

Innovations in Stroke Care

A Powerful Business Case for
Priority Interventions in British Columbia



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STROKE
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Priority Interventions in British Columbia

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Executive Summary

Stroke is the number one cause of acquired long-term disability in adults in British Columbia. Each year, there are more than 6600 strokes from which over 2000 victims die, 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 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 significant costs to the health care system and to the quality of life of stroke survivors. Stroke is estimated to cost British Columbia \$327 million in direct costs each year¹. These costs will increase dramatically as the population ages. Older stroke patients require longer lengths of stay in acute care and have increased potential for disability.

The business case is based on a commitment by the Heart and Stroke Foundation, the Stroke Recovery Association, the Canadian Stroke Strategy, health care experts and the health authorities to improve the prevention and treatment of stroke in the province. Two Stroke Summits, held in July 2006 and January 2007, identified nine priority interventions to be included in the business case including:

- Hypertension and public awareness campaigns to decrease risk factors for stroke.
- Increasing the role of general practitioners in diagnosing and treating patients at risk, and those who have had a stroke or TIA.
- Telemedicine to increase the capacity of the health care system to better manage stroke.
- Secondary stroke prevention linked to risk reduction and patient management.
- Implementing stroke wards and stroke teams to optimize care in health care facilities.
- Sustaining implementation of the emergency department protocol for stroke and TIA.
- Educating health care providers on how best to diagnose, treat and manage stroke patients.
- Increase regional capacity for rehabilitation of stroke patients.
- Implementing an evaluation program to measure progress toward targets.

A provincial stroke coordinator, establishing a stroke registry and stroke collaboratives to plan implementation of secondary prevention functions and rehabilitation programs are also included in the business case.

The business case compliments the province's priorities for chronic disease management and primary care. Actions will be taken to reduce hypertension, which is a major risk factor for many chronic conditions. Reducing the incidence of stroke will also mean a reduction in related chronic diseases including congestive heart failure, renal disease, kidney disease and dementia.

¹ This is a conservative estimate as BC has a higher percentage of people over age 65 than Ontario (13.7% vs 12.8%), (Statistics Canada, <http://www40.statcan.ca/101/cst01/demo31a.htm>).

Priorities outlined in the business case for implementation are summarized in Table 1:

Table 1

Business Case Priorities for Action

Action	Implementation
Primary Prevention	Primary prevention guidelines for general practitioners (GPs). Provide a fee incentive for GPs for CVD and stroke risk management. Education on the signs, symptoms and risk factors for stroke. Implement an online hypertension risk assessment program. Facilitate self-assessment and self management of hypertension. Education for GPs and health care providers.
Emergency Department Protocol	Establish resources in each health authority to sustain implementation and integration of the emergency department protocol for stroke and TIA.
Telehealth and Teleradiology	Complete a Canada Infoway cost share study to determine system requirements for improving telemedicine. Expand the capacity of teleradiology for neurologists to diagnose hot stroke province-wide.
Acute Stroke Management	Designate health care facilities for treating stroke. Establish stroke units and stroke teams in designated health care facilities. Establish care pathways for treatment and transfer of stroke patients to accelerate care and reduce length of stay.
Primary Care	Provide a fee incentive for general practitioners (GPs) for stroke risk factor assessment and case management. Establish an education program on stroke for GPs and health care professionals. Support regional best practice forums for health care providers.
Secondary Stroke Prevention	Establish secondary stroke prevention functions in conjunction with risk reduction clinics and chronic disease management. Establish a secondary prevention guideline for GPs to help manage stroke/TIA survivors.
Stroke Rehabilitation	Implement a health collaborative to determine how best to organize rehab facilities in each health authority.
Community Re-integration	Leverage the support and role of the Stroke Recovery Association to work with stroke survivors on community re-integration.
Coordination	Establish a provincial stroke coordinator and steering committee Setup a stroke registry in conjunction with the cardiac registry. Designate stroke managers in each health authority.
Evaluation	Develop measurement indicators to evaluate improvements in patient outcomes, reductions in stroke disease and avoided costs. Implement a program of data collection and reporting.

The projected cost for implementing the business case is summarized in Table 2. The fee incentive for GPs, which may be implemented by the government, along with contributions by the Heart and Stroke Foundation and the private sector will contribute \$5.1 million of the total budget. This leaves \$9.87 million to be funded by the province over three years to improve stroke prevention and care in British Columbia.

Table 2

Stroke Business Case Funding Summary

	2007	2008	2009	Total
Total Funding Required for the Business Case	\$4,730,000	\$5,392,500	\$4,847,500	\$14,970,000
GP Incentive	-\$1,200,000	-\$1,200,000	-\$1,200,000	-\$ 3,600,000
NGO Contribution	-\$ 250,000	-\$ 250,000	-\$ 250,000	-\$ 750,000
Private Sector	-\$ 250,000	-\$ 250,000	-\$ 250,000	-\$ 750,000
Net Funding Required	\$3,030,000	\$3,692,500	\$3,147,500	\$9,870,000

Investing nearly \$10 million to improve stroke prevention and care will result in significant savings of scarce health care dollars and lives. To determine the financial and societal benefits, the economic model used by the Canadian Stroke Strategy (CSS) was applied to the business case². The results of the economic analysis are shown in Table 3.

