

Nursing and Allied Health

Addressing educational and training needs of nurses and allied health professionals is also an essential component to building capacity in stroke care within BC. The limited resources to provide coordinated and consistent stroke education to nurses and allied health professionals working in acute care centers across BC has been identified as one of the impediments to realizing the future priorities in stroke care.

An education needs assessment conducted from June to August 2010, involving key informant interviews and an electronic survey of 111 stroke educators and leaders from across BC, identified the following factors as the most significant barriers to stroke education and training:

- lack of time available for stroke education;
- other competing clinical learning priorities;
- lack of funding; and
- lack of time to develop training materials.

The following priority areas of focus are based on a review of the literature, experience from other Canadian provinces, and the results of the needs assessment survey:

- Develop and implement a comprehensive education strategy for stroke care that addresses the gaps in knowledge and information needs of nurses and allied health professionals involved in stroke service delivery.
- Prepare a comprehensive education plan that looks at the educational needs of all service providers (including physicians) involved in treatment and rehabilitation of patients in all stages of the stroke care continuum.
- Designate regional funding/create incentives for staff/physician participation in stroke education.
- Introduce a variety of on-line learning tools that are accessible and adaptable to individuals working in rural, remote and urban areas of the province. Such tools might include: communities of practice, E-learning, videoconferencing, webinars and other innovative solutions to reach more isolated rural and remote communities. (See Alberta Stroke Strategy educational materials).
- Introduce clinical nurse specialists, rehab experts and clinical educators to the proposed regional stroke teams to facilitate an integrated team approach to education, cross-training and knowledge transfer. Working closely

with the provincial stroke secretariat team, these individuals would provide leadership to the development and implementation of regional education plans.

- Convene annual provincial stroke conferences to create opportunities for networking, sharing and learning. An annual conference would create an opportunity to bring together stroke leaders, service providers and administrators from all over the province, to share best practices, lessons learned and emerging innovations and solutions. Some of this time could be structured for review of evidence-based education resources and tools.

In summary, experts agree that the way to build capacity is to focus education on knowledge transfer of best practice, link it to performance expectations and over time change attitudes and corresponding behavior. This will take time, resources and coordinated leadership.

3. Modeling Resource Investment to Move to Optimal Stroke Care

The Provincial Stroke Action Plan has focused on a three-year time frame but recognizes that realistically the scope and nature of changes being proposed will require a substantially longer implementation and evaluation cycle. It is recognized that decisions will be required to invest in both the one-time change management and ongoing operational costs that will be incurred with the provincial commitment to provide optimal stroke care to British Columbians. It is also anticipated that ongoing operating investments will benefit from system redesign and cost avoidance resulting from improvements in functional areas of stroke care.

The figures presented here are investment estimates incurred on a graduated/incremental basis over the three to seven year period as the various components of the strategy are implemented and become fully operational. There are a number of assumptions behind these figures that are outlined in the footnotes below each table. The identified resource investments are rough estimates only, to provide an initial order of magnitude costing and need to be significantly refined once the scope/priorities of the strategy and the associated budgets are further developed.

3.1 Change Management (Start-up) Investment

Moving forward to implement best practice and optimize stroke care across the province will require changes to the overall system and clinical practices with respect to the way stroke care and services are organized and delivered. These changes will require policy, procedural and process changes at the regional, Health Service Delivery Area (HSDA) and site levels. In order to maximize the benefits and create a coordinated and aligned system of care, each region will require dedicated resources to coordinate the change activity and to mentor and support stakeholders. In addition, resources will be required centrally to minimize duplication of effort, facilitate the sharing of knowledge and experience (lessons learned), provide trouble-shooting support and to facilitate the alignment of stroke services across perceived or real barriers (e.g. geographic, functional, economic and human resource boundaries).

Provincial investments are estimated for secretariat support for the central oversight and operations management structure and for support to Regional Stroke teams in implementing the Stroke Action Plans. Other provincial investments relate to the ongoing development and management of the provincial telestroke service, the stroke registry tracking/reporting of performance measures and the training of BCAS staff with respect to bypass protocols etc.

Regional investments are reflected in the proposed composition of a change management regional stroke team. The needs of individual health authorities will vary in terms of the skill sets/competencies required. However for purposes of costing, the proposed composition of a change management regional stroke team includes: project management and coordination, physician engagement and mentoring, clinical nurse specialists and clinical education, rehabilitation leadership and administrative/logistics support. It is assumed that the stroke team in each health authority will be involved with the provincial secretariat team in development/ documentation of policy and procedure, knowledge

transfer, change management and ongoing training/education and support for the various areas of focus. In addition, it is anticipated that consulting/contract dollars will be required to support regions that will not be in a position to hire or second personnel to take on these functions. Discretionary funds have also been incorporated to provide flexibility for health authorities (regional stroke teams) to respond to unique staffing circumstances in each region.

The following tables and footnotes detail the anticipated provincial and regional change management resources required to move to optimal stroke care.

TABLE 2

Change Management Resource Investment

IMPLEMENTING OPTIMAL STROKE CARE IN BRITISH COLUMBIA

Change Management Resources	FTE per Health Authority	Total FTE	Annual Salary (incl. 22% Benefits)	Year 1 (2011/12)	Year 2 (2012/13)	Year 3 (2013/14)	Year 4 (2014/15)	Year 5 (2015/16)	Year 6 (2016/17)	Year 7 (2017/18)	
Provincial											
Stroke Secretariat											
Director	(1)	1.00	\$129,930	\$129,930	\$100,371	\$68,921	\$70,989	\$73,119	\$75,312	\$77,572	
Project Manager	(2)	1.00	\$115,900	\$115,900	\$119,377	\$122,958	\$126,647	\$130,446	\$134,360	\$138,391	
Physician Leadership	(3)	0.40	\$266,721	\$106,688	\$109,889	\$113,186	\$116,581	\$120,079	\$123,681	\$127,392	
Administrative Support	(4)	1.00	\$60,317	\$60,317	\$62,126	\$63,990	\$65,910	\$67,887	\$69,924	\$72,021	
Subtotal - Stroke Secretariat				\$412,835	\$391,763	\$369,055	\$380,127	\$391,531	\$403,277	\$415,375	
Consulting Support	(5)			\$500,000	\$300,000	\$300,000	\$0	\$0	\$0	\$0	
Physician Engagement	(6)			\$150,000	\$250,000	\$300,000	\$0	\$0	\$0	\$0	
BCAS Training	(7)			\$250,000	\$250,000	\$0	\$0	\$0	\$0	\$0	
IT Support & Measurement	(8)			\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	\$200,000	
Subtotal - Provincial				\$1,512,835	\$1,391,763	\$1,169,055	\$580,127	\$591,531	\$603,277	\$615,375	
Regional											
Stroke Lead/Project Manager	(9)	1.00	5.00	\$115,900	\$579,500	\$596,885	\$614,792	\$633,235	\$652,232	\$503,849	\$345,977
Regional Rehab Co-ordinator	(10)	1.00	5.00	\$88,440	\$442,201	\$455,467	\$469,131	\$483,205	\$497,701	\$512,632	\$528,011
Clinical Nurse Specialist	(11)	0.50	2.50	\$108,512	\$271,279	\$279,418	\$287,800	\$296,434	\$305,327	\$314,487	\$323,922
Clinical Educator	(12)	1.00	5.00	\$108,512	\$542,558	\$558,835	\$575,600	\$444,651	\$305,327	\$314,487	\$323,922
Administrative Support	(13)	0.50	2.50	\$60,317	\$150,792	\$155,316	\$159,975	\$164,774	\$169,718	\$174,809	\$180,054
Physician Leadership	(14)	0.25	1.25	\$266,721	\$333,401	\$343,403	\$353,705	\$364,317	\$375,246	\$386,503	\$398,099
Ancillary Costs	(15)			\$106,250	\$109,438	\$112,721	\$116,102	\$119,585	\$123,173	\$126,868	
Travel Costs	(16)			\$106,250	\$109,438	\$112,721	\$116,102	\$119,585	\$123,173	\$126,868	
Discretionary Funding	(17)			\$500,000	\$500,000	\$500,000	\$0	\$0	\$0	\$0	
Subtotal - Regional				\$3,032,232	\$3,108,199	\$3,186,445	\$2,618,821	\$2,544,722	\$2,453,114	\$2,353,719	
Total Change Management Resources				\$4,545,067	\$4,499,962	\$4,355,500	\$3,198,948	\$3,136,253	\$3,056,391	\$2,969,095	

NOTES:

The preferred composition of stroke teams will vary by Health Authority based on regional and local needs. The positions identified and costed here are to give a general guide as to the type and level of competencies/skill sets required to support the change agenda. Staff cost estimates include salaries and 22% benefits and are inflated by 3% per year.

Notes for Provincial Change Management Resource Staffing

- Senior level position that would lead the charge in promoting and sustaining/securing funding for the directions of the Provincial Stroke Strategy and link with executives at the MoHS, HAs, NGOs, Physicians etc. This position would be full-time in the first year, three-quarters time in the second year and half time thereafter. This position is likely to be combined with leadership of other like programs, e.g. cardiac.
- This individual would liaise directly with Regional/HA Stroke Teams. Responsible for trouble shooting, critical path, set up and coordination of networks, collaboratives etc. This position needs to be full-time for years 1-5 to coordinate the day to day activities and support for the Stroke Strategy. Should be reviewed for needs in years 6 & 7.
- Includes dedicated paid time (through portion of salary or sessional) of stroke leader/champion working in the specific organization. Responsible for mentoring and coaching other physicians re: requirements for optimal stroke care. May be involved in physician education/knowledge transfer and in setting up appropriate forums/structures for physician engagement. Costs per FTE based on 1,950 hours times \$136.76/hour. The hourly rate is based on sessional payments for specialists (\$478.66 per session divided by 3.5 hours).
- Provides administrative and secretarial support to the provincial stroke secretariat and support to regional teams, as time permits. Estimated salary derived from Hospital Employee's Union wage grid (2009) for 'Admin Assistant - Grid Code 35'. Assumed 1872 working hours per year.

Notes for Provincial Change Management Resource Support

- These resources are required to fund consultants and contractors in support of change management activities and in implementing operational changes – could be clinical, diagnostic, IT, HR, or administrative change areas. Total \$ estimated from requirements to support development of ACVS Plan and other aspects of the BCSS. It is assumed that by year three, an administrative mechanism for managing a provincial service on an ongoing basis has been established and staffing is in place to assume some of the functions previously performed by consultants.
- These resources are used to engage, orient and educate key physicians involved in stroke care through elearning, webinars, focus groups, and face to face contacts – to include neurologists, internal medicine specialists, emergency room physicians, diagnostic imaging physicians, physiatrist and rehab specialists. Should be combined with physician leadership in years 4 – 7. Costs are based on compensation for a two-hour engagement with 3,140 physicians over the three-year time period.
- Assumes the development of a training package and the delivery of a 2 hour training module for each of the approx. 3,500 EMS staff. Training to be delivered in years 1 & 2 by an outside independent consultant/trainer working in close alignment with BCAS leaders.
- These resources are to support further refinement of the central ACVS (stroke) registry, fund specific evaluations, support presentations of data to various audiences, and to facilitate planning for IT requirements to integrate stroke order sets and care pathways into regional IT data banks/routine reporting.

Notes for Regional Change Management Resource Staffing

- This individual is responsible for coordinating all change management activities in the HA and for linking with counterparts in other HAs and with the provincial secretariat. Represents the Stroke Initiative to senior leadership/executive sponsors in the HA. Responsible for project management, tracking of expenditures, gap analysis, routine reporting of performance/requirements, trouble shooting etc. Estimated salary is representative of managerial responsibilities relative to peers including Clinical Nurse Specialist and Clinical Educator.
- This position is filled by one of the allied health disciplines and oversees systems for patient navigation through the levels of acute care from point of entry in the Emergency Department through to patient discharge from acute care. Estimated salary is based on a Grade VI PT or OT (Level 15) with 3 years experience. The higher-level salary assumption is representative of the responsibilities and expertise required in this position.
- This position is responsible for developing/standardizing clinical order sets and care pathways, pulling from best practices in BC, Alberta, Ontario and from the published literature. Advisory support to the Project Manager re. clinical standards/requirements and associated training initiatives. The resources are required throughout to reflect emerging standards and changes in clinical practice and new evidence from research etc. Estimated salary derived from BC Nurses Union wage grid (April 1, 2010) for 'Level 4 - Ninth Year'. The high-level salary assumption is representative of the responsibilities and expertise required in this position.
- Provides administrative and secretarial support to the regional stroke secretariat. Estimated salary derived from Hospital Employee's Union wage grid (2009) for 'Admin Assistant - Grid Code 35'. Assumed 1872 working hours per year.
- Includes dedicated paid time (through portion of salary or sessional) of stroke leader/champion working in the health authority. Responsible for mentoring and coaching other physicians re: requirements for optimal stroke care. May be involved in physician education/knowledge transfer and in setting up appropriate forums/structures for physician engagement. Costs per FTE based on 1,950 hours times \$136.76/hour. The hourly rate is based on sessional payments for a specialists (\$478.66 per session divided by 3.5 hours).

Notes for Regional Change Management Resource Support

- Ancillary costs include office space, equipment, supplies, etc. estimated at \$5,000 per FTE per year.
- Travel costs are estimated at \$5,000 per FTE per year.
- Discretionary funds to support unique change management requirements in each Health Authority.

3.2 Modeling Optimal Stroke Care - Operational/Program Investments

Regional investments are also anticipated for implementing operational changes at the front line and for implementing or sustaining changes in TIA rapid assessment services, supporting a provincial model of telestroke, co-horting inpatient beds/setting up stroke units, and for introducing an early supported discharge program for eligible stroke patients.

Each health region is differentiated by the current level of resources available in the health care setting and the clinical complexity of stroke patients it is able to manage. As a result, even though the Provincial Stroke Action Plan builds on a collaborative network model, each health region has its own unique stroke care assets and challenges in providing the necessary components of optimal stroke care. Unique circumstances of each health authority will need to be taken into consideration in finalizing allocation and use of operational dollars in support of optimal stroke care. The assumptions underlying this section of the modeling vary by health region and are dependent on our assessment of current state as it relates to these components of stroke care. The resource investment section of the regional appendices details the unique assumptions for each health authority.

Some of these operational investments are anticipated to be incurred in the first three years of the Provincial Stroke Action Plan, while others will come into play in subsequent years as foundational policy and practice changes are introduced or ramped up. The identified investments are data modeling estimates only, to provide initial order of magnitude costing and need to be significantly refined once the scope/priorities of the strategy and the associated budgets are further developed.

3.2.1 Modeling for Expanded TIA Rapid Assessment Services

In 2009/10 an estimated 5,215 new patients were treated in TIA Rapid Assessment Services throughout the province. Of these new patients, 2,749 had a confirmed TIA/minor stroke. Of patients with a confirmed TIA/minor stroke, 980 were treated within 48 hours of symptom onset (see Table 3).

TABLE 3

TIA Rapid Assessment Service Volume IN BRITISH COLUMBIA BY HEALTH AUTHORITY 2009/10 ESTIMATED

	VIHA	VCHA (1)	FHA	IHA	BC Total
New Patients Seen	1,589	2,118	1,364	144	5,215
TIA/Stroke Patients Seen	1,031	760	854	104	2,749
Mimic Rate	35.1%	64.1%	37.4%	27.8%	47.3%
Referral Source					
GP/Specialist	44.4%	44.6%	23.2%	47.9%	39.1%
Emergency Department	46.0%	19.9%	72.9%	47.2%	42.9%
Other	9.6%	35.6%	3.9%	4.9%	17.9%
Mean Wait Time					
From Event to 1st Appointment (in days)	4.77	6.28	4.40	3.72	5.26
From Referral to 1st Appointment (in days)	3.71	5.75	3.18	1.38	4.44
# of Patients Seen Within 48 Hours	373	191	349	67	980
% Seen Within 48 Hours	23.5%	9.9%	25.6%	46.8%	19.5%

NOTE:

(1) Does not include data from LGH.

NHA - data not available.

The cost per visit to a TIA Rapid Assessment Clinic was estimated based on patient volumes and clinic operating costs in Fraser Health. The estimated cost of treating 1,438 patients (1,364 new patients and 74 repeat visits) in Fraser Health was \$572,000 in 2009/10, or approximately \$398 per patient visit (see Table 4).

TABLE 4

Costs Per Patient Seen in a TIA Rapid Assessment Clinic

FHA — SOUTH, NORTH AND EAST CLINICS

2009/10 ESTIMATED

Patient Visits in 2009/10	1,438
Clinics open a total of 11 half days per week	
Estimated Cost	
RN DC1 (1.10 fte) plus relief and benefits	\$118,786
Unit Clerks (1.10 fte) plus relief and benefits	\$75,923
Central Booking Clerk (1.00 FTE) plus relief and benefits	\$69,021
PC lease costs/impact to admitting & Health records	\$15,000
Neurologist (1.10 FTE) plus relief and benefits	\$293,350
Total	\$572,080
Estimated Cost per Patient Visit	\$398

NOTES:

Salary costs based on Fraser Health estimates.