Over three years, 6100 strokes will be prevented, 2,200 life years gained and \$160 million in health care costs will be avoided. The benefits rise exponentially. After five years, 10,300 potential new strokes will be averted, 7,100 life years will be gained and \$420 million in health care costs will be avoided. By year 10, avoided health care costs reach \$1.3 billion (Figures 1 and 2).

Table 3

Health Care and Financial Outcomes

	Implementation over 3 Years	Implementation Over 5 Years	Implementation Over 10 Years
Initial strokes prevented	6,100	10,300	21,600
Secondary strokes prevented	1,100	2,600	8,100
Stroke deaths prevented (initial strokes)	1,100	1,800	3,600
Stroke deaths prevented (recurrent strokes)	230	600	1,100
Disabling strokes prevented	3,100	5,500	11,800
Net Avoided Cost	\$160 Million	\$420 Million	\$1.3 Billion
Life years gained	2,200	7,100	28,000
Quality adjusted life years gained	5,500	15,000	53,000

These savings do not include those generated by reductions in cardiac disease, renal failure and dementia which would be expected from preventive therapies applied to those at risk of stroke.

² The economic model was developed for the CSS by health care experts from the Regional Stroke Centre at the Ottawa Hospital and the University of Ottawa, and in association with Caro Research Institute, an independent consulting firm specializing in disease modeling and economic analysis.

Fig. 1

Net Economic Benefit from Business Case Investment

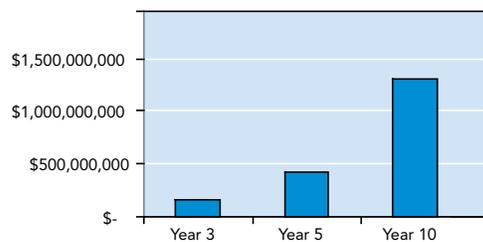
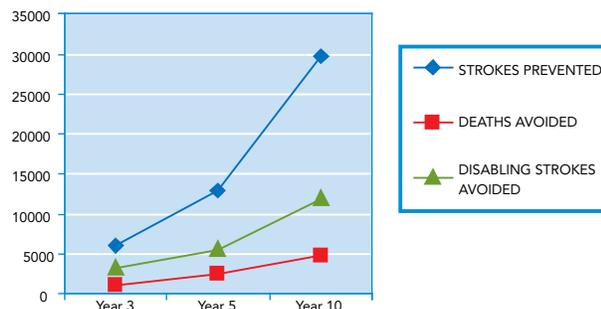


Fig. 2

Strokes Prevented, Deaths and Disabling Strokes Avoided



Despite solid evidence, prevention measures, stroke treatments and health practices that could save thousand of lives and millions in health care costs are not being used in British Columbia. These include establishing a network of designated stroke hospitals around the province, proactively engaging the public in managing hypertension, improving awareness of the signs and symptoms of stroke, using organized stroke units to treat patients, use of clot-busting therapies, managing secondary stroke prevention and improving access to resources for rehabilitation. The lack of organization for stroke prevention and care is costing the province millions of dollars each year.

Stroke is highly preventable and treatable with the interventions available within the community and the health care system. But to be effective, interventions must be organized and the basic resources provided to enable both the health care system, the public and patients to respond.

The business case sets a course for an integrated approach to organized stroke care in British Columbia. The results will be dramatic – 1100 lives saved, 6100 fewer strokes and \$160 million in net avoided health care costs in just three years; in ten years, 8100 lives will be saved, 21,600 strokes prevented and \$1.3 billion in avoided health care costs will be achieved.

The Heart and Stroke Foundation, the Canadian Stroke Network, health authorities and other non-government organizations are committed to making improvements in stroke care. While some improvements are operational and can be made using existing resources, an investment is required to make system-wide changes. Nine priority areas were identified for improvement in stroke prevention and care at the July 2006 Stroke Summit. Further analysis has identified specific actions that require an additional investment by the provincial government of approximately \$10 million over three years. By providing this funding and leadership, the provincial government will take a significant step forward to achieve its goals of improving the health and wellness of British Columbians, in establishing high quality patient care and in contributing to a sustainable and affordable health care system in the years to come.

1. Overview

This report sets out the business case for investing in stroke prevention and care in the Province of British Columbia. Priorities outlined in the business case were established at the July 2006 Stroke Summit, and with the participation of health authorities, the Province of British Columbia, the Heart and Stroke Foundation of BC and Yukon and other non-government organizations.

The business case identifies specific interventions in each of the nine priorities areas, and across the continuum of stroke care. Interventions focus on evidence-based best practices outlined in the Heart and Stroke Foundation's BC Stroke Strategy 2005¹ and the Canadian Best Practice Recommendations for Stroke Care 2006². Health care experts were also consulted to help identify specific actions in each of the nine priority areas.

The justification for making improvements in stroke care is indisputable and well documented. While health authorities in BC have made important strides over the past year, the province continues to be well behind other jurisdictions in addressing the gaps in stroke prevention and care. There is overwhelming evidence of a lack of protocols, and facilities and services in BC to properly diagnose, treat, rehabilitate and re-integrate stroke patients. Yet other jurisdictions have demonstrated significant financial and health care benefits from an organized and coordinated approach to managing stroke.

The business case is presented by the Heart and Stroke Foundation of BC and Yukon (Heart and Stroke Foundation). The Canadian Stroke Network (CSN), in association with the University of Ottawa and the Caro Research Institute, provided the modeling that confirms the net economic benefits of implementing the business case. The economic analysis clearly shows that investing in stroke, coupled with the province's investment in chronic disease management and primary care, and various health authority initiatives, will have a net economic return of \$160 million to British Columbia over three years, and \$420 million over five years.

The province has a unique opportunity to play a leadership role in improving the prevention and treatment of stroke. Total funding required to implement the business case is \$14,970,000. Of this total amount, the government's fee incentive for general practitioners along with partnerships and private sector participation amounts to \$5,100,000. **Therefore, the request to the provincial government is a modest \$9,870,000 over three years to achieve significant economic and health care benefits valued at over \$160 million in just three years.**

The province has a unique opportunity to play a leadership role in improving the prevention and treatment of stroke.

1 Heart and Stroke Foundation of BC and Yukon, 2005, British Columbia Stroke Strategy, Context Research Ltd., November 2005

2 Canadian Stroke Strategy, 2006, Canadian Best Practice Recommendations for Stroke Care: 2006, CSS Best Practices and Standards Working Group

2. Background

Each year in British Columbia, there are more than 6600¹ strokes from which over 2000 victims die, 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. As a result, stroke is the number one cause of acquired long-term disability in adults.

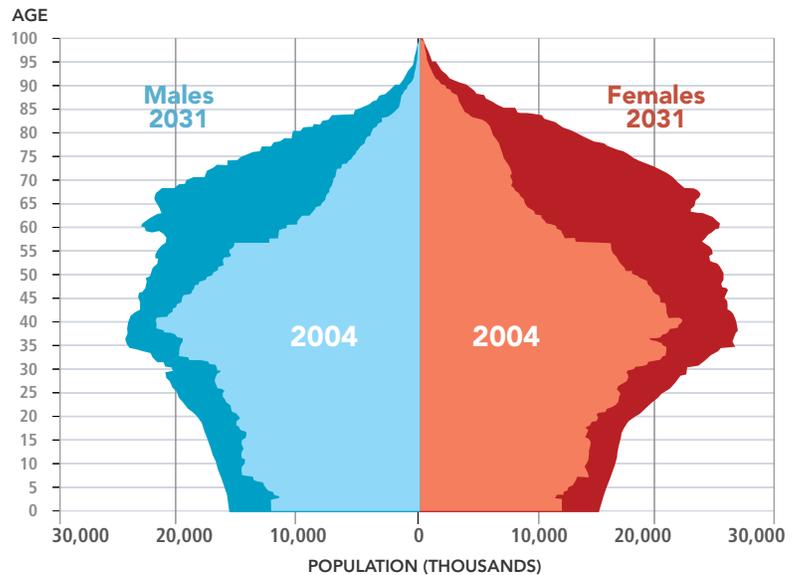
The overall incidence of stroke is strongly linked with age. Figure 1 shows the change in the age composition of the BC population over the next twenty years. The ‘greying’ of the population will result in an increase in the rate of stroke, which will have significant consequences for British Columbia’s health care system. Older stroke patients require longer lengths of stay in acute care and have increased potential for disability.

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 significant costs to the health care system and to the quality of life of stroke survivors. These costs are estimated at \$4 to \$5 billion annually in Canada, and about \$327 million in direct costs for British Columbia.

Stroke is a highly preventable and treatable disease with the interventions currently available.

Fig. 1

Demographic Profile



Source: Urban Futures Institute

¹ The number of strokes is based only on admitted stroke patients and does not take into account stroke victims who are not admitted to hospital. The actual number of strokes in BC is very likely much higher.

Recognizing the impact of stroke to the health care system, the economy and the community, the Heart and Stroke Foundation developed a British Columbia Stroke Strategy in 2005. The Strategy identified specific recommendations necessary to improve stroke prevention and care.

Following the development of the Stroke Strategy in 2005, the Heart and Stroke Foundation and the Ministry of Health co-sponsored a Stroke Summit in July 2006. Participants at the Summit identified the following nine priorities to be included in an action plan and business case for stroke:

- Hypertension and public awareness campaigns to decrease risk factors for stroke.
- Increasing the role of general practitioners in diagnosing and treating patients at risk, and those who have had a stroke or TIA.
- Telemedicine to increase the capacity of the health care system to better manage stroke.
- Secondary stroke prevention linked to risk reduction and patient management.
- Implementing stroke wards and stroke teams to optimize care in health care facilities.
- Sustaining implementation of the emergency department protocol for stroke and TIA.
- Educating health care providers on how best to diagnose, treat and manage stroke patients.
- Increase regional capacity for rehabilitation of stroke patients.
- Implementing an evaluation program to measure progress toward targets.

The business case outlines the actions to be implemented in each of the nine priority areas, along with a budget estimate and a projection of the economic and societal benefits.



3. Business Case Methodology

The process for developing the business case involved the following key steps:

- Step 1:** For each priority identified at the July 2006 Summit, health care experts (Appendix A) were interviewed to help further define each area and to identify specific implementation initiatives.
- Step 2:** Cost estimates for implementing initiatives under each priority area were developed for input to the economic model.
- Step 3:** The economic model, developed by the University of Ottawa and Caro Research Institute, was calibrated to reflect BC population demographics, health care utilization measures, and the incidence of stroke and transient ischemic attacks (TIAs).
- Step 4:** The economic model was used to provide a cost/benefit analysis for implementing the combined initiatives within the nine priorities.
- Step 5:** The initial results of the cost/benefit analysis were presented to a second stroke summit on January 25, 2007. Input received at this session was used to finalize the business case.
- Step 6:** The business case was presented to the Minister and the Ministry of Health for funding consideration.