Neurologists costs per FTE based on 1,950 hours times \$136.76/hour. The hourly rate is based on sessional payments for a specialists (\$478.66 per session divided by 3.5 hours).

The estimated cost of achieving optimal care was based on the following assumptions:

- The 5,826 incident TIA/non-hospitalized stroke patients per year in the province require timely access to a TIA Rapid Assessment Clinic;
- The current mimic rate in each health authority would be maintained;
- That timely access (i.e. within 48-72 hours of symptom onset) to these clinics could be achieved through patient and provider education as well as operational efficiencies (e.g. central booking, etc.); and
- A potentially achievable goal would be to provide optimal care to 80% of the incident TIA/non-hospitalized stroke patients in each health authority.

Based on these assumptions, achieving optimal care for 80% of the incident TIA/non-hospitalized stroke patients in the province would mean an additional 2,628 clinic visits at an annual cost of \$1,046,000 (see Table 5).

TABLE 5

TIA Rapid Assessment Services

IN BRITISH COLUMBIA BY HEALTH AUTHORITY

ACHIEVING OPTIMAL CARE

	VIHA	VCHA	FHA	IHA	NHA	BC Total
Incident TIA / Non-hospitalized Stroke Patients (1)	1,382	1,295	1,785	1,113	251	5,826
New Patients Seen in TIA Clinics	1,589	2,118	1,364	144		5,215
TIA/Stroke Patients Seen in TIA Clinics	1,031	760	854	104		2,749
Mimic Rate	35.1%	64.1%	37.4%	27.8%	40.0%	47.3%
Assume that Optimal Care is provided to 100% of Incident TIA / Non-hospitalized Stroke Patients						
TIA/Stroke Patients Not Seen in a Clinic	351	535	931	1,009	251	3,077
Additional Clinic Visits Required	474	878	1,279	1,289	351	4,272
Estimated Additional Costs (@\$398/clinic visit)	\$188,699	\$349,269	\$508,865	\$512,914	\$139,798	\$1,699,545
Assume that Optimal Care is provided to 80% of Incident TIA / Non-hospitalized Stroke Patients						
TIA/Stroke Patients Not Seen in a Clinic	75	276	574	786	201	1,912
Additional Clinic Visits Required	101	453	789	1,005	281	2,628
Estimated Additional Costs (@\$398/clinic visit)	\$40,122	\$180,184	\$313,736	\$399,758	\$111,838	\$1,045,638

NOTE:

(1) TIA / Non-hospitalized strokes based on average annual incident cases for the years from 2006/07 to 2008/09, from the ACVS Registry.

3.2.2 Modeling – Enhanced tPA Utilization/Provincial Telestroke Service

The ability of emergency departments throughout the province to offer high-quality assessments and initial brain-saving treatments (such as tPA – a clot-busting drug) depends on having the right specialist staff using current standards of care and procedures in hub/regional centers and broader access to such resources through a telestroke network. This technology provides access to specialists for facilities lacking the necessary stroke expertise to provide tPA therapy. Implementing a provincial telestroke model is assumed to take place over a four-year period with service, clinical readiness and technical planning undertaken in year one. Engagement and service implementation is assumed to occur from years two to four, with connection to five consulting sites to the Telestroke System in year two, nine referring sites in year three and eight in year four. It is assumed that by year three, an administrative mechanism for managing a provincial service on an ongoing basis has been established and staffing is in place to assume some of the functions previously performed by consultants.

A provincial Telestroke service could be implemented within the existing FTE allotment of health authorities, using internal resources complemented by external resources provided by the proposed BC Telestroke Team of consultants and later by a new and permanent office overseeing the Telestroke system. Responsibilities could include coordination, referral management, on-call schedules, communication, data collection and metrics.

Over a four-year period, project costs of implementing a provincial Telestroke service are estimated to total \$4.1 million (see Table 6). Hospital facilities work is estimated at \$70,000 over three years for 22 sites. End-point videoconferencing equipment for the five consulting sites and 17 referring sites is expected to total about \$588,600. Total internal costs for health authorities are estimated at about \$2.4 million, which includes staffing time for five positions responsible for implementing Telestroke in their region and travel time (estimates assume no back-filling of positions). External costs, including consulting fees, travel, training, physician education, and other miscellaneous costs, are estimated at almost \$1.1 million. Estimates also include ongoing operational costs associated with maintaining a provincial Telestroke service. In years one to four, while the service is ramping up to full capacity, operational costs are estimated to total almost \$5.3 million for drug costs, technical support and on-call compensation.

When the provincial Telestroke service is fully implemented and the percentage of eligible thrombotic patients receiving tPA (target of 10 percent) has been reached in year five, operational costs are estimated at around \$2.4 million annually, including:

- technical support by SSO (Shared Services Organization) of \$208,800 annually for managing videoconferencing bridging, scheduling and service desk functions for the province. Negotiations will be required once SSO is ready to take on this additional role;
- preliminary estimates for an annual on-call compensation model of one main and one back-up physician of roughly \$405,000 (includes MSP billings for fee-for-service once the physician has been called). This initial estimate is based on Ontario's original model and is subject to future discussions with the BC stroke neurology group for an appropriate on-call compensation model during the pre-implementation phase;
- annual costs associated with administering tPA of almost \$1.6 million, including drug costs of \$1.0 million and assessment and administration costs of about \$600,000; and
- staffing costs for operating a provincial Telestroke service of over \$223,000 for a physician lead, program manager and support staff.

Note: Anticipated equipment, installation and operating costs associated with alternative points of care for physicians providing 24/7 service from home are not included in these estimates. Telestroke equipment refresh/replacement costs at the regional level are also excluded from this costing. Costs associated with expanding the Diagnostic Imaging program province-wide are also not included.

TABLE 6

Estimated Resources Required To Enhance tPA Utilization/Telestroke

IMPLEMENTING OPTIMAL STROKE CARE IN BRITISH COLUMBIA

2011/12 TO 2017/18

Estimated Resources Required	FTE	Year 1 (2011/12)	Year 2 (2012/13)	Year 3 (2013/14)	Year 4 (2014/15)	Year 5 (2015/16)	Year 6 (2016/17)	Year 7 (2017/18)
Enhanced tPA Utilization / Telestroke								
Activity		<i>Plan for expansion</i>	<i>Implement at 5 consulting sites</i>	<i>Implement at 9 referring sites</i>	<i>Implement at 8 referring sites</i>	<i>Ongoing operational costs</i>	→	
% Receiving tPA (assumption)		4.27%	4.27%	6.00%	8.00%	10.00%	10.00%	10.00%
Project Costs:								
Renovations		\$0	\$2,000	\$36,000 (8)	\$32,000 (8)	\$0	\$0	\$0
Equipment		\$0	\$55,000 (5)	\$280,800 (9)	\$252,800 (9)	\$0	\$0	\$0
Staffing		\$0	\$277,000	\$1,032,388	\$1,063,360	\$0	\$0	\$0
Consulting Fees	(13)	\$245,820	\$272,490	\$122,237	\$122,237	\$0	\$0	\$0
Travel		\$21,960	\$25,560	\$35,320 (10)	\$35,320 (10)	\$0	\$0	\$0
Training & Professional Development		\$0	\$200	\$0	\$0	\$0	\$0	\$0
PIA, Teleconference, bcbedline, meetings		\$35,041 (4)	\$22,541 (6)	\$32,541 (6)	\$30,041 (6)	\$0	\$0	\$0
Physician Engagement, Education & Training		\$19,800 (7)	\$8,200 (7)	\$45,470 (7)	\$40,430 (7)	\$0	\$0	\$0
Operating Costs:								
Technical Support - SSO		\$0	\$47,455 (11)	\$123,382	\$208,800	\$208,800	\$208,800	\$208,800
On-call Compensation		\$32,000 (12)	\$91,989	\$404,750	\$404,750	\$404,750	\$404,750	\$404,750
tPA Costs	(14)	\$656,910	\$656,910	\$933,808	\$1,245,078	\$1,556,347	\$1,556,347	\$1,572,257
Operational: Physician Lead	(1) 0.25			\$66,651	\$68,651	\$70,710	\$72,831	\$75,016
Operational: Program Manager	(2) 1.00			\$117,000	\$120,510	\$124,125	\$127,849	\$131,685
Operational: Administrative Support	(3) 1.00			\$49,440	\$50,923	\$52,451	\$54,024	\$55,645
Subtotal - Enhanced tPA Utilization / Telestroke		\$1,011,531	\$1,459,345	\$3,279,787	\$3,674,899	\$2,417,183	\$2,424,602	\$2,448,153

NOTES:

Staff cost estimates include salaries and benefits and are inflated by 3% per year.

- (1) Operating costs of running the Telestroke (TS) program of based on the current sessional rate of \$136.72/hr at an FTE allocation of 0.25 (or 0.25 of 1,920 hrs/yr).
- (2) Operating costs of running the TS service. Assumes ongoing clinical resource @ \$60/hr, full-time @ 1950 hrs annually.
- (3) Operating cost of running the TS service (i.e., On-call scheduling; data collection and metrics, general administration support).
- (4) Includes teleconference costs of \$7,200 with Telus as carrier, \$25,000 for documentation and statistical improvements for TS for bcbedline, and \$2,841 for working group meetings (primarily for physician compensation at \$136.76/hr).
- (5) Assume average equipment costs of \$11,000/unit or site (average cost of Tandberg and Polycom equipment). Includes taxes; excludes HST rebate.
- (6) Assumes teleconference charges of \$7,200, Privacy Impact Assessment (PIA) negotiations of \$2,500/site and \$2,841 for working group meetings primarily for physician compensation costs of \$136.76/hr.
- (7) Assumes engagement costs of about \$900 per site or for about 7 physicians for 1 hour each at a blended rate of about \$126/hr (\$136.76/hr for specialists; \$115.94/hr for GPs) in year 1. In year 2, physician education and training at consulting sites assumes costs for 6 specialists for about 2 hours at \$136.76/hr for 5 sites. In years 3 and 4, assumes costs for 20 physicians for 2 hours per referring site at a blended rate of about \$126/hr.
- (8) Assume average of \$4,000 per site for network drop installations (average of \$3,000 for fixed units and \$5,000 for mobile units).
- (9) Assume average equipment costs of \$31,200/unit or site (average cost of fixed and mobile units). Includes taxes; excludes HST rebate. Does not take into account future equipment refresh costs.
- (10) Mileage and air travel for referring sites plus travel for consultants.
- (11) Estimate based on a per unit charge or per call charge (to be determined).
- (12) On-call compensation for year 1 is estimated as net new dollars for TS (estimated number of services on an annual basis for TS codes only). In year 2, it includes these net new dollars plus on-call compensation of \$1,000/day for one main and one back-up physician for the two existing prototype TS projects within VIHA (the Victoria General Hospital provides neurologist consulting services to Cowichan District and Nanaimo Regional General Hospitals) and VCH/FH (Vancouver General Hospital provides neurologist consulting services to Peach Arch and Chilliwack District Hospitals). Starting in year 3 onwards, costs includes these net new dollars plus on-call compensation for the prototypes and the expanded provincial TS service. Estimates are preliminary and based on Ontario's original on-call model. Initial estimates are subject to future discussion with the stroke neurology group during the pre-implementation phase.
- (13) Reflects the creation of a provincial Telestroke team of consultants to support planning, pre-implementation and implementation activities, including negotiating on-call compensation, and technical and clinical service level agreements; training neurologists, bringing on referring and consulting sites from each health authority, and aligning Telestroke management and governance within stroke care administration. The team would consist of a project manager, clinical coordinator, physician liaison, and a Telehealth fee coordinator and technical advisor, when required. By year three, it is assumed that the administrative mechanism for managing and sustaining the provincial Telestroke service is in place and begins to assume the implementation activities previously performed by the consulting project manager and physician liaison. Estimates include taxes; excludes HST rebates.
- (14) Assumes costs of \$4,055 per case, which includes tPA drug costs of \$2,700 and other assessment and administration costs of \$1,355 for CT scans, ER and recovery costs, and pharmacy, nursing and transport costs (inflated at 3% per year). The estimated number of patients meeting the inclusion criteria for tPA is 162 cases in years 1 and 2; 228 in year 3; 304 in year 4; and 380 in years 5 and 6 (or 10 per cent of the estimated number of incident hospitalized ischemic stroke patients annually).

3.2.3 Modeling for Organized Inpatient Stroke Care

In 2008/09, a total of 121,000 acute days were utilized by stroke patients in the province (see Table 7). Note that the information by Health Authority in this section is based on the residency (by Health Authority) of the patient, not necessarily the Health Authority in which the patient received their care.

TABLE 7

ACVS Acute Care Days by Health Authority 2008/09

Health Authority	Ischemic				Haemorrhagic				Total Days
	Incident	Readmissions	Recurrence	Sub-Total	Incident	Readmissions	Recurrence	Sub-Total	
FHA	29,179	582	3,775	33,535	8,479	141	547	9,168	42,703
VCHA	19,290	440	3,529	23,259	6,712	23	662	7,397	30,656
VIHA	17,469	247	2,278	19,995	2,562	28	180	2,770	22,764
IHA	11,514	351	2,372	14,238	2,309	244	105	2,659	16,896
NHA	4,719	187	806	5,711	2,064	94	106	2,265	7,976
Total	82,171	1,807	12,760	96,738	22,127	530	1,601	24,258	120,996

Several of the hospitals in the province currently have 'stroke units', including Vancouver General Hospital, Surrey Memorial Hospital, Royal Inland Hospital, Victoria General Hospital and Campbell River Hospital. It is assumed that 50% of patients seen in these units are currently receiving optimal care. Based on this estimate, 13% of stroke patients in the province are currently receiving organized inpatient stroke care.

It is also assumed that a potentially achievable goal would be to provide organized inpatient stroke care to 80% of stroke patients in the province.

The costs of achieving optimal care in this area was based on the addition of 1.2 FTE Physiotherapist, Occupational Therapist, Speech Language Pathologist and Rehab Assistant positions as well as a 0.8 FTE Dietitian per 10-bed acute care medical/general neurology unit. These additional staff added \$121 per patient day on the unit.

The estimated cost of converting 89,000 patient days (121,000 less 13% times 80%) to organized stroke care is estimated at \$10.8 million (see Table 8).

TABLE 8

Estimated Cost of 'Converting' Patient Days to Organized Stroke Care

ASSUMING THAT 80% OF STROKE PATIENTS ARE TREATED VIA ORGANIZED STROKE CARE

Health Authority	Patient Days	Additional Cost/ Pt. Day	Estimated Cost
FHA	32,568	\$121.18	\$3,946,771
VCHA	20,715	\$121.18	\$2,510,282
VIHA	16,077	\$121.18	\$1,948,226
IHA	13,218	\$121.18	\$1,601,835
NHA	6,381	\$121.18	\$773,248
Total	88,958		\$10,780,362

3.2.4 Modeling for Early Home - Supported Discharge

No stroke patients currently receive Early Home-Supported Discharge (EHSD) services in the province.

An estimated 5,417 discharges associated with stroke care take place in BC hospitals annually (see Table 9). Note that the information by Health Authority in this section is based on the residency (by Health Authority) of the patient, not necessarily the Health Authority in which the patient received their care.

TABLE 9

Acute Care Discharges by Health Authority

AVERAGE ANNUAL DISCHARGES FOR PATIENTS WITH 'UNKNOWN' LOCATION ALLOCATED
2006/07 TO 2008/09

Health Authority	Ischemic				Haemorrhagic				Total Discharges
	Incident	Readmissions	Recurrence	Sub-Total	Incident	Readmissions	Recurrence	Sub-Total	
FHA	1,239	33	207	1,479	293	4	24	321	1,800
VCHA	856	22	142	1,021	231	2	28	261	1,282
VIHA	718	16	104	838	168	4	13	185	1,023
IHA	720	17	107	844	131	5	12	148	992
NHA	214	6	38	257	55	2	6	63	320
Total	3,747	94	599	4,440	877	18	83	978	5,417

Evidence from the literature suggests that approximately 37% of these discharges would be eligible for EHSD (see Table 10).

TABLE 10

Acute Care Discharges by Health Authority

ESTIMATED DISCHARGES ELIGIBLE FOR EARLY HOME-SUPPORTED DISCHARGE

Health Authority	Ischemic				Haemorrhagic				Total Discharges
	Incident	Readmissions	Recurrence	Sub-Total	Incident	Readmissions	Recurrence	Sub-Total	
FHA	459	12	77	547	108	2	9	119	666
VCHA	317	8	53	378	85	1	10	97	474
VIHA	266	6	39	310	62	2	5	68	378
IHA	266	6	40	312	48	2	5	55	367
NHA	79	2	14	95	20	1	2	23	119
Total	1,386	35	222	1,643	324	7	31	362	2,004

NOTE:

Assume that 37% of patients are eligible for Early Supported Discharge based on information in Winkel A, Ekdahl C, Gard G. Early discharge to therapy-based rehabilitation at home in patients with stroke: a systematic review. *Physical Therapy Reviews*. 2008; 13(3): 167-87.

The estimated costs associated with providing EHSD are based on the following assumptions:

- The staffing composition of the EHSD team is taken from the 2005 Cochrane review *Services for reducing duration of hospital care for acute stroke patients* (see Table 11);
- That 11 visits, on average, per patient are required (2005 Cochrane review *Services for reducing duration of hospital care for acute stroke patients*);
- That 60% of staff productive time is available for hospital/home visits; and
- That each hospital/home visits takes 2.5 client contact hours (this includes travel to and from the clients location).

TABLE 11

Early Home-Supported Discharge

ESTIMATED PERSONNEL/SALARY COSTS

TYPICAL ESD TEAM (1)

	Ideal FTE	Salary/FTE	Estimated Salary	Benefits @ 22%	Total
Medical (2)	0.10	\$266,682	\$26,668	\$5,867	\$32,535
Nursing (3)	1.00	\$77,184	\$77,184	\$16,980	\$94,164
Physiotherapy (4)	1.00	\$65,400	\$65,400	\$14,388	\$79,788
Occupational Therapy (5)	1.00	\$65,400	\$65,400	\$14,388	\$79,788
Speech and Language Therapy (6)	0.40	\$73,140	\$29,256	\$6,436	\$35,692
Assistant (7)	0.40	\$38,293	\$15,317	\$3,370	\$18,687
Social Worker (8)	0.50	\$73,140	\$36,570	\$8,045	\$44,615
Total	4.40		\$315,795		\$385,270

NOTES:

- (1) ESD Team composition is taken from the 2005 Cochrane review *Services for reducing duration of hospital care for acute stroke patients*.
- (2) Neurologists costs per FTE based on 1,950 hours times \$136.76/hour. The hourly rate is based on sessional payments for a specialists (\$478.66 per session divided by 3.5 hours).
- (3) Assume a Level Three nurse with 5 years experience.
- (4) Assume a Grade 3 Physiotherapist with 5 years experience (paid at level 10).
- (5) Assume a Grade 3 Occupational Therapist with 5 years experience (paid at level 10).
- (6) Assume a Grade 3 Speech Language Pathologist/Audiologist with 5 years experience (paid at level 13).
- (7) Assume this position is equivalent to a Clerk IV, Nursing Staffing paid rate R9 Grid Code 16.
- (8) Assume a Grade 3 Social Worker with 5 years experience (paid at level 13).

Based on these assumptions, the cost per visit would be \$256 while the cost per patient would be \$2,820 (\$256 times average number of visits [11]), as indicated in Table 12.

TABLE 12

Early Home-Supported Discharge

ESTIMATED COST PER PATIENT

	Ideal FTE	Annual Hours	Less Stat / Vacation / Sick (1)	Hours Available	Client Contact Hours (2)	Admin / Meeting, etc. Hours
Medical	0.10	1,950	1,673	167	-	167
Nursing	1.00	1,872	1,606	1,606	963	642
Physiotherapy	1.00	1,872	1,606	1,606	963	642
Occupational Therapy	1.00	1,872	1,606	1,606	963	642
Speech and Language Therapy	0.40	1,872	1,606	642	385	257
Assistant	0.40	1,872	1,606	642	-	642
Social Worker	0.50	1,872	1,606	803	482	321
Total	4.40			7,071	3,757	3,314

Potential Annual Client Visits by the Team

Cost / Visit

Cost / Patient (assume 11 visits)

1,503

\$ 256 (3)

\$ 2,820 (4)

NOTES:

- (1) Assume 20 days vacation, 11 Stat holidays and 6 sick days.
- (2) Assume 60% of productive time is available for hospital / home visits.
- (3) Assume that a home visit takes 2.5 client contact hours (this includes travel to and from the clients location). Travel expenses not included.
- (4) Assume 11 visits on average (2005 Cochrane Review *Services for reducing duration of hospital care for acute stroke patients*).

The total annual cost for providing EHSD to 2,004 stroke discharges in the province would be about \$5.7 million (see Table 13).

TABLE 13

ACVS Discharges by Health Authority
ESTIMATED ANNUAL COST OF EARLY HOME-SUPPORTED DISCHARGE

Health Authority	Estimated Discharges	Cost/Discharge	Estimated Cost
FHA	666	\$2,820	\$1,878,599
VCHA	474	\$2,820	\$1,337,493
VIHA	378	\$2,820	\$1,067,197
IHA	367	\$2,820	\$1,034,716
NHA	119	\$2,820	\$334,389
Total	2,004		\$5,652,394

NOTE:

An early home-supported discharge (EHSD) team is comprised of “physiotherapists and occupational therapists supported by speech therapists, physicians, nurses, and social workers whose teamwork is coordinated by regular meetings. Often the EHSD begins with one or more pre-discharge home visits, continues the day of discharge, and goes on with more home sessions per week based on a patient-held recovery plan. [However,] it should be emphasized that EHSD is not considered an alternate to a stroke unit”. Larsen T, Olsen TS, Sorensen J. Early home-supported discharge of stroke patients: a health technology assessment. *International Journal of Technology Assessment in Health Care*. 2006; 22(3): 313-20.

3.3 Modeling Summary – Estimated Resource Investment in Support of Optimal Stroke Care

In summary, the estimated change management investment associated with the implementation of the activities outlined in this plan, are approximately \$ 13.4 million over the initial three-year period. Modeling for an incremental ramping up of operational activity indicates a projected operations investment over the three year period of \$20.3 million for an overall total of change management and operational program investment of approximately \$33.7 million (see Table 14). As the system moves toward optimal care over a seven-year period, progressive cost avoidance benefits are anticipated to begin to accrue. This potential cost avoidance will be covered in the next section.

TABLE 14

Estimated Resources Required and Potential Costs Avoided

IMPLEMENTING OPTIMAL STROKE CARE IN BRITISH COLUMBIA

2011/12 TO 2017/18

The cost estimates identified in this table are order of magnitude estimates based on a number of data modeling assumptions related to moving the BC health system to optimal stroke care over the next seven years, as detailed in the text of the Provincial Plan. The modeling is based on a staged implementation approach. The actual timing of implementation will likely vary for each Health Authority.

	Year 1 2011/12	Year 2 2012/13	Year 3 2013/14	3-Year Total	Year 4 2014/15	Year 5 2015/16	Year 6 2016/17	Year 7 2017/18
Change Management Resource Requirements								
Provincial	\$1,512,835	\$1,391,763	\$1,169,055	\$4,073,654	\$580,127	\$591,531	\$603,277	\$615,375
Regional	\$3,032,232	\$3,108,199	\$3,186,445	\$9,326,876	\$2,618,821	\$2,544,722	\$2,453,114	\$2,353,719
Sub-Total Change Management	\$4,545,067	\$4,499,962	\$4,355,500	\$13,400,530	\$3,198,948	\$3,136,253	\$3,056,391	\$2,969,095
Modeling for Optimal Care - Operational Areas								
TIA Rapid Assessment Services (1)								
Proportion of Patients Receiving Optimal Care	16.8%	25%	40%		60%	80%	80%	80%
Cost Estimate	\$0	\$235,699	\$464,547	\$700,246	\$827,679	\$1,212,181	\$1,248,546	\$1,286,003
Enhanced tPA Utilization / Telestroke (2)								
<i>Activity</i>	<i>Plan for expansion</i>	<i>Implement at 5 consulting sites</i>	<i>Implement at 9 referring sites</i>		<i>Implement at 8 referring sites</i>	<i>Ongoing operational costs</i>		
% Receiving tPA (assumption)	4.27%	4.27%	6.00%		8.00%	10.00%	10.00%	10.00%
Cost Estimate	\$1,011,531	\$1,459,345	\$3,279,787	\$5,750,663	\$3,674,899	\$2,417,183	\$2,424,602	\$2,448,153
Organized Stroke Care (3)								
Proportion of Patients Receiving Optimal Care	13.0%	25%	50%		75%	80%	80%	80%
Cost Estimate	\$0	\$2,881,196	\$6,973,250	\$9,854,447	\$11,308,235	\$12,497,394	\$12,872,316	\$13,258,485
Early Home Supported Discharge (4)								
Proportion of Patients Receiving Optimal Care	0%	0%	10%		20%	30%	37%	37%
Cost Estimate	\$0	\$0	\$1,669,331	\$1,669,331	\$3,438,821	\$5,312,978	\$6,749,253	\$6,951,731
Sub-Total Modeling for Optimal Care	\$1,011,531	\$4,576,240	\$12,386,915	\$17,974,687	\$19,249,633	\$21,439,736	\$23,294,717	\$23,944,372
Current Funding for the TIA Rapid Assessment Services ending after 2010//11	\$750,000			\$750,000				
Additional Funding to Maintain Current Capacity for the TIA Rapid Assessment Services		\$772,500	\$795,675	\$1,568,175	\$819,545	\$844,132	\$869,456	\$895,539
Order of Magnitude Estimate	\$6,306,598	\$9,848,703	\$17,538,091	\$33,693,392	\$23,268,127	\$25,420,121	\$27,220,564	\$27,809,005
Potential Costs Avoided	\$0	(\$4,281,957)	(\$18,879,319)	(\$23,161,276)	(\$34,958,934)	(\$45,470,176)	(\$50,281,542)	(\$51,789,988)

NOTES:

- Optimal care associated with TIA Rapid Assessment Services is defined as access within 72 hours for 80% of TIA/minor stroke patients in the province. Optimal care is currently being provided to an estimated 16.8% of TIA/minor stroke patients in the province.
- Optimal care associated with tPA utilization is defined as receipt by a maximum of 10% of incident ischemic stroke patients. tPA is currently being utilized by 4.27% of the incident ischemic stroke patients in the province.
- Optimal care assumes that 80% of stroke patients admitted to acute care will have access to organized stroke care. An estimated 13.0% of stroke patients in B.C. are currently receiving organized stroke care.
- An early home-supported discharge (EHSD) team is comprised of "physiotherapists and occupational therapists supported by speech therapists, physicians, nurses, and social workers whose teamwork is coordinated by regular meetings. Often the EHSD begins with one or more pre-discharge home visits, continues the day of discharge, and goes on with more home sessions per week based on a patient-held recovery plan. [However,] it should be emphasized that EHSD is not considered an alternate to a stroke unit". Larsen T, Olsen TS, Sorensen J. Early home-supported discharge of stroke patients: a health technology assessment. *International Journal of Technology Assessment in Health Care*. 2006; 22(3): 313-20.
The literature suggests that an average of 37% of stroke patients admitted to acute care would be eligible for EHSD. Winkel A, Ek Dahl C, Gard G. Early discharge to therapy-based rehabilitation at home in patients with stroke: a systematic review. *Physical Therapy Reviews*. 2008; 13(3): 167-87.
No patients in the province are currently receiving EHSD.
- Totals may not add due to rounding.

3.4 Benefits and Potential Cost Avoidance

Initiatives to reduce the incidence of stroke and to improve care for stroke patients have become a priority in many jurisdictions around the world due to the significant economic and health burden of stroke. It is well recognized that any attempt to optimize stroke management and care should include a focus on the entire care pathway. The BC Stroke Strategy (BCSS), following the lead of the Canadian Stroke Strategy (CSS), has outlined initiatives for developing and improving the ACVS care pathway in BC, including the enhancement of key individual components along the continuum of care.

The purpose of this section is to outline key components along the care pathway with a view to estimating the potential for cost-avoidance in British Columbia if services are provided in a comprehensive and optimal fashion. The summary provided here is supported by a comprehensive model and report that is available on request.

3.4.1 Current Stroke Care in British Columbia

Data from the updated ACVS Registry, as well as a variety of other sources, were utilized to illustrate the current state of stroke care in British Columbia. This served as the starting point for the cost avoidance model; results are summarized on Table 15 below. Each year there are an estimated 5,233 hospitalizations for stroke care; this cohort of stroke patients is associated with the use of 134,490 acute care days and almost 397,000 residential care days. In addition to this use of direct health care resources, the cohort is associated with 1,451 deaths in hospital and almost 45,000 years of life lost.

TABLE 15

Current Status of Stroke Care in British Columbia

	Type of Stroke		
	Ischemic	Hemorrhagic	Combined
Hospitalized Stroke Cases	4,240	992	5,233
Acute Care Days	105,825	28,665	134,490
Residential Care Days	332,894	63,614	396,508
Deaths in Hospital	1,074	377	1,451
Life Years Lost	35,536	9,442	44,978

3.4.2 Opportunities for Cost Avoidance

Opportunities for optimizing stroke care in the province, and thus the potential for cost avoidance, will be assessed for four major areas as outlined below. A summary table of the annual benefits of optimal stroke care in each of these areas is included at the end of this section.

TIA Rapid Assessment Services

Ensuring that a patient with a TIA is diagnosed and treated as quickly as possible is a key step in reducing the risk of converting from a TIA to a full stroke. This is the reason for the focus on TIA Rapid Assessment Services in the BCSS. Due to the high incidence of stroke following a TIA, there can be a substantial economic burden related to TIA that reflects both hospitalization and inpatient rehabilitation rates.

In the model, the following assumptions were made:

- 980 of the annual 5,919 patients with a diagnosed TIA or minor stroke would be receiving optimal care, while the other 4,939 would not be receiving optimal care (980 of the TIA/stroke patients in 2009/10 were seen within 48 hours);
- The annual conversion rate from TIA/non-hospitalized stroke to hospitalized stroke could be reduced by 80% (as indicated in the EXPRESS study by Rothwell et al.); and
- 80% of the 4,939 patients would eventually receive optimal care.

Overall, the result of providing optimal care in this area in the province would mean 148 fewer hospitalizations, a total of 3,699 fewer acute care days and 11,637 fewer residential care days resulting in an annual direct care cost avoidance of \$5.13 million dollars. In addition, 38 fewer early deaths would be expected each year with 1,242 life years saved.

Thrombolysis for Acute Ischemic Stroke

Prompt treatment of stroke with thrombolytic therapy can restore blood flow before major damage occurs. One such therapy, recombinant tissue plasminogen activator (tPA) thrombolysis, may only be used within 4.5 hours of stroke onset. The strict inclusion/exclusion criteria and delays in arriving at an Emergency Department mean that few patients actually receive tPA. Increasing the use of this therapy among eligible patients may be achieved by implementing Telestroke, and by ensuring early arrival of the patient at the emergency department followed by an accurate and timely diagnosis. In modeling the effect of optimal care in this area, the following assumptions were made:

- The proportion of incident hospitalized ischemic stroke patients that receive tPA reaches 10%;
- Patients given tPA would, on average, have a 12.3% shorter average length of stay (ALOS) in hospital;
- 11 out of every 100 (11%) patients given tPA would benefit;
- The patients who benefit from tPA would have a 50% reduced risk of re-admission or recurrence;
- Of the 11 patient who benefited, five would have had an mRS score of 3 and six an mRS score of 4. All of the patients with an mRS score of 4 and 50% of patients with an mRS score of 3 would have required residential care; and
- All patients who benefit from tPA would be discharged home.

Overall, the result of providing optimal care in this area in the province would mean 26 fewer hospitalizations, 1,255 fewer acute care days and 10,888 fewer residential care days resulting in an annual direct care cost avoidance of \$2.89 million dollars. In addition, 10 fewer early deaths would be expected each year with 249 life years saved.

Comprehensive, Organized Stroke Care

A comprehensive stroke unit is a multi-disciplinary, specialized hospital unit dedicated to stroke care and management. Navigation of the stroke care system is best accomplished when a care pathway is in place for the patient, directing the patient's treatment within and between the various stages of the stroke care continuum. Research comparing organized stroke unit care to care provided in a general medical unit has uniformly pointed to the effectiveness of stroke units; care in an organized stroke unit has been associated with a significant reduction in death, institutional care, dependency, and shorter length of stay.

In British Columbia, stroke units have been established at five hospitals; anecdotal feedback, however, suggests that these stroke units are not being operated in an optimal fashion. In modeling the effect of optimal care in this area, the following assumptions were made:

- 50% of patients in these five hospitals were receiving optimal care in their stroke unit;
- There would be a 20.7% reduction in acute care ALOS, a 15% reduction in death, and a 5% reduction in institutional care;

- The 20% reduction in death and dependency reflects patients that would instead be discharged home; and
- 80% of stroke patients in BC would eventually receive care in a dedicated stroke unit.