4. Context for the Stroke Business Case

The business case supports the government's *Five Great Goals for a Golden Decade* designed to place British Columbia at the top in literacy, healthy living, social support, environmental management and job creation.

Two of the goals that relate to improvements in stroke care include:

1. Lead the way in North America in healthy living and physical fitness.
2. Build the best system of support in Canada for persons with disabilities, those with special needs, children at risk and seniors.

More specifically, the business case complements the Ministry of Health Service Plan goals of:

- Improved health and wellness for British Columbians.
- High quality patient care.
- A sustainable, affordable, publicly-funded health system.

The business case is also directly aligned with the activities of the health authorities and the government's priorities for improving chronic disease management (CDM) and primary care. Health authorities have made significant progress in taking action on improvements in stroke care. Vancouver Coastal Health has established a Coordinator for stroke, and has a strategy and implementation program in place. Vancouver Island Health has assigned a Manager for the stroke program, and has completed a stroke charter to guide system changes across the continuum of care. Fraser Health has also initiated improvements in stroke care, including plans to integrate stroke risk management with plans for a pilot risk reduction clinic.

Stroke is a chronic condition¹ that fits within the province's approach to chronic disease management and improvements in primary care. Stroke shares many of the same risk factors as other chronic conditions, and many of these risk factors are modifiable, including physical inactivity, poor diet and smoking. Other risk factors such as diabetes, hypertension, atherosclerosis, atrial fibrillation and ischemic heart disease are predisposing conditions that need to be carefully managed. Implementing the business case will result in real action to better assess patients at risk and to help manage stroke survivors through their recovery and re-integration to the community.



Stroke is a chronic condition that fits within the province's approach to chronic disease management and improvements in primary care.

¹ Chronic disease is defined as a disease which is permanent and leaves residual disability; requires a person to receive special training for rehabilitation; or is expected to require a long period of supervision, observation, or care.



The business case is aligned with the chronic care model and primary prevention in that it initiates real changes that include:

1. **Primary prevention strategies:** addressing hypertension and public awareness of preventable risk factors (e.g., healthy eating, physical exercise, obesity, tobacco control), and providing general practitioners (GPs) with education and incentives to diagnose and treat stroke efficiently.
2. **Community actions:** the public awareness and hypertension campaigns will help to prevent stroke as well as other chronic conditions such as congestive heart failure, renal disease, diabetes and dementia.
3. **Community supports** will be leveraged and strengthened through the role of the Heart and Stroke Foundation, Stroke Recovery Associations and health authorities.
4. **Health system actions:**
 - Clinical Transformation: quality improvement initiatives include developing basic guidelines and protocols for risk factor and patient management, implementing an emergency department protocol and establishing secondary stroke prevention functions to expedite care and manage patient outcomes.
 - Information & Technology Transformation: health care information is vital to the treatment and management of stroke patients. A stroke registry, as part of the cardiac registry, is proposed, along with improvements to telehealth and teleradiology to improve the diagnosis of acute stroke, patient management, and education.
 - Delivery System Design: designating stroke treatment facilities in health authorities, and establishing stroke wards and stroke teams will significantly improve health outcomes.
 - Health care savings through reduced length of hospital stay, shorter rehabilitation times and fewer readmissions, as well as reduced incidence of dementia, congestive heart failure and diabetes.

5. Intended Outcomes

Implementing the business case will be a major step toward meaningful action on furthering the prevention of chronic disease and improving patient care. Significant benefits for British Columbians include:

- Thousands of lives saved over both the short term (3 years) and the long term (10 years).
- Major financial savings in expenditures now required for health care, which can be used by the government to address other priorities.
- Improved public awareness about the signs and symptoms of stroke, and self management of risk factors such as hypertension, that have direct benefits to other chronic conditions.
- Reduced mortality and morbidity, and increased quality of life for stroke patients by early intervention and improved care and reintegration.
- Reduced prevalence and incidence of stroke by up to 50%.
- Improved rehabilitation and community re-integration by leveraging community resources.
- Improved best practices through early intervention and implementation of practice guidelines.
- Reductions in cardiac disease, renal failure and dementia resulting from preventive therapies applied to those at risk of stroke.

6. Business Case Priority Actions

The nine priority actions presented in the business case cross the continuum of stroke care. All priorities are evidence based, focus on expanding the current capacity of the health care system and reflect system-wide improvements for preventing and managing stroke.

Priorities are interdependent and are presented for implementation as a combined program. That is, the economic and societal benefits will only be maximized through the combined implementation of all actions, including the province's work in chronic disease management and primary care, and the work of the health authorities.

6.1 Health Promotion & Primary Prevention

The high prevalence of stroke risk factors in the Canadian population requires strategies to reduce the risk of stroke at both a population and an individual level. This includes improving public awareness of modifiable risk factors (e.g., physical inactivity, smoking, obesity) for preventing strokes, taking action on hypertension and providing support to general practitioners.

Implementing a public awareness campaign to decrease the risk of stroke includes a hypertension and a public awareness campaign.