Overall, the result of providing optimal care in this area in the province would mean 18,641 fewer acute care days and 13,000 fewer residential care days resulting in an annual direct care cost avoidance of \$18.83 million dollars. In addition, 155 fewer early deaths would be expected each year with 1,393 life years saved.

Early Home-Supported Discharge

Patients with a mild-to-moderate stroke can be discharged from hospital early provided that appropriate supports are available in the home. On average, patients in an early supported discharge (ESD) program have a shorter length of hospital stay, and such a program is associated with reduced death or institutionalization and reduced death or dependency.

In modeling the effect of optimal care in this area, the following assumptions were made:

- 37% of hospitalized stroke patients would receive ESD; and
- For patients receiving ESD, there would be a 26.7% reduction in acute care ALOS, a 10% reduction in death, and a 16% reduction in institutional care.

Overall, the result of providing optimal care in this area in the province would mean 13,162 fewer acute care days and 20,471 fewer residential care days resulting in an annual direct care cost avoidance of \$15.26 million dollars. In addition, 46 fewer early deaths would be expected each year with 415 life years saved.

3.4.3 Summary of Potential Costs Avoided

The benefits estimated for the four focal areas of improvement along the stroke care continuum are summarized in the following tables. The combined result of providing optimal care in these four areas in the province would mean approximately 37,000 fewer acute care days, 56,000 fewer residential care days with an estimated current annual direct care cost avoidance of approximately \$42 million. (As noted in Figure 6, this \$42 million will increase to \$52 million by 2017/18 due to a 3% per year inflation adjustment.) The estimated change in utilization of acute and residential care reflects a reduction of 96 and 152 beds, respectively.⁶

The estimated annual direct costs avoided associated with acute and residential care services, if optimal care is implemented throughout the province, are substantial. Indirect costs avoided, however, are likely to be even more substantial. Not only would there be 248 fewer early deaths in the province each year, but optimal care is associated with about 3,300 life years saved. This represents both the early deaths avoided in stroke patients as well as the shorter life expectancy generally if an individual has a stroke. In addition, stroke is associated with significant disability and a reduced quality of life, primarily for the individual with the stroke but also for their caregiver(s).

⁶ The potential reduction in beds was calculated assuming a 95% occupancy rate for acute care beds and a 99% occupancy rate for residential care beds.

TABLE 16

Estimated Annual Benefits of Optimal ACVS Care by Area of Focus in British Columbia

	TIA Rapid Assessment & Treatment (1)	Increased Utilization of tPA (2)	Stroke Unit (3)	Early Home-Supported Discharge (4)	Total
Hospitalized Stroke Cases	(148)	(26)	--	--	(174)
Acute Care Days	(3,699)	(1,255)	(18,641)	(13,162)	(36,757)
Acute Care Costs (\$million)	(\$3.21)	(\$1.09)	(\$16.68)	(\$11.88)	(\$32.87)
Residential Care Days	(11,637)	(10,888)	(13,000)	(20,471)	(55,996)
Residential Care Costs (\$million)	(\$1.92)	(\$1.80)	(\$2.14)	(\$3.38)	(\$9.24)
Total Costs (\$million)	(\$5.13)	(\$2.89)	(\$18.83)	(\$15.26)	(\$42.11)
Deaths in Hospital	(38)	(10)	(155)	(46)	(248)
Life Years Lost	(1,242)	(249)	(1,393)	(415)	(3,299)
Percent of Total					
Hospitalized Stroke Cases	85.0%	15.0%	0.0%	0.0%	100.0%
Acute Care Days	10.1%	3.4%	50.7%	35.8%	100.0%
Residential Care Days	20.8%	19.4%	23.2%	36.6%	100.0%
Total Costs	12.2%	6.9%	44.7%	36.2%	100.0%
Deaths in Hospital	15.1%	4.0%	62.3%	18.6%	100.0%
Life Years Lost	37.7%	7.5%	42.2%	12.6%	100.0%

NOTES ON KEY ASSUMPTIONS:

- (1) 80% of patients not receiving optimal care in 2009/10 will ultimately receive optimal care.
- (2) tPA utilization will increase from 4.27% of hospitalized ischemic stroke patients in 2008/09 to 10%.
- (3) 80% of patients not receiving optimal care in 2009/10 will ultimately receive optimal care.
- (4) 37% of patients will ultimately receive optimal care.

TABLE 17

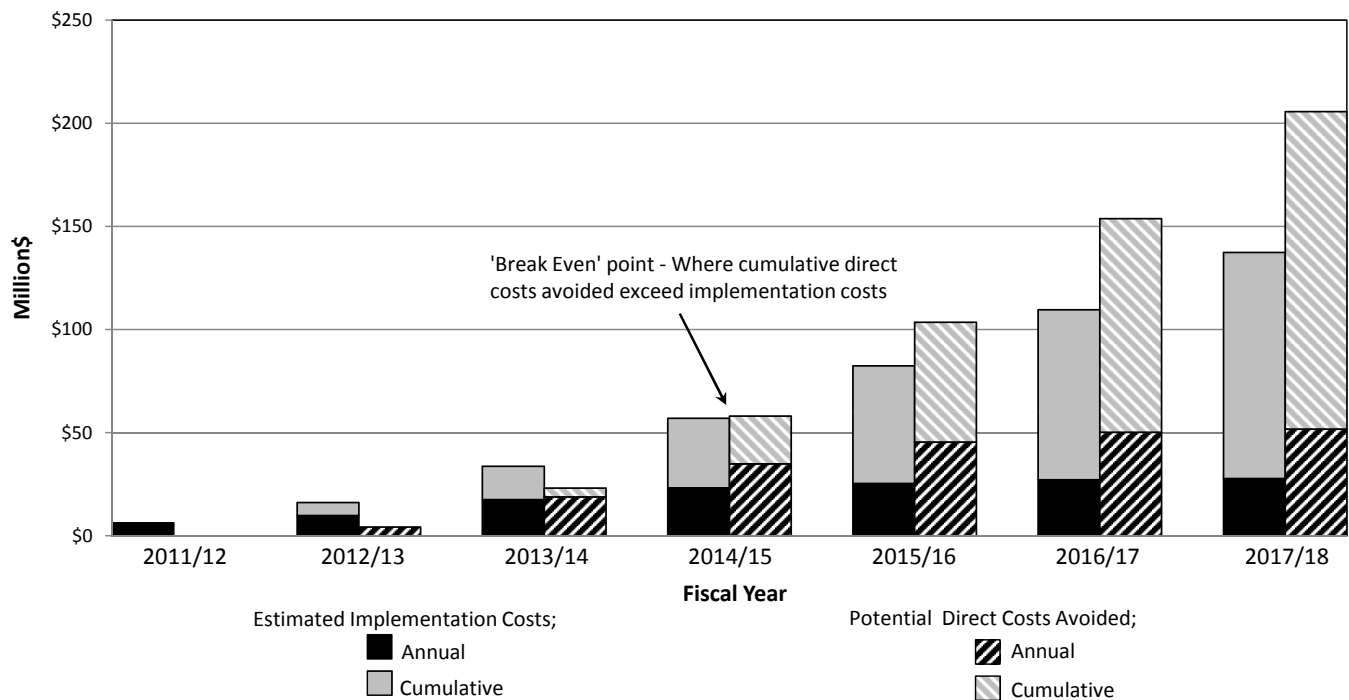
Estimated Annual Benefits of Optimal ACVS Care in British Columbia

	Current State	Optimal Care	Variance	% Var
Hospitalized Incident Stroke	4,624	4,493	(131)	-2.8%
Readmissions	80	75	(6)	-7.1%
Recurrent Stroke Admissions	529	491	(38)	-7.1%
Average Length of Hospital Stay	25.70	19.32	(6.38)	-24.8%
Total Acute Care Days	134,490	97,732	(36,757)	-27.3%
Discharges Home	2,304	2,509	205	8.9%
% Discharged Home	44.0%	49.6%	5.6%	12.7%
Total Deaths in Hospital	1,451	1,203	(248)	-17.1%
% Deaths in Hospital	28.2%	24.1%	-4.0%	-14.3%
Discharges to Residential Care Facility	745	640	(106)	-14.2%
% Discharges to Residential Care Facility	14.2%	12.6%	-1.6%	-11.2%
Total Residential Care Days	396,508	340,512	(55,996)	-14.1%
Life Years Lost	44,978	41,679	(3,299)	-7.3%
Acute Care Cost (\$million)	\$120.23	\$87.36	(\$32.87)	-27.3%
Residential Care Cost (\$million)	\$65.42	\$56.18	(\$9.24)	-14.1%

Figure 6 below depicts annual and cumulative investments associated with implementing the four operational areas outlined in the modeling work and the annual and cumulative potential direct costs avoided. The intersection or breakeven point occurs in fiscal year 2014/15. Note: this table does not include indirect costs avoided. After 7 years, a relatively steady state for both investment and costs avoided would be expected. The reduction in some investments (e.g. change management, telestroke implementation) will have largely already occurred by year 7. Other costs are linked to treatment volume so any increase in volume should lead to both increased costs and corresponding cost avoidance.

FIGURE 6

Implementing Optimal Stroke Care in British Columbia
ESTIMATED COST OF ENHANCING FOUR KEY INTERVENTIONS[†] AND THE
POTENTIAL DIRECT COSTS[‡] AVOIDED (MILLIONS \$)
ANNUAL AND CUMULATIVE COSTS, FISCAL YEARS 2011/12 TO 2017/18



† The four key implemented interventions are;
 1. Transient ischemic attack (TIA) rapid assessment and treatment services
 2. Enhanced utilization of telestroke and tissue plasminogen activator (tPA)
 ‡ Direct costs avoided include acute and residential care services.

3. Organized inpatient stroke care
 4. Early home-supported discharge

4. Oversight & Operations Management Model

There is recognition by health system leadership that as the BC Stroke Strategy moves from planning and prototyping into implementation and operational stages of work, it is essential to pass the oversight role from the Heart and Stroke Foundation of BC & Yukon to a longer-term oversight and operations management structure within the health system. This is necessary to drive provincial and regional improvements in stroke care and to support change management activities. Consultation with key stakeholders has suggested that PHSA could provide the leadership and coordination of the BCSS and align the oversight role of stroke with other like programs such as cardiac, renal etc. However, discussions regarding PHSA's potential role are still ongoing and hence for the purpose of this document, the oversight body is referred to as the "Provincial Coordinating Body."

The proposed collaborative provincial model to support the BC Stroke Strategy over the next three years recognizes the need to build capacity and evolve into an integrated stroke network of service providers. A decision is required as to how to best provide operations oversight and to coordinate embedding this initiative in the operating context of the health authority system.

The most important benefit of working together in a provincial collaborative model going forward will be the knowledge transfer and sharing of expertise and experience to expedite bringing all regions to an optimal care model while building a province-wide foundation from which to incrementally introduce required changes.

The following principles are suggested for guiding decisions in the two levels of provincial and regional decision-making. They are as follows:

- The best interests of the patient are considered first and foremost above those of geopolitical boundaries. Stroke services are coordinated on a provincial basis to ensure all British Columbians have reasonable access to stroke prevention and management services.
- While each Health Authority is accountable for service delivery planning and implementation within their region, each health region is accountable to provide leadership and stewardship at the provincial level to ensure all British Columbians have reasonable access to stroke services with the intent of improving outcomes of care.
- The Stroke Strategy and Plan are predicated on a systems management approach to address specific issues (e.g. remote areas, deficits in diagnostics/technology, human resources shortages), to ensure adequate linkages and coordination are achieved and to optimize the impact of the available resources for allocation.
- Hospitals/Facilities with specialized resources and personnel accept their responsibility for collaborating and providing service in ways that promote patient access to an appropriate level of care in a timely fashion.

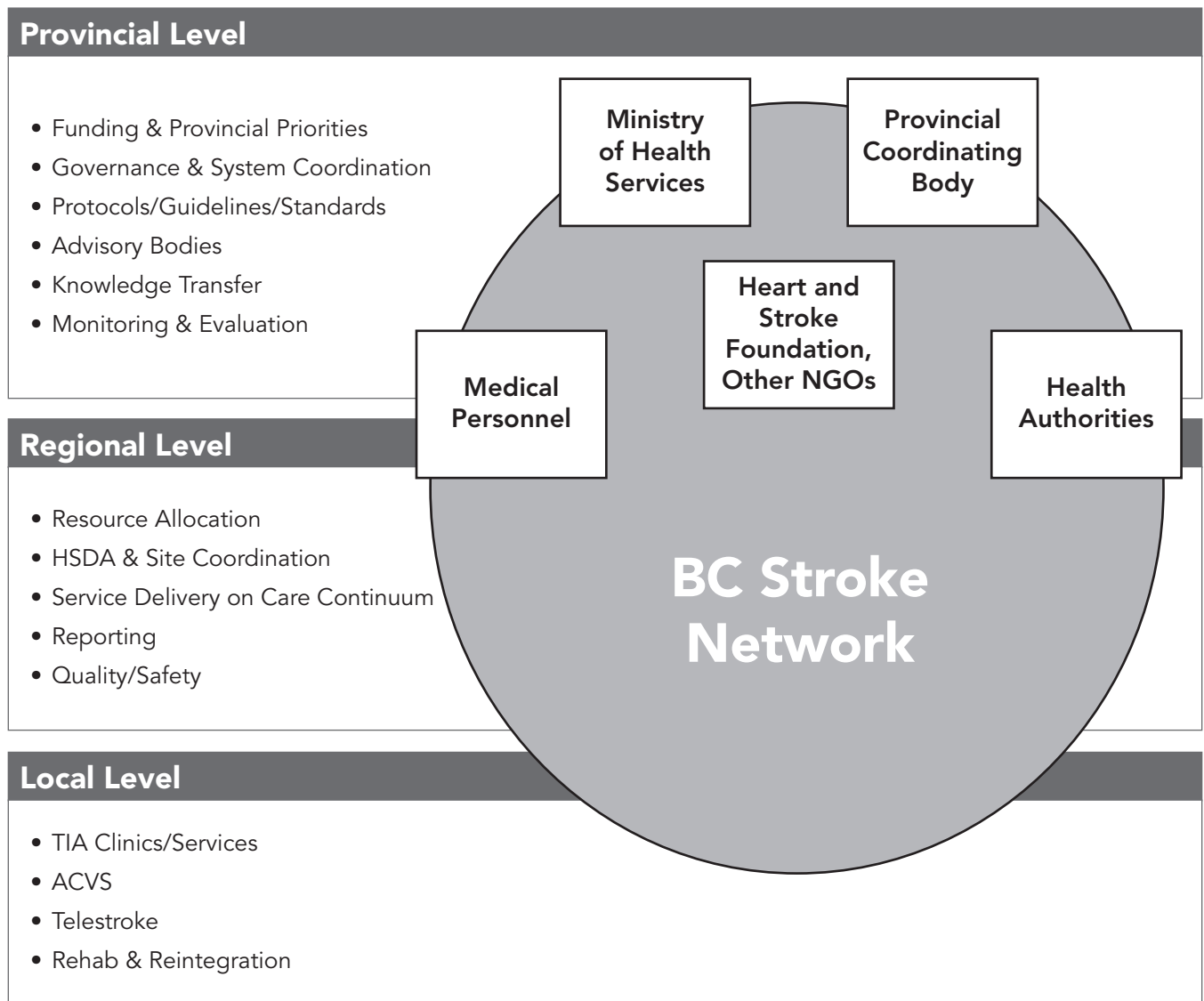
4.1 Features of the Proposed Model

- A Provincial Coordinating Body (such as PHSA) provides overall coordination and support to provincial and regional stroke strategies;
- The Provincial Coordinating Body will replace the Heart and Stroke Foundation with a Secretariat for the BC Stroke Strategy and continue to provide the overall coordination, communication and project support to the implementation of the Provincial Stroke Action Plan;
- The Provincial Coordinating Body holds the provincial stroke budget in support of change management and system redesign and allocates resources based on agreed priorities identified in the Provincial Stroke Action Plan and supported through the Provincial Stroke Steering Committee;
- The Provincial Coordinating Body establishes service agreements and performance targets with each Health Authority and monitors individual and system-wide performance on a quarterly basis;
- All Health Authorities are represented on the oversight /operations management structure by Executive Sponsors and others as required;
- Regional Health Authorities are accountable for the development of their own local strategies and service plans in response to provincial priorities and directions and work cooperatively with others to share expertise and to standardize and streamline systems and processes;
- The BCSS Measurement and Evaluation Working Group (MEWG) continues to use data from the Provincial Stroke Registry (residing in the MoHS) in support of ongoing performance monitoring, gap analysis, evaluations, research, and the setting of benchmarks and targets;
- Under the Secretariat and Steering Committee, multi-disciplinary Advisory Groups made up of clinical, administrative and operations representatives from health authorities continue to support special projects and long-term initiatives;
- BC Ambulance Services, now coordinated provincially by PHSA, closely align with the Health Authorities in providing patient transport and local emergency response services;
- The technical elements of a provincial telestroke system (e.g. videoconference bridging, network support, on call scheduling/funding, service desk functions, and diagnostic imaging) will also need to be supported through the Provincial Coordinating Body in conjunction with the Provincial Shared Services Organization, E-Health, and the BC Tele-health Development Committee (BCTDC); and
- The clinical components of the telestroke network/system will also need to fall under the direction of the Provincial Stroke Steering Committee based on recommendations/proposals put forward by the Telestroke/ Tele-health Advisory Group.