6.1.1 Hypertension Campaign

Best Practice Recommendation:

- All persons at risk of stroke should have their blood pressure measured at each healthcare encounter.
- Patients found to have elevated blood pressure should undergo thorough assessment for the diagnosis of hypertension following the current guidelines of the Canadian Hypertension Education Program.

Targets:

- Engage 100% of health care providers, including general practitioners, to promote the use of the Blood Pressure Action Plan tool.
- Increase awareness among those British Columbians who are hypertensive, but are not aware of their condition to 50%.

Hypertension affects an estimated 651,000 people in British Columbia¹, and fewer than 50% of those affected are aware of their condition; it is estimated that one in five British Columbians are hypertensive and only a small proportion are being diagnosed, effectively treated and managed.

Implementing a hypertension campaign will demonstrate action within primary prevention to address one of the most modifiable risk factors for stroke and for other chronic conditions among British Columbians.

1 Province of British Columbia, 2007, Primary Health Care Charter 2006 – 2010 Draft Document.

The goals of the hypertension campaign are to:

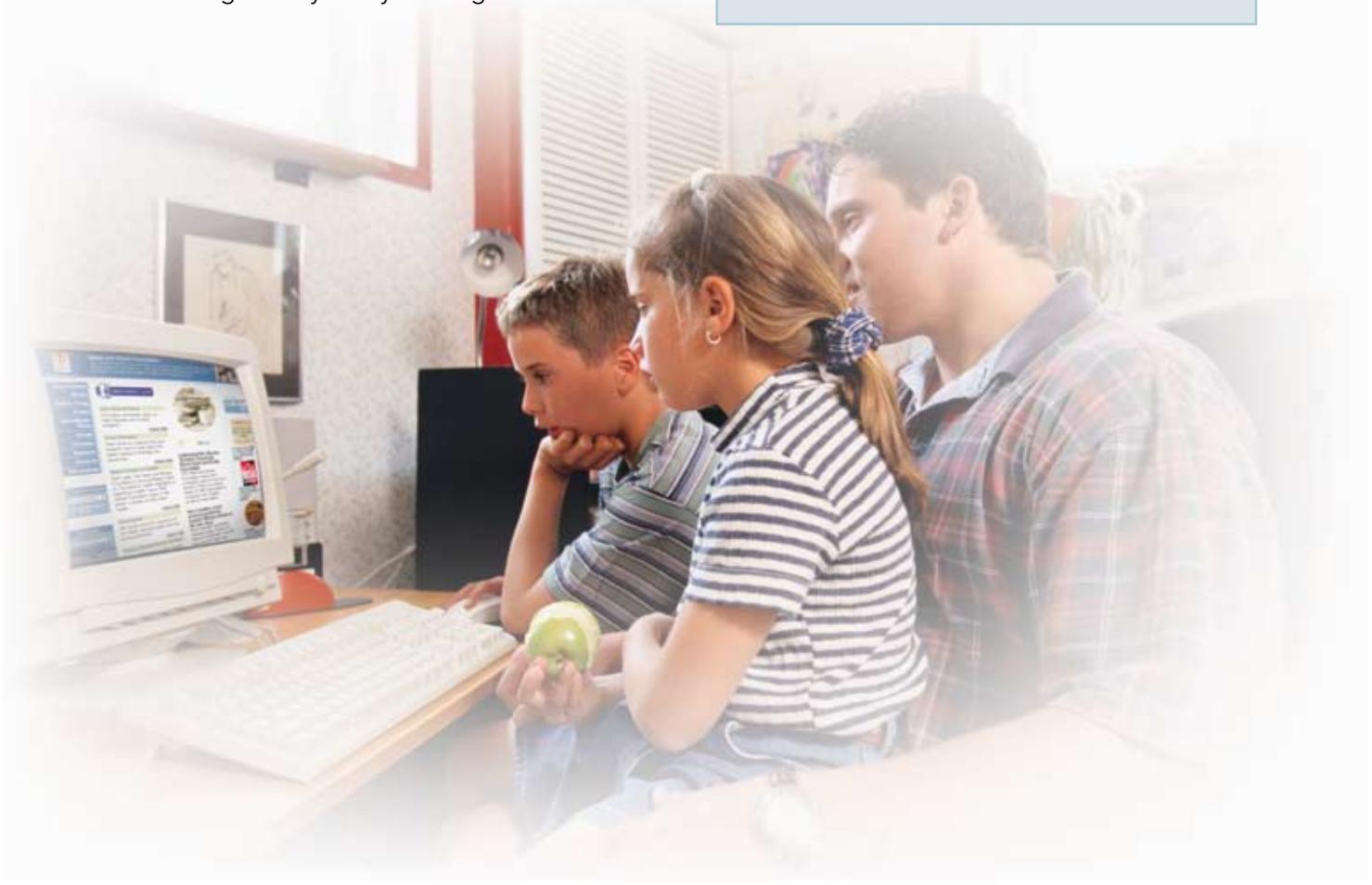
1. Increase general awareness and knowledge.
2. Encourage self-assessment, self-management and following clinical recommendations.
3. Work in collaboration with a multi-disciplinary range of health care providers.
4. Build effective and sustaining multi-agency, cross-sector partnerships.

The hypertension campaign will reduce the risk of stroke at the population level through the mediation of high blood pressure. A key component of the campaign is an online risk assessment program (the Blood Pressure Action Plan™ [BPAP] and Heart & Stroke Risk Assessment™ [H&SRA]). The BPAP/H&SRA generates, for each user, an action plan personalized not only to his or her risk factors but to their readiness to make behavioural changes. Action plans provide consumers with tangible, practical and appropriate advice on making healthy lifestyle changes.

Heart and Stroke Foundation of Ontario's Online Assessment Program

Operating in Ontario since 2003, the online assessment program has demonstrated high acceptance and usability with consumers.

- Up to **90%** of consumers who start a risk assessment complete it. Half of those who complete a risk assessment enrol for follow-up emails.
- Approximately **80%** found the information in their Action Plan helpful in making lifestyle changes.
- **77%** found the information in the email service practical, of high quality (78%) and helpful (79%).
- **80%** of respondents planned to continue with the service and the same proportion said they tried to follow "some" or "all" of the advice they received.
- **75%** of respondents said they had used the information in the emails to help them make lifestyle changes



6.1.2 Public Awareness Campaign

Best Practice Recommendation:

- All persons (members of the public) should be able to recognize and identify at least two signs and symptoms of stroke.
- Poor recognition of the warning signs of stroke may be at least partially responsible for delays in seeking medical attention², thereby exacerbating the patient’s condition at a critical point on the care pathway. Recognizing symptoms results in early detection which, in turn, results in timely treatment and better outcomes³.
- Only 30% of British Columbians know the principle risk factors (e.g., smoking, hypertension) for stroke. Approximately 60% of British Columbians can identify 2 warning signs of a stroke, and only 35% can identify at least three signs.

Target:

- Increase public awareness and recall of at least 2 warning signs of stroke and 3 risk factors to 75% by 2009.

Stroke awareness needs to increase to promote early recognition of the signs and symptoms of a stroke, and to promote understanding of where to access stroke information and treatment either for oneself or a family member. The study by Silver (2003) et al. in Ontario confirmed that television advertising increases public awareness of health issues; effective advertising increased the mean number of stroke warning signs named by respondents.

A multimedia campaign will be implemented to increase awareness of the signs, symptoms and risk factors for stroke. The campaign will also educate the public about the urgency in getting a suspected stroke patient to a hospital. Costs for the campaign include updating campaign materials already developed in other jurisdictions and British Columbia, implementing the campaign and conducting the evaluation.



Walter Gretzky, Stroke Survivor
 I'm alive today because someone knew the signs of a stroke.
DO YOU?

JUNE is STROKE MONTH

STROKE WARNING SIGNS

- WEAKNESS**
Sudden loss of strength or sudden numbness in the face, arm or leg, even if temporary
- TROUBLE SPEAKING**
Sudden difficulty speaking or understanding or sudden confusion, even if temporary
- VISION PROBLEMS**
Sudden trouble with vision, even if temporary
- HEADACHE**
Sudden severe and unusual headache
- DIZZINESS**
Sudden loss of balance, especially with any of the above signs

Call 9-1-1 or medical emergency number immediately.

HEART & STROKE FOUNDATION
 Finding answers. For life.

www.heartandstroke.ca

2 Silver, F., Rubini, F., Black D., Hodgson, S. 2003, STROKE, Volume 34, Number 8, Aug. 2003

3 Canadian Stroke Strategy, 2006, Canadian Best Practice Recommendations for Stroke Care: 2006

6.1.3 Guideline for Primary Prevention of CVD and Stroke

A guideline for stroke is required to help establish consistency in managing risk factors. BC has approved guidelines for managing hypertension and diabetes. A guideline for cardiovascular disease and stroke is currently being developed by the BCMA and the Ministry of Health, through the Guideline Protocol Advisory Committee (GPAC). The guideline will go out to all GPs in the province, along with a reimbursement incentive for physicians to capture prevention information on patients through risk factor assessment. It is anticipated that the guideline will be issued in the summer of 2007 through GPAC, and will be included in continuing medical education.

6.1.4 Physician Support for Stroke Prevention and Management

General practitioners are the first point of contact for the majority of patients with a chronic disease. In this capacity, they can play a key role in risk factor management, detecting the warning signs of stroke, diagnosing and referring stroke patients to specialty care and managing secondary stroke prevention.

Target:

- Complete risk assessments for patients at risk of stroke, presenting at a GP office, within a chronic disease risk assessment model.

The provincial government has established an “Expanded Full Service Family Practice Condition Based Payment” incentive, aimed at supporting high quality management of congestive heart failure, diabetes, and hypertension. Physicians receive an annual payment of \$125 for each patient with diabetes and/or congestive heart failure. In addition, an annual \$50 incentive payment is now available for BC Clinical Practice Guidelines treatment of hypertension where this care is not part of treating diabetes or congestive heart failure.

To facilitate implementation of the guideline for cardiovascular disease and stroke prevention, a fee incentive is recommended. The incentive would cover the cost of a Framingham risk assessment and development of an action plan for patients at risk of a stroke. Ongoing patient counseling once the risk assessment is completed would be covered under the medical services plan.

The BCMA and the province are also working toward incentives to enable GPs to provide complex case management for patients with co-morbidities which will also benefit stroke.

GPs play a key role in diagnosing stroke

Between April 2005 and March 2006, 795 patients were seen in Victoria’s Stroke Rapid Assessment Unit. Of these, 63% were referred from GPs, 32% from emergency physicians and the remaining 5% from other sources.



6.2 Pre-Hospital and Emergency Care

6.2.1 Emergency Department Protocol

Target:

- Implement and sustain protocols for emergency department diagnosis and treatment of stroke in 100% of emergency departments in British Columbia.