Figure 7 and Table 18 summarize the proposed roles for participating organizations.

This next section outlines proposed roles and responsibilities for the various stakeholder organizations. Additional role/function descriptors are included in Section 5 of the document as part of the identification of roles, functions, and activities required to move forward in implementing the Stroke Action Plan.

Levels of Participation in BC Stroke Strategy



Proposed Roles & Responsibilities – Oversight and Operations Management Model

Organization	Proposed Role and Responsibility
Ministry of Health Services	<ul style="list-style-type: none"> • Endorsing the proposed health system strategy for stroke care • Ongoing policy support and guidance for best practices and the delivery of stroke care across the care continuum • Investing in system alignment and change management initiatives in stroke services • Establishing and articulating clear expectations and target outcomes for health authority performance • System-wide medical and health human resource planning and education • Ensuring alignment of the BC Stroke Strategy activities with other initiatives including the Canadian Stroke Strategy, the BC Divisions of Family Practice and Integrated Health Networks, E-Health, Tele-health BC, and the BC MoHS Clinical Care Management & KRA Processes etc.
PHSA or Other Provincial Coordinating Body	<ul style="list-style-type: none"> • Coordination of highly specialized health care services such as ACVS stroke care and linkage with partners involved in the delivery of stroke services across the continuum of stroke care • Coordination of BC Ambulance Services in partnership with health authorities in order to facilitate expedited transport to appropriate centers for stroke care • Fiduciary/Stewardship responsibility for provincial investments in BC Stroke Strategy initiatives • Finalizing policy and system change requirements and preparing necessary documentation, detailed budgets, and implementation strategies in consultation with health authorities • Distribution of provincial stroke funds according to agreements with health authorities • Working with health authorities to improve the data collection and reporting infrastructure/systems for monitoring of stroke incidence and prevalence and key indicators tracked as part of measurement of stroke system performance • Supporting a sustainable system of stroke surveillance for British Columbia, enhancing the data collection and reporting capabilities of the central stroke registry • Monitoring and evaluating health authority performance against targets and service expectations • Housing of Secretariat function to support the BC Stroke Strategy • Support and functional leadership for the Provincial Telestroke System in conjunction with system partners • Ensuring alignment of the BC Stroke Strategy activities with other initiatives/system-wide commitments including provincial cardiac and renal services, the Canadian Stroke Network /Strategy, the MoHS Guidelines and Protocols Advisory Committee (GPAC), E-Health, Tele-health BC, and the BC MoHS Clinical Care Management & KRA Processes etc.
Regional Health Authorities	<ul style="list-style-type: none"> • Identifying population health needs and planning appropriate programs and services • Working with PHSA (or other provincial coordinating body), finalize policy and system change requirements and prepare necessary documentation, detailed budgets, and implementation strategies • Ensuring alignment of the BC Stroke Strategy activities with other initiatives including the BC Divisions of Family Practice, Integrated Health Networks, and the BC MoHS Clinical Care Management & KRA Processes etc. • Demonstrating a systems approach to ensure stroke care is coordinated across the continuum by organizing stroke care on a regional and inter-regional basis, establishing networks that follow natural referral patterns and available expertise/resources. • Delivery of stroke care services in regions of the province • Liaison and alignment of regional stroke services with home and community services to facilitate early supported discharge and community reintegration • Partnering with other health regions to ensure the provision of a network of services so that all British Columbians (especially those in rural and remote areas) have reasonable access to care • Ensuring stroke programs and services are appropriately funded and managed • Meeting performance objectives/targets • Participating in the development of best practices and consistent approaches to care by providing representation to the provincial committees and working groups • Participating in strategy development for human resources, education, training, evidence-based care, technology, tele-learning, information management and evaluation activities undertaken at the provincial level • Providing leadership and mentoring to share expertise and promote knowledge transfer in stroke prevention and management across the system
Heart and Stroke Foundation of BC & Yukon	<ul style="list-style-type: none"> • Advocacy, research, health promotion, patient support and public awareness pertinent to cardiovascular and cerebrovascular diseases
BC Stroke Recovery Association	<ul style="list-style-type: none"> • Assistance to stroke survivors and their caregivers through support, education, physical and mental stimulation, and communication, in order to improve their overall quality of life and facilitate community reintegration

4.2 Benefits of the Proposed Oversight Model

- The model is representative of key stakeholder groups and has an inter-regional, inter-disciplinary stroke network perspective;
- Builds on existing and successful relationships and a network established in the last five years under the BC Stroke Strategy;
- Ensures alignment of provincial priorities with regional plans to address gaps in stroke care;
- Supports and invests in a central coordination, stroke secretariat function;
- Sustains and builds on prototype work and collaborative planning efforts;
- Creates a decision framework from which to advise on system priorities and investments and other long term issues;
- Promotes measurement, evaluation and ongoing monitoring;
- Supports ongoing work of advisory bodies to provide system standards, guidance, and improvement; and
- Facilitates the ability to connect stroke experts when needed locally, provincially or nationally.

5. Moving Forward

5.1 Priority Areas of Focus

Once commitment to directions and associated investment has been confirmed by health system executives, it will be important to have further discussion at the BC Stroke Strategy Steering Committee and HA executive levels to finalize staging of work, confirm financial and human resources required /available to support the change agenda and to confirm a manageable number of priority areas from which to incrementally build system-wide capacity. Suggested priority areas of focus are summarized below. Priority areas for initial focus (investment and support) are highlighted in bold type.

TABLE 19

Moving Forward - Priorities for Action

Action	Policy/System Change	Practice Change
Secondary Stroke Prevention	Rapid assessment coverage for all incident TIAs in the province through a variety of models including tele-TIA	Increased number of rapid assessment/TIA services (as volumes/demand warrants). The proportion of patients seen within 48 hours is increased to at least 80%
Pre-hospital	Hospital bypass and stroke patient transport protocols for BC Ambulance Service	
Emergency Department	Formal sign-off, endorsement and communication of health facility/hospital role designations in stroke care Ongoing embedding of order sets and care pathways into clinical practice Earlier involvement of rehab staff in Emergency Dept. care pathway Emergency staff skilled and cross-trained in stroke care Repatriation agreements for inter and intra-health authority patient movement	Protocols for handling “walk-in” patients that do not arrive at the Emergency Department by Ambulance
Telestroke	Phased development of a provincial telestroke network, in the context of improved acute stroke services and facility role designations for stroke care Tele-health for mentoring and support to rural and remote sites and/or those that are challenged with limited technical or human resources.	Pre-requisites for telestroke are in place (e.g. transport bypass protocols, emergency department order sets, patient care pathways, etc.) Provincial network of neurologists, diagnostic imaging and internal medicine specialists for mentoring and support between sites On-demand point to point videoconferencing connectivity between referring sites and consulting sites Technical support in place to seamlessly access CT imaging from designated sites across the province A data collection and performance monitoring system for provincial telestroke services

TABLE 19, CONTINUED

Action	Policy/System Change	Practice Change
Acute Stroke Management	<p>Cross-training of facility personnel to ensure minimum requirements are met for optimal patient care (e.g. swallowing screens, mobilization, activities of daily living etc.)</p> <p>Stroke units and stroke teams in designated health care facilities</p> <p>Stroke units or geographically designated (co-horted) beds as appropriate, based on facility functional capacity and role designation</p>	<p>Protocols and education for stroke care across all inpatient centers, not just stroke units. Clinical supports and mentoring relationships to support stroke care at all levels and in all settings</p> <p>Inter-disciplinary stroke teams with enhanced knowledge of stroke care and a mandate to coordinate care</p> <p>Discharge protocols and early discharge planning to ensure smooth transitions and appropriate and timely access to service</p>
Stroke Rehabilitation	<p>A BC-wide, standardized system for screening to determine impairments and most appropriate level of rehabilitation</p> <p>Tele-rehabilitation service capacity to address gaps in stroke expertise in isolated and remote areas of the province</p>	<p>A formal, collaborative process to determine how best to organize rehab resources/capacity in each health authority</p> <p>Rehabilitation plans and implementation of processes to meet minimum requirements of early, intensive and coordinated interdisciplinary stroke rehab standards</p> <p>Rehab protocols and formal education, mentoring and tele-consultation relationships</p> <p>Trialing of early supported discharge programs, where possible. Linkages to community programs that support stroke survivor long-term rehabilitation and community re-integration</p> <p>Partnerships between health care providers and community/NGO agencies such as the Stroke Recovery Association of BC</p>
Coordination	<p>A Provincial Coordinating Body and supporting infrastructure, including a stroke services secretariat function to steer and manage implementation of the Provincial Stroke Action Plan</p>	<p>Change management investment and allocation criteria/process for disbursing stroke-related funds</p> <p>Regional stroke teams to manage implementation of best practices in stroke care and to coordinate the change agenda in each HSDA/region</p>
Building Capacity in Stroke Management	<p>A Human Resource Strategy - working with the academic community, BCMA leadership, Nursing and Allied Health Professional Groups and the Medical Services Division (MoHS) to identify future skill and resource requirements to build capacity in stroke care</p> <p>Stroke neurology physicians acting as consultants in either regional pools or a provincial pool with provisions for appropriate compensation for "on call" consultation</p>	<p>Structured mentoring and support programs by interested clinicians currently involved in stroke care to share knowledge and experience of evidence-based practices with colleagues through Divisions of Family Practice, E to E Webinars, elearning, telestroke and practice support programs for family physicians</p>
Measurement and Evaluation	<p>Routine reporting of 5 provincial indicators already approved by the joint BCSS/MoHS measurement and evaluation group</p>	<p>A program of data collection and reporting with measurement indicators to evaluate improvements in patient outcomes, reductions in stroke disease and avoided costs</p> <p>Performance targets for stroke care improvements in MoHS KRA processes and letters of agreement/ understanding with each Health Authority</p>

5.2 Proposed Critical Path

Outlined below is a general framework for developing a system-wide approach to support provincial and regional priorities going forward and for confirming the staging of work over the next three and subsequent fiscal years. The emphasis is on structural and process elements required to be in place to support a collaborative model.

FIGURE 8

Moving Forward – Implementation of the Provincial Stroke Action Plan

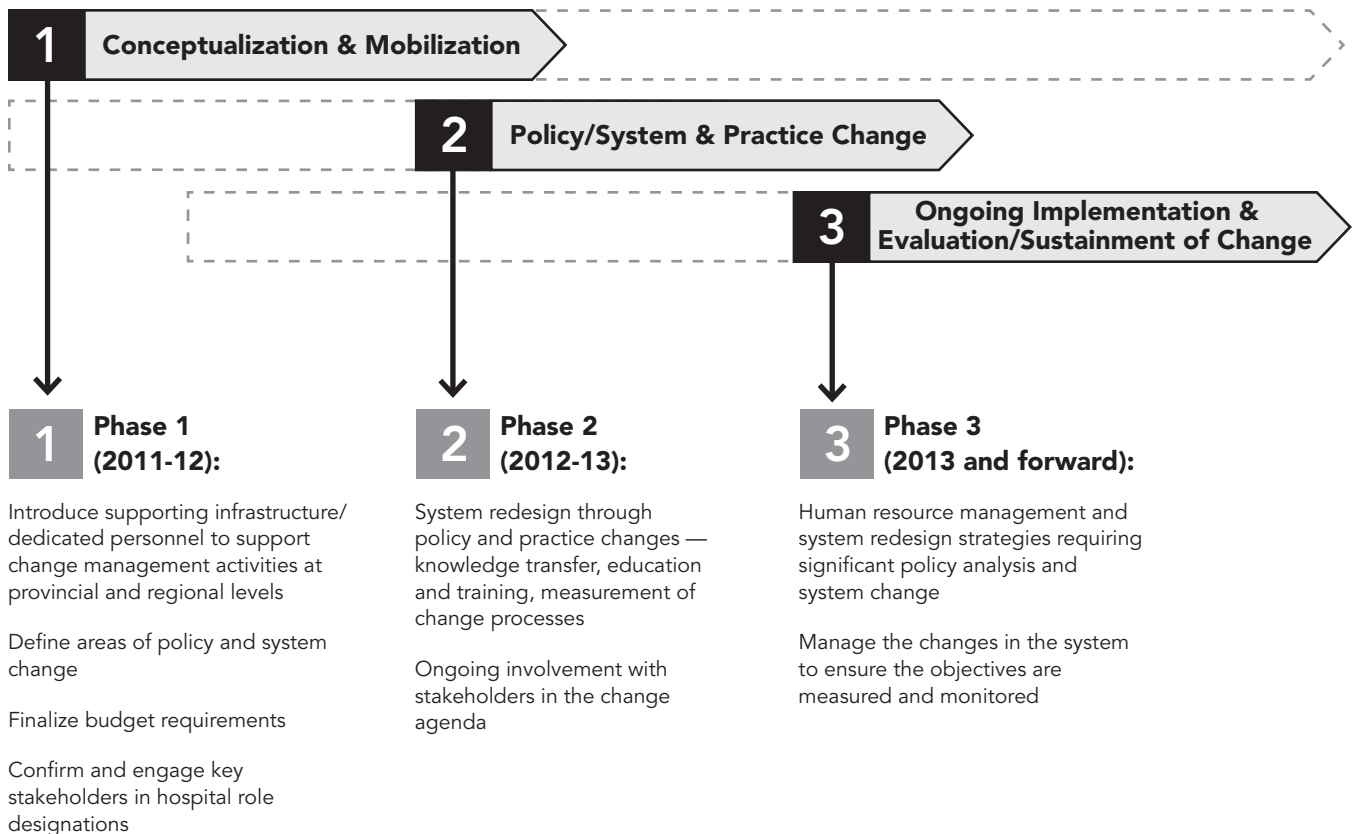


Table 20 summarizes key activities required at the provincial and regional/HSDA levels in support of moving forward with the Provincial Stroke Action Plan.