Protocols (i.e., standard and accepted guidelines) for stroke provide for coordinated and consistent approach to patient care in emergency departments across British Columbia. In the late fall of 2006, the provincial Emergency Department Protocol Working Group developed a set of protocols and guidelines for stroke and TIA with the overall goal of enabling emergency departments to incorporate the latest clinical guidelines into day-to-day patient care in an effective, coordinated and efficient way. The stroke/TIA protocol is intended to reduce mortality and morbidity among patients presenting to emergency departments in British Columbia by improving adherence to practice guidelines.

The Emergency Department Protocol for stroke/TIA is currently being implemented in collaboration with the health authorities. To facilitate and sustain implementation of the protocol, the following actions are recommended:

- Complete training, education and data collection to provide a benchmark for evaluating emergency department protocols and patient transfer. A budget for this work is currently in place.
- Conduct a gap analysis, based on the results of the current practice indicator project, to identify priority sites where change management is required to facilitate protocol implementation.
- Establish a staff position in each health authority to help facilitate and sustain implementation of the protocol, and to integrate other operational elements of the stroke strategy. The staff position would be cost shared between each health authority and the business case.
- Conduct collaborative planning with experts from each health authority to share best practices in implementation.
- Conduct a follow-up measure of the performance indicators in years 2 and 3 to evaluate progress on protocol implementation, integrated within the broader evaluation of the stroke business case.



6.2.2 Telehealth/Telestroke

Best Practice Recommendations for Stroke Care:

- 2006 identify telehealth as an important component in diagnosing and treating stroke including:
 - Telehealth/telestroke coverage to remote communities to support organized stroke care across the continuum.
 - Use of telehealth/telestroke to provide rehabilitation assessments for stroke patients.
 - Use of telehealth/telestroke for monitoring and managing stroke survivors.

Target:

- Complete a telehealth infrastructure assessment by 2008.
- Provide stroke neurologists with the equipment, technology and protocols to treat stroke patients on a province-wide, on-call basis by 2008.

Telehealth and telestroke can significantly improve access to acute care and rehabilitation by overcoming barriers of geography, transportation costs, and socio-economic disparity. This technology can facilitate assessment of hot stroke, clinical consultations, continuing professional education, health promotion, and healthcare management and administration.

The Provincial Telehealth Steering Committee has recently begun work on the development of a provincial strategic plan. This includes a current application for funding from Canada Health Infoway with a view to securing funding to grow and enhance Telehealth initiatives in the province.

The electronic patient archive and communication system (PACS) allows a stroke neurologist to diagnose a hot stroke patient in a community that does not have the appropriate stroke expertise. The PACS system functions well within health authorities but requires security permissions and bridge connections for access between health authorities.

The business case recommends funding for telehealth and telestroke to:

- Obtain a cost share Canada Infoway grant to determine infrastructure, resources and protocols for the use of telehealth and telestroke to diagnose, treat and manage stroke patients.
- Provide the physical infrastructure (space and equipment) to utilize telehealth for patient counseling. The funding request in the business case may be offset by federal funding following the Canada Infoway study.
- Expand the use of PACS to enable diagnosis of hot stroke on an 'on-call' basis from anywhere in the province, including access to off-site medical offices and places of residence.
- Provide additional training for physicians and health care staff on the use of telehealth and telestroke.

6.3 Acute Stroke Management

Best Practice Guidelines

- Patients admitted to hospital because of an acute stroke should be treated in an interdisciplinary stroke unit.

6.3.1 Stroke Units and Stroke Teams

The July 2006 Summit identified one major priority for acute care, namely delivering acute care in stroke wards and through interdisciplinary stroke teams. Numerous studies have shown that stroke units reduce the odds of death by 17%, increase the ability to live at home by 7% and reduce the length of stay by 8% compared to care provided on a general ward.

The business case recommends establishing stroke units and multi-disciplinary stroke teams within designated health care facilities. This requires reorganization within health care facilities, and is not considered a new cost under the business case.

6.3.2 Care Pathways

GPs and other nursing/health care professionals need to have an understanding of the care pathway for TIA and stroke within their health care facility, and the services/resources available to manage stroke patients. The care pathway would follow the patient from pre-hospital care, through the emergency department, acute care, sub-acute care, rehabilitation and transition back to the community.

Development of care pathways needs to address guidelines to expedite patient transfer between each stage of the continuum of stroke care. Improving the transfer and management of patients through the continuum can have significant cost savings particularly in terms of reduced length of stay in acute care and accelerated recovery through rehabilitation. Care pathways will be health region and, in some cases, health care site specific.



6.4 Secondary Prevention

6.4.1 Secondary Prevention Functions

Best Practices Recommendation:

- Persons at risk of stroke and patients who have had a stroke should be assessed for and given information about risk factors, lifestyle management issues and be counseled about possible strategies to modify their lifestyle and risk factors.

Target:

- Establish one secondary stroke prevention function per 400,000 - 500,000 population, with flexibility to geographic population distribution demographics, and the structure of health care delivery in each health region.

Secondary prevention focuses on preventing strokes when significant risk is already present. Secondary prevention should be targeted at those people who have substantial risk factors and those who have already had a stroke or transient ischemic attack (TIA) and are at substantial risk of having a full stroke.