Moving Forward - Provincial and Regional Activity

Year/Stage	Provincial Activity	Regional Activity
<p>Year 1:</p> <p>Conceptualization and Mobilization</p>	<ul style="list-style-type: none"> • Assess extent to which, provincial coordination of stroke can be aligned with other provincial programs such as cardiac, renal, etc. • Set-up a provincial oversight and operations management structure and revisit the membership of the Stroke Steering Committee. Align role and membership with other provincial committees/councils, where possible • Develop a telestroke coordination and administration function under the provincial stroke secretariat. Align telestroke management and governance with stroke care administration e.g. confirm roles of BC Bedline, Shared Services Organization (SSO) and Provincial Tele-health Office • Clearly establish the anticipated working relationship between the provincial structures providing operations oversight for Stroke Care and the Clinical Care Management/KRA processes (who also have an interest in improving stroke care at the front line). Clarification is required on roles, responsibilities, deliverables and anticipated reporting of system performance • Secure approach to funding the change management and operations investment for the next fiscal year (2011-12) and commence aligning provincial and health authority budgets with an agreed upon, manageable number of priority areas of focus • Explore criteria for accessing new funds available through “pay for performance” and “patient-focused funding” • Work with regional HAs to finalize policy and system change requirements and prepare necessary documentation, detailed budgets, and implementation strategies • Meet with Senior VP and BCAS Executive Team to review requirements for formalizing and training BCAS personnel on hospital roles, by-pass protocols and pre-hospital screening tools • Work collaboratively with health regions to provide central support to the implementation of the key initiatives, facilitating linkages between partners and health regions and providing the provincial leadership and direction on issues that have a provincial impact • Confirm training/education requirements for physicians, nurses & rehab professionals involved in stroke care • Communicate change expectations to key stakeholder groups through a variety of vehicles 	<ul style="list-style-type: none"> • Appoint full-time stroke coordinators & associated support infrastructure to enable change management activities • Engage regional decision-making structures to support stroke change agenda e.g. regional steering committee, working groups etc. Clearly define roles and expectations and align with provincial structures • Work with PHSA and other regional HAs to finalize priority areas for policy and system change in year 1 and prepare necessary documentation, detailed budgets, and implementation strategies • Identify individuals to participate in collaboratives and communities of practice and set up processes to facilitate informed participation • Identify and prioritize immediate and ongoing regional stroke education and training needs with input from regional stroke steering committees; prepare/share materials as required • Build on current stroke education/training initiatives in accordance with best practice guidelines • Build a network that allows regional educators to communicate issues and ideas regarding the development, implementation and evaluation of educational programs to promote best practice stroke care • Prepare and implement stroke report card ensuring alignment with deliverables and performance targets identified in service agreements and with the MoHS KRA (key result area) processes • Engage key stakeholder groups in the change process and support ongoing communications/engagement

TABLE 20, CONTINUED

Year/Stage	Provincial Activity	Regional Activity
<p>YEAR 2 and forward:</p> <p>Policy/System and Practice Change</p>	<ul style="list-style-type: none"> • Review work to date and re-focus as necessary from Year 1 • Confirm priority areas of focus for Year 2 • In consultation with regional HAs, finalize policy and system change requirements and prepare necessary documentation, detailed budgets, and implementation strategies • Allocate funding for priority areas of focus for Year 2 • Work with HAs to address unique regional requirements for moving forward with the Provincial Stroke Action Plan • Confirm effectiveness/appropriateness of collaborative models and degree of HA participation, modify approach as required • Liaise with Ministry of Health and HA Leadership re. progress and ongoing leadership/investment requirements • Support provincial priorities for system and practice change • Ongoing monitoring and reporting of stroke system performance 	<ul style="list-style-type: none"> • Review work to date and re-focus as necessary from Year 1 • Continue to identify gaps in practice and to align regional practices with national and provincial evidence-based guidelines for stroke care • Revisit and confirm priority areas of focus for Year 2 • In consultation with PHSA and other HAs, finalize policy and system change requirements and prepare necessary documentation, detailed budgets, and implementation strategies • Allocate funding for priority areas of focus for Year 2 • Work with PHSA and other HAs to address unique regional requirements for moving forward with the Provincial Stroke Action Plan • Identify resources required to sustain learning, embed practices and enable knowledge transfer over the longer term • Increase access to and continuity of knowledge transfer, training & education using a variety of modalities • Identify and evaluate additional tele-health/tele-rehab technical and support solutions including interim and longer term solutions to support clinical care processes • Liaise with IT representatives to ensure protocols are incorporated into the EHR to guide care decisions. Identify training requirements for use of electronic protocols • Regional data collection for performance management, monitoring and reporting
<p>YEAR 3 and forward:</p> <p>Ongoing Implementation and Evaluation/ Sustainment of Change</p>	<ul style="list-style-type: none"> • Liaise with Ministry of Health and HA leadership re. ongoing leadership/funding requirements; modify oversight structure & associated arrangements as required • Review work to date and re-focus efforts as necessary from Year 2 • Confirm priority areas of focus for Year 3 • In consultation with regional HAs, finalize policy and system change requirements and prepare necessary documentation, detailed budgets, and implementation strategies • Allocate funding for priority areas of focus for Year 3 • Support provincial priorities for system and practice change • Work with HAs to address unique regional requirements for moving forward with the Provincial Stroke Action Plan • Confirm effectiveness/appropriateness of collaborative models and degree of HA participation, modify approach as required • Monitor the effectiveness of the BC Stroke Strategy and associated plans for action in reducing adverse stroke outcomes, improving access to optimal care and improving health care efficiency and the reduction of costs • Work with health authorities to improve the data collection and reporting infrastructure/systems for monitoring of stroke incidence and prevalence and key indicators tracked as part of measurement of stroke system performance • Support a sustainable system of stroke surveillance for British Columbia, enhancing the data collection and reporting capabilities of the central stroke registry 	<ul style="list-style-type: none"> • Participate in discussions with MoHS and HA Executives (Leadership Council) re. ongoing governance and oversight requirements for the Stroke Strategy going forward • Review work to date and re-focus efforts as necessary from Year 2 • Confirm priority areas of focus for Year 3 • In consultation with PHSA and other HAs, finalize policy and system change requirements and prepare necessary documentation, detailed budgets, and implementation strategies • Allocate funding for priority areas of focus for Year 3 • Support provincial priorities for system and practice change • Address unique regional requirements for moving forward with the Provincial Stroke Action Plan • Participate in the proposed national re-audit of stroke care (currently tabled for 2012) • Share “lessons learned” • Identify new gaps in care and strategies/ requirements for closing these gaps • Reassess gaps in care and needs going forward.

5.3 Summary and Next Steps

What has been achieved to date

- A foundation of solid relationships and partnerships;
- A collaborative model of communities of practice;
- A comprehensive approach to aligned stroke care;
- A stroke strategy based on evidence and clinical consensus;
- A strategy that is founded on priorities needed to build the fundamentals of an improved system;
- A summary of lessons learned from experiences in prototyping various stroke care models and their application for BC; and
- A metrics and measurement process for tracking progress.

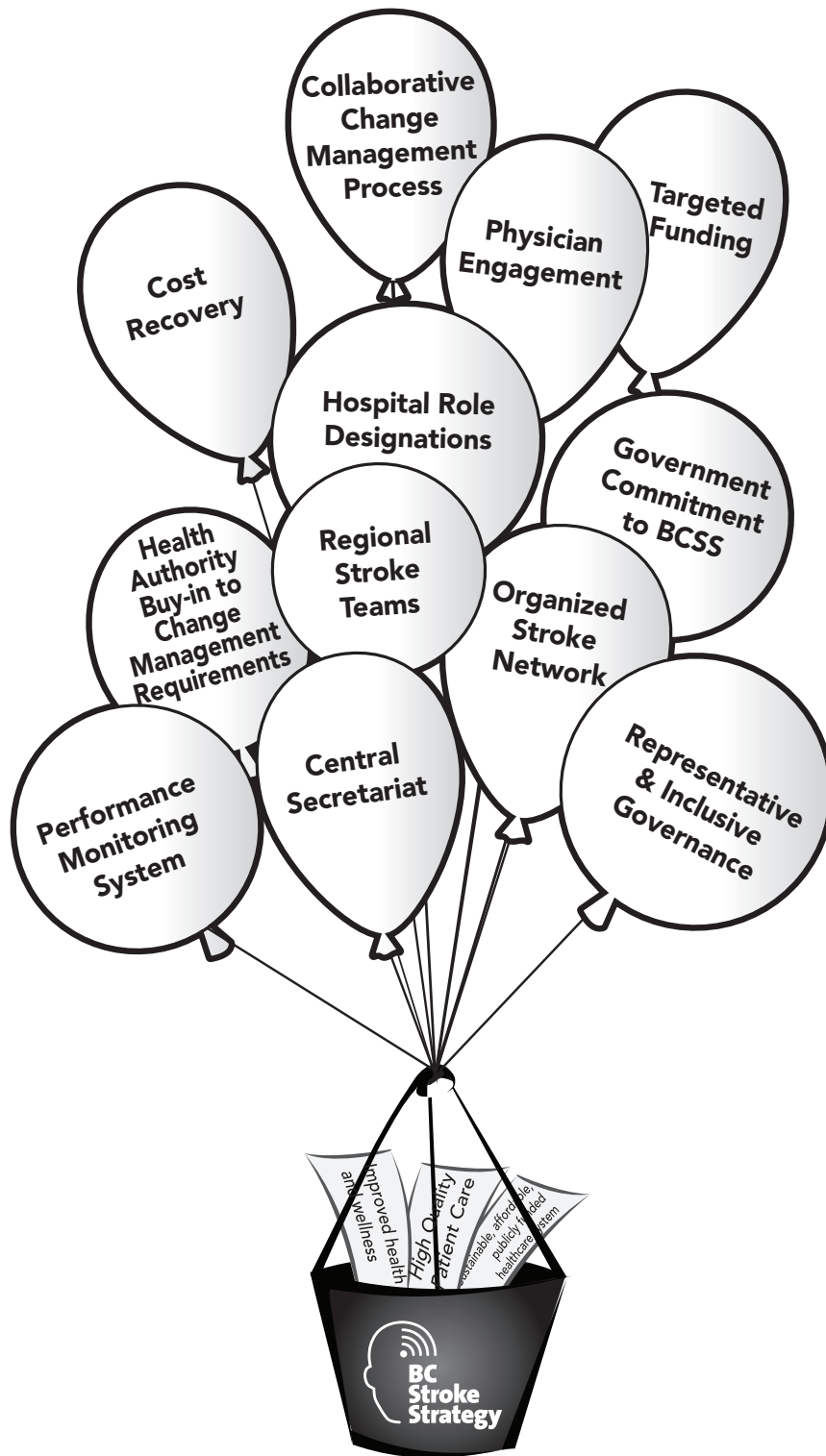
What is Needed Moving Forward

- An oversight and operations management model that supports continued collaboration and momentum.
- “Internal connectivity” in the MoHS and Health Authorities with respect to the multiple/intertwined commitments and initiatives.
- Clarity on the anticipated working relationship between the provincial structures providing operations oversight for Stroke Care and the Clinical Care Management/KRA processes.
- An “integrated” and cohesive approach to change.
- Securing of change management and operations investment for the next fiscal year (2011-12) and alignment of provincial and health authority budgets with an agreed upon, manageable number of priority areas of focus.
- Exploration of criteria for accessing new funds available through “pay for performance” and “patient-focused funding.”
- Regional performance goals and measureable deliverables.

Critical Success Factors

The following illustration identifies a number of factors that are critical in keeping the BC Stroke Strategy moving forward and “afloat.”

Critical Success Factors in Implementing the Provincial Stroke Action Plan





APPENDICES

(REGIONAL SUMMARIES AVAILABLE ON REQUEST)

Appendix A: Sample Planning Tools

- A1 Provincial Stroke Metrics
- A2 Rehabilitation Framework for Rehabilitation Role Designation
- A3 Summary - Clinical Best Practices & Performance Measures

Provincial Stroke Metrics | ACUTE CEREBROVASCULAR SYNDROME ADULTS* RESIDING IN BRITISH COLUMBIA

2001/02 to 2008/09 Data provided as of August 26, 2010
* age 20 or older

	Fiscal Year								% Change
	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	01/02 - 08/09
Number of Incident ACVS Patients									
Hospitalized Ischemic Stroke	4,032	3,889	3,747	3,836	3,801	3,788	3,799	3,654	-9.4%
Hospitalized Hemorrhagic Stroke	911	822	815	856	856	870	886	872	-4.3%
Sub-total	4,943	4,711	4,562	4,692	4,657	4,658	4,685	4,526	-8.4%
Hospitalized TIA	1,248	1,203	1,124	1,236	1,151	1,102	1,178	1,206	-3.4%
Non-hospitalized TIA/Stroke	3,417	3,846	4,066	4,316	4,508	4,552	4,812	4,907	43.6%
Sub-total	4,665	5,049	5,190	5,552	5,659	5,654	5,990	6,113	31.0%
Readmission (within 28 days) of Hospitalized Stroke Patients									
Number	104	76	81	102	81	80	82	n/a	-21.2%
Percent	2.10%	1.61%	1.78%	2.17%	1.74%	1.72%	1.75%	n/a	-16.8%
Recurrence (within 365 days) in Hospitalized Stroke Patients									
Number	180	163	140	168	161	150	135	n/a	-25.0%
Percent	3.64%	3.46%	3.07%	3.58%	3.46%	3.22%	2.88%	n/a	-20.9%
Number of Prevalent ACVS Patients									
Hospitalized Ischemic Stroke	21,843	22,465	23,058	23,631	24,237	24,776	25,190	25,603	17.2%
Hospitalized Hemorrhagic Stroke	4,310	4,539	4,788	5,076	5,333	5,622	5,900	6,174	43.2%
Sub-total	26,153	27,004	27,846	28,707	29,570	30,398	31,090	31,777	21.5%
Hospitalized TIA	8,552	8,952	9,219	9,611	9,814	9,982	10,154	10,467	22.4%
Non-hospitalized TIA/Stroke	21,740	23,466	25,349	27,294	29,230	31,243	33,307	35,269	62.2%
Sub-total	30,292	32,418	34,568	36,905	39,044	41,225	43,461	45,736	51.0%
Age-Standardized Incidence / 1,000 Population									
Hospitalized Ischemic Stroke	0.999	0.934	0.870	0.868	0.833	0.800	0.775	0.723	-27.6%
Hospitalized Hemorrhagic Stroke	0.225	0.197	0.188	0.193	0.188	0.185	0.186	0.177	-21.4%
Sub-total	1.231	1.139	1.066	1.069	1.029	0.993	0.968	0.906	-26.4%
Hospitalized TIA	0.306	0.286	0.259	0.278	0.249	0.231	0.237	0.239	-21.8%
Non-hospitalized TIA/Stroke	0.858	0.939	0.962	0.995	1.011	0.995	1.018	1.009	17.5%
Age-Standardized Prevalence / 1,000 Population									
Hospitalized Ischemic Stroke	5.083	5.076	5.046	5.024	4.996	4.946	4.872	4.790	-5.8%
Hospitalized Hemorrhagic Stroke	1.030	1.060	1.083	1.118	1.145	1.175	1.200	1.218	18.2%
Sub-total	6.113	6.136	6.129	6.143	6.141	6.120	6.072	6.008	-1.7%
Hospitalized TIA	1.994	2.026	2.023	2.047	2.026	1.994	1.961	1.960	-1.7%
Non-hospitalized TIA/Stroke	5.338	5.605	5.865	6.138	6.372	6.599	6.819	6.994	31.0%
Conversion Rate from TIA/Non-hospitalized Stroke to Hospitalized Stroke									
90-Day Conversion Rate	3.79%	2.71%	2.41%	2.74%	2.93%	2.67%	2.27%	n/a	-40.2%
365-Day Conversion Rate	5.77%	4.14%	4.08%	4.21%	4.56%	4.03%	3.86%	n/a	-33.1%
Utilization of tPA by Incident Acute Ischemic Stroke Patients									
Number Receiving tPA	n/a	n/a	n/a	n/a	n/a	128	133	156	
Total Number	n/a	n/a	n/a	n/a	n/a	3,788	3,799	3,654	
Proportion of Incident Hospitalized AIS Patients Receiving tPA	n/a	n/a	n/a	n/a	n/a	3.38%	3.50%	4.27%	
Utilization of Acute Care by Incident Ischemic Stroke Patients									
Discharges	4,032	3,889	3,747	3,836	3,801	3,788	3,799	3,654	-9.4%
ALOS	28.95	28.67	27.09	26.71	26.77	26.39	26.41	22.49	-22.3%
Patient Days	116,718	111,488	101,491	102,474	101,761	99,965	100,340	82,171	-29.6%
Utilization of Acute Care by Incident Hemorrhagic Stroke Patients									
Discharges	912	823	815	857	856	871	887	872	-4.4%
ALOS	29.43	27.81	28.27	27.52	30.47	32.61	30.07	25.38	-13.8%
Patient Days	26,841	22,885	23,036	23,588	26,083	28,406	26,675	22,127	-17.6%
Discharge Disposition following Acute Admissions for Incident Ischemic Stroke Patients									
Died	26.8%	24.1%	23.5%	22.6%	23.3%	24.5%	24.7%	21.8%	-18.4%
Discharged to Home	46.8%	47.9%	47.6%	49.2%	46.8%	45.9%	45.7%	49.0%	4.7%
Home with Support Services	9.9%	10.1%	10.6%	10.0%	10.1%	9.8%	10.2%	10.5%	5.7%
Continuing Care Facility	13.8%	15.2%	15.9%	15.7%	16.8%	16.2%	15.7%	13.9%	1.0%
Other	2.7%	2.8%	2.5%	2.5%	3.0%	3.6%	3.6%	4.7%	75.1%
Discharge Disposition following Acute Admissions for Incident Hemorrhagic Stroke Patients									
Died	41.1%	42.9%	42.6%	41.1%	36.9%	40.1%	39.1%	35.2%	-14.4%
Discharged to Home	39.8%	38.5%	36.7%	37.3%	40.7%	36.5%	41.0%	40.4%	1.4%
Home with Support Services	5.4%	5.8%	7.4%	5.8%	7.1%	7.1%	6.3%	6.2%	15.3%
Continuing Care Facility	7.3%	9.6%	9.4%	10.5%	11.0%	11.6%	9.8%	10.7%	45.2%
Other	6.4%	3.2%	3.9%	5.3%	4.3%	4.7%	3.7%	7.6%	19.0%
Mortality Following an Incident Stroke (Hospitalized Ischemic Stroke)									
Crude 30-day In-hospital Mortality Rate	21.0%	18.9%	19.0%	18.2%	18.5%	20.0%	20.1%	18.3%	-12.6%
Crude 31-365 Day Mortality Rate in 30-day In-hospital Survivors	20.5%	19.4%	19.4%	19.8%	21.3%	20.7%	20.4%	19.2%	-6.3%
Mortality Following an Incident Stroke (Hospitalized Hemorrhagic Stroke)									
Crude 30-day In-hospital Mortality Rate	37.4%	39.5%	39.4%	38.9%	34.1%	36.7%	36.3%	32.5%	-13.3%
Crude 31-365 Day Mortality Rate in 30-day In-hospital Survivors	13.7%	16.3%	15.0%	13.8%	13.5%	19.2%	14.4%	14.6%	6.7%

Rehabilitation – Framework for Rehab Facility Roles

The BC Stroke Strategy's Rehabilitation and Reintegration Working Group recommends the adoption of the four facility designations presented in the document Providing Optimal Stroke/Acute Cerebrovascular Syndrome Care in British Columbia: A Clinical Leadership Consensus Statement (December 2008). For the purposes of stroke rehabilitation, the four-level designation system has been adjusted to accurately reflect the rehabilitation service delivery system in BC. It is recommended that each health authority examine their stroke rehabilitation resources and determine their regional stroke rehabilitation facility designations.

A Comprehensive Stroke (Rehabilitation) Centre (Level 1) serves as a major provincial and regional facility and referral destination from other hospitals, providing highly specialized rehabilitation services. A Level 1 Stroke centre provides immediate access to CT and tPA protocols with the ability to manage all levels of stroke including complex patients with a high risk of deterioration and have immediate access to neurosurgical and neuro-interventional (radiology) expertise. Short-term acute and longer-term rehabilitation capability may be present within the Level 1 stroke centre (unit) or in a geographically distinct unit elsewhere in a stand-alone facility in the same campus of care (hospital system).

A Comprehensive Stroke Centre features a comprehensive stroke rehabilitation care team that can offer specialized services such as driving assessments, seating clinics, sexual counseling, vocational rehabilitation, and specialized neuropsychological services. The Comprehensive Stroke Centre may have provincial care responsibilities, offering services to younger or more complex patients.

A Comprehensive Stroke Centre's rehabilitation program would likely have a university and/or research centre affiliation and offer continuing medical and rehabilitation education. These sites would take a leadership role in a provincial Tele-rehab Consulting Pool.

A Regional Stroke (Rehabilitation) Facility (Level 2) serves as a regional referral facility by accepting rehabilitation referral responsibilities from within their health regions. These sites will have access to interdisciplinary rehabilitation teams with specific expertise and ongoing training in stroke care management. Patients may be managed in an Acute Stroke Unit or designated stroke beds, or potentially transferred to a Level 1 facility. Level 2 Stroke Rehabilitation Centres operate with a high degree of organization for stroke services and link closely to Comprehensive Stroke Centres through tele-rehab/tele-medicine for consults with neurologists and rehabilitation specialists. Level 2 sites may contribute to the provincial Tele-rehab Consulting Pool.

A Primary Stroke (Rehabilitation) Facility (Level 3) serves as a referral facility for Stroke Rehabilitation for local community hospitals but not for the region. Level 3 facilities have secondary, interdisciplinary rehabilitation inpatient and outpatient services available to stroke patients and to patients of varying diagnosis other than stroke. Level 3 facilities link with Comprehensive and Regional Stroke Rehabilitation Centres and/or Regional Stroke Centres for stroke education initiatives via Tele-rehab videoconferencing. Sites access medical and allied health stroke expertise through the Tele-rehab Consulting Pool. Complex Stroke patients with high risk of deterioration are transferred to a Level 2 or Level 1 hospital and may be transferred back to the Level 3 facility to receive long-term rehabilitation.

A Community Stroke (Rehabilitation) Facility (Level 4) represents the majority of community hospitals and small health centres in BC that link into the provincial stroke strategy through regional networking, medical and allied health professional education (via Tele-rehab, where appropriate) as well as outreach teams from Comprehensive and/or

Regional Stroke Centres. High risk or complex Stroke patients with a high risk of deterioration are transferred to Level 2 or Level 1 facilities. Stroke survivors may link back with Level 4 facilities for ongoing long-term rehabilitation, following their comprehensive rehabilitation to ensure functional gains are maintained as they age and encounter new life challenges.

Level 4 facilities generally provide primary rehabilitation – by a single discipline or a multidisciplinary team in a non-rehabilitation unit or in an outpatient department. Availability of skilled hospital rehabilitation personnel is necessary in communities where early supported discharge for individuals who have suffered mild strokes is an option and home-based support and rehabilitation are not available.

Clinical Best Practices in Stroke Care & Associated Performance Measures

Referenced from: Canadian best practice recommendations for stroke care (updated 2008) • CMAJ • December 2, 2008; 179 (12). doi:10.1503/cmaj.081148.R2.

TIA/Secondary Prevention

Secondary stroke prevention is an individually-based clinical approach to reducing the risk of recurrent vascular events in individuals who have already experienced a stroke or transient ischemic attack and in those who have one or more medical conditions that place them at high “risk of stroke”. Stroke prevention assessment and education can be provided in a variety of settings – acute care, stroke prevention clinics and community-based care settings. They pertain to patients initially seen in primary care, those who are treated in an emergency department and then released and those who are hospitalized because of stroke or transient ischemic attack.

Pre-Hospital Care

Scope of pre-hospital care is from first patient contact with emergency medical services (e.g., 9-1-1 or local emergency number) to the transfer of care to the receiving facility (e.g., emergency department). Acute stroke is a medical emergency, and optimizing pre-hospital care improves patient outcomes. Emergency medical services play a critical role in pre-hospital assessment and management of patients with suspected stroke. Acute interventions such as reperfusion therapies (clot-busting drugs) are time-sensitive, and therefore strategies such as redirecting ambulances to stroke centers facilitates earlier assessment, diagnosis and treatment, and may result in better outcomes.

Emergency Care

Patients who present with symptoms suggestive of minor stroke or transient ischemic attack must undergo a comprehensive evaluation to confirm the diagnosis and begin treatment to reduce the risk of major stroke as soon as is appropriate to the clinical situation. Hyper acute stroke care is defined as the health care activities that take place from the time of first contact between a patient with potential stroke and medical care until the patient is either admitted to hospital or discharged back into the community.

Inpatient Care

Ideally, patients admitted to hospital because of an acute stroke or transient ischemic attack should be treated in an interdisciplinary stroke unit. Risk for venous thromboembolism, temperature, mobilization, continence, nutrition and oral care should be addressed in all hospitalized stroke patients. Appropriate management strategies should be implemented for areas of concern identified during screening. Discharge planning should also be included as part of the initial assessment and ongoing care of acute stroke patients. Definition of stroke unit varies widely from institution to institution. Where stroke units do not exist that meet the criteria defined in the recommendation, then a hierarchy of other stroke care models could be considered: (1) dedicated stroke unit, (2) designated area within a general nursing unit where clustering of stroke patients occurs, (3) mobile stroke team care and (4) management on a general nursing unit by staff using guidelines and protocols.

Acute Rehab Care

Acute rehab essentially represents two time periods – the first 24-48 hours and 48+ hours in an acute / hospital environment. Protocols and an organized system of stroke care should be in place to enable the rapid transfer of stroke patients from the emergency department to an interdisciplinary stroke unit as soon as possible after the arrival in hospital, ideally within the first three (3) hours. An interdisciplinary team should assess patients within 24-48 hours of hospital admission and formulate a management plan using standardized and valid assessment tools. If not feasible, then mechanisms need to be in place for coordinating the care of stroke patients to ensure application of best practices and optimization of outcome. Post acute (48+ hours) rehabilitation care must be collaborative and guide referral, intake and coordination of inpatient stroke rehabilitation services, and support and educate family members and care givers where possible.

1. Secondary Prevention

Persons at risk of stroke and patients who have had a stroke should be assessed for vascular disease risk factors and lifestyle management issues (diet, sodium intake, exercise, weight, smoking and alcohol intake). They should receive information and counseling about possible strategies to modify their lifestyle and risk factors.

- Healthy balanced diet: high in fresh fruits, vegetables, low-fat dairy products, dietary and soluble fibre, whole grains and protein from plant sources and low in saturated, cholesterol and sodium, in accordance with Canada's Food Guide to Healthy Living;
- Sodium: the recommended daily sodium intake from all sources is the Adequate Intake by age;
- Exercise: moderate exercise (accumulation of 30 to 60 minutes) of walking, jogging, cycling, swimming or other dynamic exercise 4-7 days each week in addition to routine activities of daily living. Medically supervised exercise programs are recommended for high risk patients (those with cardiac disease);
- Weight: Maintain goal of a body mass index (BMI) of 18.5 to 24.0 kg/m² and a waist circumference of <88cm for women and <102 cm for men;
- Smoking: Smoking cessation and a smoke-free environment: nicotine replacement therapy and behavioral therapy. For nicotine replacement therapy, nortriptyline therapy, nicotine receptor partial agonist therapy and/or behavioural therapy should be considered; and
- Alcohol consumption: two or fewer standard drinks per day and fewer than 14 drinks per week for men and fewer than nine drinks per week for women.

a) Blood Pressure Assessment

- All persons at risk of stroke should have their blood pressure measured at each health care encounter but no less than once annually;
- Proper standardized techniques as described by the Canadian Hypertension Education Program should be followed for blood pressure measurement (CHEP);
- Patients found to have elevated blood pressure should undergo assessment for the diagnosis of hypertension following current guidelines of the Canadian Hypertension Education Program; and
- Patients with hypertension or at risk for hypertension should be advised on lifestyle modifications.

b) Blood Pressure Management

- The Canadian Stroke Strategy recommends target blood pressure levels as defined by the Canadian Hypertension Education Program (CHEP) guidelines for prevention of first stroke, recurrent stroke and other vascular events;
- Randomized controlled trials have not yet defined the optimal time to initiate blood pressure lowering therapy after stroke or transient ischemic attack. It is recommended that blood pressure lowering treatment be initiated or modified before discharge from hospital. For patients with non-disabling stroke or transient ischemic attack not requiring hospitalization, it is recommended that blood pressure lowering treatment be initiated or modified at the time of the first medical assessment; and
- For recommendations on specific agents and sequence of agents, refer to the current Canadian Hypertension Education Program Guidelines.

1. Secondary Prevention, cont'd

c) Lipid Assessment

- Fasting lipid levels (total cholesterol, total glycerides, low-density-lipoprotein (LDL) cholesterol, high density lipoprotein (HDL) cholesterol) should be measured every 1-3 years for all men 40 years or older and for women who are postmenopausal and/or 50 years or older. More frequent testing should be performed for patients with abnormal values or if treatment is initiated; and
- Adults at any age should have their blood lipid levels measured if they have a history of diabetes, smoking, hypertension, obesity, ischemic heart disease, renal vascular disease, peripheral vascular disease, ischemic stroke, transient ischemic attack or symptomatic carotid stenosis.

d) Diabetes Assessment

- All individuals in the general population should be evaluated annually for type 2 diabetes risk on the basis of demographic and clinical criteria;
- A fasting plasma glucose should be performed every 3 years in individuals >40 years of age to screen for diabetes. More frequent and/or earlier testing with either a fasting plasma glucose or plasma glucose sample drawn 2 hours after a 75g oral glucose load should be considered in people with additional risk factors for diabetes;
- In adults, fasting lipid levels (total cholesterol, HDL cholesterol, total glycerides and calculated LDL cholesterol) should be measured at the time of diagnosis of diabetes and then every 1-3 years as clinically indicated; and
- Blood pressure should be measured at every diabetes visit.

e) Diabetes Management

- Glycemic targets must be individualized: however, therapy in most patients with type 1 or type 2 diabetes should be targeted to achieve a glycated hemoglobin (HbA1c) level $\leq 7.0\%$ in order to reduce the risk of microvascular complications and in individuals with type 1 diabetes, macrovascular complications;
- To achieve an HbA1c $\leq 7.0\%$, patients with type 1 or type 2 diabetes should aim for a fasting plasma glucose or preprandial plasma glucose targets of 4.0 to 7.0 mmol/l;
- The 2-hour postprandial plasma glucose target is 5.0-10.0mmol/l. If HbA1c targets cannot be achieved with a postprandial target of 5.0-10.0mmol/l, further postprandial blood glucose lowering to 5.0-8.0mmol/l can be considered;
- Adults at high risk of a vascular event should be treated with a statin to achieve an LDL cholesterol ≤ 2.0 mmol/l;
- Unless contraindicated, low dose acetylsalicylic acid (ASA) therapy (80-325 mg/day) is recommended in all patients with diabetes with evidence of cardiovascular disease, as well as for those individuals with atherosclerotic risk factors that increase their likelihood of cardiovascular events;
- ASA, combined ASA (25mg) and extended-release dipyridamole (200mg) or clopidogrel may be used depending on the clinical circumstances;
- For adult patients on ASA, the usual maintenance dosage is 80-325 mg/day and in children, the usual maintenance dosage of ASA is 3-5 mg/kg per day for the prevention on recurrent stroke;
- Long-term combinations of ASA and clopidogrel are not recommended for secondary stroke prevention; and
- Patients with stroke and atrial fibrillation should be treated with warfarin at a target international normalized ratio of 2.5, range 2.0-3.0 (target INR of 3.0 for mechanical cardiac valves, range 2.5 – 3.5), if they are likely to be compliant with the required monitoring and are not at high risk for bleeding complications.

1. Secondary Prevention, cont'd

f) Symptomatic Carotid Stenosis

- Patients with transient ischemic attack or non-disabling stroke and ipsilateral 70-99% internal carotid artery stenosis (measured on a catheter angiogram or by 2 concordant noninvasive imaging modalities) should be offered carotid endarterectomy within 2 weeks of the incident transient ischemic attack or stroke unless contraindicated;
- Carotid endarterectomy is recommended for selected patients with moderate (50-69%) symptomatic stenosis and these patients should be evaluated by a physician with expertise in stroke management;
- Carotid endarterectomy should be performed by a surgeon with a known perioperative morbidity and mortality rate of <6%;
- Carotid stenting may be considered for patients who are not operative candidates for technical, anatomic or medical reasons; and
- Carotid endarterectomy is contraindicated for patients with mild (<50%) stenosis.

g) Asymptomatic Carotid Stenosis

- Patients should be less than 75 years old with a surgical risk of <3%, a life expectancy of >5 years and be evaluated by a physician with expertise in stroke management.

Secondary Prevention Performance Indicators

- Proportion of the population with major risk factors for stroke including hypertension, obesity, history of smoking, low physical activity, hyperlipidemia, diabetes and atrial fibrillation;
- Annual occurrence of stroke based on acute hospital admissions by stroke type;
- Proportion of persons at risk for stroke who had their blood pressure measured at their last health care encounter;
- Proportion of the population diagnosed with elevated blood pressure;
- Proportion of stroke patients assessed for or prescribed lipid-lowering agents for secondary prevention of stroke, either at discharge from acute care, through a secondary prevention clinic or by primary care;
- Proportion of persons with diabetes presenting to hospital with a new stroke event;
- Proportion of patients with stroke or transient ischemic attack prescribed antiplatelet therapy on discharge from acute care;
- Proportion of patients with stroke or transient ischemic attack prescribed antiplatelet therapy on discharge from secondary prevention clinic care;
- Proportion of eligible stroke and transient ischemic attack patients with atrial fibrillation prescribed anticoagulant therapy in discharge from acute care;
- Proportion of stroke and transient ischemic attack patients with atrial fibrillation prescribed anticoagulant therapy after a visit to a secondary prevention clinic;
- Median time from stroke symptom onset to carotid endarterectomy surgery;
- Proportion of stroke patients with moderate to severe (70-99%) carotid artery stenosis who undergo a carotid intervention procedure following an index stroke event; and
- Proportion of stroke patients requiring carotid intervention who undergo the procedure within 2 weeks of the index stroke event.

2. Pre-hospital Care

Patient Transport

- Patients who show signs and symptoms of hyper-acute stroke should be transported without delay to the closest institution that provides emergency stroke care;
- The recommended total time from symptom onset to reperfusion for eligible patients, is usually defined as 4.5 hours. The pre-hospital phase, which starts with symptom onset, and includes on-scene management and should provide clear guidance related to transport decisions to enable patients to arrive at the appropriate stroke center in less than 3.5 hours;
- Direct transport protocols must be in place to facilitate the transfer of eligible patients to the closest and most appropriate facility providing acute stroke care;
- Emergency medical service providers provide coordinated, seamless transport and disposition (land, water and air) of care for acute stroke patients;
- Direct transport protocol criteria must be based on (1) the local ED performance which is recommended as being less than 60 minutes; and (2) the out-of-hospital phase, including symptom duration and anticipated transport duration, being less than 3.5 hours and/or (3) other acute care needs of the patient;
- Patients who are not considered potentially eligible for time-sensitive reperfusion should be transported to the closest appropriate emergency department;
- Direct transport agreements (bypass or redirect) should be in place between emergency medical service providers and regional health authorities and/or receiving facilities; and
- Policies and procedures should be in place between sending and receiving organizations regarding repatriation of patients to the “home” facility, once stabilized.

Assessment & Screening

- The Emergency Medical Services Dispatch System must be set up to categorize patients exhibiting signs and symptoms of a hyper acute stroke as a high priority;
- A standardized acute stroke diagnostic screening tool should be used by paramedics;
- Out-of-hospital patient management should be optimized to meet the needs of suspected acute stroke patients; and
- History of event, including time of onset, signs and symptoms, and previous medical and drug history, must be obtained from the patient if able and/or informant when available.

Pre-Hospital Care Performance Indicators

- Proportion of acute stroke patients who arrive at hospital within 3.5 hours of stroke symptom onset for all stroke types;
- Percentage of (suspected) stroke patients arriving in the emergency department who were transported by emergency medical services (BC ambulance);
- Time from initial call received by emergency dispatch centre to emergency medical services arrival on patient scene;
- Proportion of patients arriving by ambulance who bypassed another hospital (s) to arrive at the treating hospital; and
- Percentage of potential stroke patients transported by emergency medical services who received a final diagnosis of stroke or transient ischemic attack during hospital stay (in the emergency department or as an inpatient).

3. Emergency Care

Assessment

The recommended total time from symptom onset to reperfusion for eligible patients, is usually defined as 4.5 hours. This is broken into 2 phases: pre-hospital and ED. The current evidence shows that emergency department phase should be less than 60 minutes.

- All patients with suspected transient ischemic attack or minor stroke should have an immediate clinical evaluation and additional investigations as required to establish the diagnosis, rule out stroke mimics and develop a plan of care;
- Use of standardized risk stratification tools at the initial point of health care contact – whether first seen in primary, secondary or tertiary care – should be used to guide the triage process;
- Patients with suspected transient ischemic attack or minor stroke should be referred to a designated stroke prevention clinic or to a physician with expertise in stroke assessment and management, or, if these options are not available, to an emergency department that has access to neurovascular imaging facilities and stroke expertise;
- Patients with suspected transient ischemic attack or minor stroke require brain imaging with CT or magnetic resonance imaging (MRI). Emergent patients (those patients classified at highest risk of recurrent stroke) should have neurovascular imaging within 24 hours, and patients classified as urgent should have neurovascular imaging within 7 days;
- Patients who may be candidates for carotid revascularization should have computed tomographic angiography (CTA), magnetic resonance angiography (MRA), or a carotid duplex ultrasound as soon as possible (within 24 hours for emergent patients, and 7 days for urgent patients);
- The following investigations should be undertaken routinely for patients with suspected transient ischemic attack or minor stroke: complete blood count, electrolytes, renal function, cholesterol level, glucose level, and electrocardiography; and
- Patients with suspected transient ischemic attack or minor stroke with confirmed cerebral infarction on brain imaging should undergo a comprehensive outpatient assessment(s) for functional impairment, which includes a cognitive evaluation, screening for depression, screening of fitness to drive, as well as functional assessments for potential rehabilitation treatment, preferably within 2 weeks.

Management

- All patients with transient ischemic attack or minor stroke not on an antiplatelet agent at time of presentation should be started on antiplatelet therapy immediately after brain imaging has excluded intracranial hemorrhage. The initial dose of ASA should be at least 160 mg. For clopidogrel the loading dose is 300 mg;
- Patients with transient ischemic attack or minor stroke and >70% carotid stenosis and select patients with acutely symptomatic 50% - 69% carotid stenosis on the side implicated by their neurologic symptoms, who are otherwise candidates for carotid revascularization, should have carotid endarterectomy performed as soon as possible, within 2 weeks;
- Patients with transient ischemic attack or minor stroke and atrial fibrillation should begin anticoagulation using warfarin immediately after brain imaging has excluded intracranial hemorrhage, aiming for a target therapeutic international normalized ratio of 2 to 3;
- All risk factors for cerebrovascular disease must be aggressively managed, through both pharmacologic and non-pharmacologic means, to achieve optimal control; and
- Patients with transient ischemic attack or minor stroke who smoke cigarettes should be strongly counseled to quit immediately, and be provided with the pharmacologic and non-pharmacologic means to do so.

3. Emergency Care, cont'd

Neurovascular Imaging

- All patients with suspected acute stroke or transient ischemic attack should undergo brain imaging immediately (Evidence Level A) (ASA, CSQCS). In most instances, the initial modality of choice is a non-contrast CT scan;
- Vascular imaging should be done as soon as possible to better understand the cause of the stroke event and guide management decisions. Vascular imaging may include CT angiography, magnetic resonance angiography, catheter angiography and duplex ultrasonography;
- If MRI is performed, it should include diffusion-weighted sequences to detect ischemia and gradient echo and fluid-attenuated inversion recovery (FLAIR) sequences to determine extent of infarct or presence of hemorrhage; and
- Carotid imaging should be performed within 24 hours of a carotid territory transient ischemic attack or non-disabling ischemic stroke (if not done as part of the original assessment) unless the patient is clearly not a candidate for carotid endarterectomy.

Blood Glucose Abnormalities

- All patients with suspected acute stroke should have their blood glucose concentration checked immediately;
- Blood glucose measurement should be repeated if the first value is abnormal or if the patient is known to have diabetes. Hypoglycemia should be corrected immediately;
- Elevated blood glucose concentrations should be treated with glucose-lowering agents.

Acute ASA (Aspirin) Therapy

- All acute stroke patients should be given at least 160 mg of ASA immediately as a one-time loading dose after brain imaging has excluded intracranial hemorrhage; and
- ASA (80-325 mg daily) should be continued indefinitely or until an alternative antithrombotic regime is started.

Acute Thrombolytic Therapy (tPA)

- All patients with disabling acute ischemic stroke who can be treated with 4.5 hours after symptom onset should be evaluated without delay to determine their eligibility for treatment with intravenous tissue plasminogen activator (tPA or alteplase);
- All eligible patients should receive intravenous alteplase within 1 hour of hospital arrival (door-to-needle time <60 minutes); and
- Administration of alteplase should follow the American Stroke Association (ASA) guidelines: total dose 0.9 mg/kg with 10% (0.09 mg/kg) given as an intravenous bolus over 1 minute and the remaining 90% (0.81 mg/kg) given as an intravenous infusion over 60 minutes.

Management of Subarachnoid and Intracerebral Hemorrhage

- Patients with suspected subarachnoid hemorrhage should have an urgent neurosurgical consultation for diagnosis and treatment;
- Patients with cerebellar hemorrhage should have an urgent neurosurgical consultation for consideration of craniotomy and evaluation of the hemorrhage; and
- Patients with supratentorial intracerebral hemorrhage should be cared for on a stroke unit.

3. Emergency Care, cont'd

Emergency Care Performance Indicators

- Proportion of patients with TIA who are discharged from the ED with a referral to a designated hospital-based or community secondary prevention clinic;
- Time from first encounter with medical care (primary care or emergency department) to neurologic assessment by a stroke expert;
- Distribution of Canadian neurological scale scores by stroke type;
- Proportion of stroke patients who receive a brain CT or MRI within 25 minutes of hospital arrival (if tPA eligible);
- Proportion of stroke patients who receive a brain CT or MRI within 24 hours of hospital arrival;
- Proportion of stroke patients who receive a brain CT or MRI before hospital discharge;
- Proportion of all tPA stroke patients who receive acute thrombolytic therapy (tPA) within one hour of hospital arrival. (Also mean DTN time);
- Proportion of patients in rural or remote communities who receive tPA through the use of telestroke technology (as a proportion of all ischemic stroke cases in that community and as a proportion of all telestroke consults for ischemic stroke cases);
- Proportion of ischemic stroke patients who receive acute ASA therapy within the first 48 hours of hospital arrival; and
- Proportion of patients with a documented assessment/screen for dysphagia before being given food or drink.

4. Inpatient Care

Stroke "Unit" Care

A stroke unit is a specialized, geographically defined hospital unit dedicated to the management of stroke patients during the first 7 to 10 days (may be longer) following an acute stroke event. A key difference with cohorted stroke beds is the presence of an interdisciplinary stroke team on the unit.

The core interdisciplinary team should consist of clinicians with appropriate levels of expertise in medicine, nursing, occupational therapy, physiotherapy, speech–language pathology, social work and clinical nutrition. Additional disciplines may include pharmacy, (neuro)psychology and recreation therapy.

The interdisciplinary team should assess patients within 48 hours of admission and formulate a management plan. Identified components of in-patient assessment should include:

- medical evaluation and diagnostic testing;
- early assessment of rehabilitation needs;
- early management policies relating to mobilization, prevention of complications, treatment of hypoxia, hyperglycemia, fever and hydration; and
- Clinicians should use standardized, valid assessment tools to evaluate the patient's stroke-related impairments and functional status.

Components of Acute Inpatient Care

Risk for venous thrombo-embolism, temperature, mobilization, continence, nutrition and oral care should be addressed for all hospitalized stroke patients. Appropriate management strategies should be implemented for areas of concern identified when screening. Further, discharge planning should be included as part of initial assessment and ongoing care of patients.

4. Inpatient Care, cont'd

Venous Thrombo-embolism Prophylaxis

- All stroke patients should be assessed for their risk of developing venous thrombo-embolism (including deep vein thrombosis and pulmonary embolism). Patients considered as high risk include patients with inability to move one or both lower limbs and those patients unable to mobilize independently;
- Patients who are identified as high risk for venous thrombo-embolism should be considered for prophylaxis provided there are no contraindications;
- Early mobilization and adequate hydration should be encouraged with all acute stroke patients to help prevent venous thrombo-embolism;
- The use of secondary stroke prevention measures, such as antiplatelet therapy, should be optimized in all stroke patients; and
- For patients with hemorrhagic stroke, non-pharmacologic means of prophylaxis (as described above) should be considered to reduce the risk of venous thrombo-embolism.

Temperature

- Temperature should be monitored as part of routine vital sign assessments (every 4 hours for first 48 hours and then as per ward routine or based on clinical judgment);
- For temperature greater than 37.5°C, increase frequency of monitoring and initiate temperature reducing measures;
- Sources of fever should be treated and antipyretic medications administered to lower temperature in febrile patients with stroke to <38°C; and
- In case of fever, the search for a possible infection (site and cause) is recommended, in order to start tailored antibiotic treatment.

Mobilization

- Mobilization is defined as “the act of getting a patient to move in the bed, sit up, stand, and eventually walk;”
- All people admitted to hospital with acute stroke should be mobilized as early and as frequently as possible and preferably within 24 hours of stroke symptom onset, unless contraindicated;
- Within the first 3 days after stroke, blood pressure, oxygen saturation and heart rate should be monitored before each mobilization; and
- All people admitted to hospital with acute stroke should be assessed by rehabilitation professionals as soon as possible after admission – preferably within the first 24 to 48 hours.

Contenance

- All stroke patients should be screened for urinary incontinence and retention, fecal incontinence and constipation;
- Stroke patients with urinary incontinence should be assessed by trained personnel using a structured functional assessment;
- The use of indwelling catheters should be avoided. If used, indwelling catheters should be assessed daily and removed as soon as possible;
- A bladder training program should be implemented in patients who are incontinent of urine;
- The use of portable ultrasound is recommended as the preferred non-invasive painless method for assessing post void residual and eliminates the risk of introducing urinary infection or causing urethral trauma by catheterization; and
- A bowel management program should be implemented in stroke patients with persistent constipation or bowel incontinence.

4. Inpatient Care, cont'd

Nutrition

- The nutritional and hydration status of stroke patients should be screened within the first 48 hours of admission using a valid screening tool;
- Results from the screening process should guide appropriate referral to a dietitian for further assessment and the need for ongoing management of nutritional and hydration status.
- Stroke patients with suspected nutritional and/or hydration deficits, including dysphagia, should be referred to a dietitian for:
 - recommendations to meet nutrient and fluid needs orally while supporting alterations in food texture and fluid consistency based on the assessment by a speech–language pathologist or other trained professional; and
 - consideration of enteral nutrition support (tube feeding) within 7 days of admission for patients who are unable to meet their nutrient and fluid requirements orally. This decision should be made collaboratively with the multidisciplinary team, the patients, and their caregivers and families.

Oral Care

- All stroke patients should have an oral/dental assessment, which includes screening for obvious signs of dental disease, level of oral care and appliances, upon or soon after admission;
- For patients wearing a full or partial denture it must be determined if they have the neuro motor skills to safely wear and use the appliance(s);
- An appropriate oral care protocol should be used for every patient with stroke, including those who use dentures. An oral care protocol should address areas including frequency of oral care (twice per day or more), types of oral care products (toothpaste, floss and mouthwash) and specific management for patients with dysphagia and should be consistent with current recommendations of the Canadian Dental Association;
- If concerns are identified with implementing an oral care protocol, consider consulting a dentist, occupational therapist, speech–language pathologist and/or dental hygienist; and
- If concerns are identified with oral health and/or appliances, patients should be referred to a dentist for consultation and management as soon as possible.

Discharge Planning

- Discharge planning should be initiated as soon as possible after patient admission to hospital (emergency department or inpatient care);
- A process should be established to ensure involvement of patients and caregivers in the development of the care plan, management and discharge planning;
- Discharge planning discussions should be ongoing throughout hospitalization to support a smooth transition from acute care; and
- Information about discharge issues and possible needs of patients following discharge should be provided to patients and caregivers soon after admission. Components of effective discharge planning should include: family and team meetings, care plans, pre-discharge needs assessment, care-giver training, post-discharge follow-up, information and education, liaison with community resources, review of patient and caregiver psychological and support needs.

4. Inpatient Care, cont'd

Inpatient Care Performance Indicators

- Number of stroke patients treated/managed in designated stroke beds at any time during their inpatient hospital stay for an acute stroke event as a percentage of total number of stroke patients admitted to hospital;
- Percentage of stroke patients discharged to their home or place of residence following an inpatient admission for stroke;
- Percentage of inpatients with stroke who experience complications during inpatient stay (pneumonia, venous thrombo-embolism, gastrointestinal bleed, secondary cerebral hemorrhage, pressure ulcers, urinary tract infection, pulmonary embolus, seizures or convulsions);
- Length of stay for stroke patients admitted to hospital (Acute & Long Stay);
- Proportion of acute ischemic stroke patients discharged on antithrombotic therapy unless contraindicated;
- Proportion of acute stroke patients with atrial fibrillation who are treated with anti-coagulant therapy unless contraindicated;
- Proportion of patients who receive carotid imaging during hospitalization or have documentation to have tests completed as outpatient following hospital discharge; and
- Proportion of stroke patients who are assessed for and prescribed a blood-pressure lowering agent.

5. Acute Inpatient Rehabilitation

- Patients admitted to hospital because of an acute stroke or transient ischemic attack should be treated in an interdisciplinary stroke unit, ideally within 3 hours of presentation to the Emergency Department;
- Where admission to a stroke rehabilitation unit is not possible, a less optimal solution is inpatient rehabilitation on a mixed rehabilitation unit (i.e., where interdisciplinary care is provided to patients disabled by a range of disorders including stroke);
- The interdisciplinary rehabilitation team may consist of a physician, nurse, physical therapist, occupational therapist, speech–language pathologist, psychologist, recreation therapist, patient and family/caregivers;
- All patients admitted to hospital with acute stroke and transient ischemic attack (TIA) should have an initial rehabilitation assessment (within the first 24-48 hours after admission) by relevant rehabilitation professionals. Using standardized, valid assessment tools, this assessment should evaluate the patient's stroke-related impairments and functional status and result in a comprehensive, individualized rehabilitation plan which reflects the severity of the stroke and the needs and goals of the stroke patient;
- Appropriate management strategies should be implemented for areas of concern identified during screening. Discharge Planning should also be included as part of the initial assessment and ongoing care of acute stroke patients;
- Comprehensive, evidence-based, written protocols, order sets and care pathways/algorithms should be in place to guide acute stroke care and rehabilitation;
- All stroke survivors (excluding TIAs) who are discharged home from acute care need to undergo an ambulatory or home-based screening assessment, which includes a medical, functional, and cognitive assessment by professionals with expertise in stroke, preferably within two weeks; and
- Education that is integrated and coordinated should be provided in a timely manner to families and caregivers and reflect the phase of care or recovery in the care continuum for all patients and be appropriate to patient, family, and caregiver readiness and needs.

5. Acute Inpatient Rehabilitation, cont'd

Acute Inpatient Rehabilitation Performance Indicators

- Proportion of ischemic stroke or TIA patients who received a rehabilitation assessment within 48 hours of hospital arrival;
- Proportion of acute stroke patients discharged from acute care to inpatient rehabilitation care;
- Final discharge disposition for stroke survivors following inpatient rehabilitation: percentage discharged to their original place of residence; percentage discharged to a long-term care facility or nursing home; percentage requiring readmission to an acute care hospital for stroke-related causes (core);
- Number of stroke patients assessed by physiotherapist, occupational therapist, speech–language pathologist and social workers during inpatient rehabilitation; and
- Proportion of patients who are discharged from acute care who receive a referral for home care/community support services.



Ministry of Health Services