Stroke Prevention Clinics and organized functions currently exist in Vancouver (Vancouver General Hospital, St. Paul's Hospital) and Victoria (Victoria General Hospital). A number of hospitals have rapid access functions to treat hot stroke and TIAs, but do not provide ongoing patient support typically associated with a secondary prevention clinic. Without access to secondary prevention, patients often get discharged back to their community without a management plan to reduce further risk of stroke.

Participants at the July 2006 Stroke Summit recognized that improving access to stroke prevention functions can be delivered in different settings. An established clinic, while preferred, may not always be feasible or practical. Alternatives to a secondary prevention clinic within a hospital setting include establishing secondary prevention functions within a neurologist's medical practice or combining stroke functions within a rapid access unit and a risk reduction clinic (e.g. Penticton).

Organized stroke prevention functions would ideally be located where resources are concentrated, where a core of stroke-interested clinicians exist (not limited to neurologists, but including GPs, internists, and nurse practitioners), where risk factor management is available and where technology and equipment are supported.



The business case recommends establishing additional secondary prevention functions in each of the five health authorities. However, recognizing that alternative models need to be explored and may be unique to each health authority's situation, it is recommended that a collaborative planning process be implemented.

The business case recommends the following improvements for organizing secondary prevention functions:

1. Establish a collaborative study group to determine the most appropriate implementation of secondary stroke prevention functions in each health authority. The study group should consider:
 - a. Establishing new secondary stroke prevention functions (clinics) in Fraser Health in conjunction with Royal Columbian Hospital and Surrey Memorial Hospital.
 - b. Incorporating secondary prevention functions in the pilot risk reduction clinic planned for Fraser Health.
 - c. Establishing new stroke prevention functions in the Interior Health Authority (1) and the Northern Health Authority (1).
 - d. Establishing a second stroke prevention function on Vancouver Island either in Nanaimo or Campbell River.

6.4.2 Secondary Stroke Prevention Guideline

A secondary prevention guideline is required for GPs to better manage patients who have had a TIA or stroke. The guideline will address patient access to secondary prevention or risk reduction clinics, medication, diagnostics and lifestyle modification.

Secondary prevention by GPs must also be linked to health promotion programs in the community. GPs need to know where to refer patients to enable them to make lifestyle changes that will reduce their risk of further events. Information on community programs for healthy eating, physical activity and tobacco control is required and would be provided by regional stroke managers.

Responsibility for developing the secondary prevention guideline would fall under the Guideline Protocol Advisory Committee.



6.5 Stroke Rehabilitation

Best Practices Recommendation

- All people admitted to hospital with acute stroke should have an initial assessment by a rehabilitation professional within the first 24 – 48 hours of admission.
- All people with acute stroke but not admitted to hospital should undergo a comprehensive outpatient assessment which includes a medical evaluation and functional assessment
- Post acute stroke care should be delivered in a coordinated and organized setting, where rehab care is comprehensive and delivered by an interdisciplinary team.

Target:

- Establish a stroke rehabilitation collaborative to identify health authority specific initiatives to improve rehabilitation of stroke patients.

Rehabilitation and successful integration back to the community are essential to the realization of a complete and organized pathway of care. Over 4000 British Columbians survived a stroke in 2004-05, which means that over the next five years we can expect thousands new stroke survivors will be living with varying levels of disability.

In British Columbia, stroke survivors, their caregivers and families do not benefit from an organized, well-designed, high-quality rehabilitation system that could maximize recovery and reduce disability and handicap. There is a dependency on a few specialized rehabilitation hospitals/units in BC—notably G.F. Strong and Holy Family hospital in Vancouver, Lions Gate Hospital in North Vancouver, the Gorge Road Hospital in Victoria, and Kelowna General Hospital—that places strain on these programs.

Additional resources are required in each health authority. This includes additional focus on in-patient stroke rehabilitation units, and community rehabilitation facilities for out-patients. The delivery of rehabilitation services is, however, hampered by both a lack of facilities and specialists.

Additional planning is required to determine the most effective way of providing rehabilitation services within each health authority. The approach will vary depending on the success of stroke prevention and primary care programs, and on existing facilities and specialist resources available in each region. A collaborative is recommended to establish action plans for improving rehabilitation in each health authority. The collaborative will complete the action plans in 2007, with implementation to begin in 2008.



6.6 Community Support and Re-Integration

Best Practices Recommendation:

- Stroke survivors and their caregivers should have their individual psychosocial and support needs reviewed on a regular basis.
- People living in the community who have difficulty with activities of daily living (ADL) should have access, as appropriate to therapy services to improve or prevent deterioration in ADL.

Target:

- Establish a province-wide system of support for community re-integration for stroke patients by 2008.

The post-discharge period is consistently reported by stroke survivors and their families to be a difficult time. Within British Columbia's health care system there is very little organized community support for stroke patients, their families and caregivers. This hampers the recovery process, making it difficult for patients to navigate their way through recovery or to obtain the support required for activities of daily living or to return to work.

The Stroke Recovery Association (SRA) of British Columbia provides the opportunity to leverage community resources to significantly improve patient re-integration to the community. Established in 1979, the SRA is a provincial non-profit organization that assists stroke survivors and their caregivers to improve their overall quality of life. The inventory of community-based programs in 2004/05 identified that SRAs in British Columbia are the most widely offered program of its type in Canada, with 38 groups located throughout the province.

Expanding the role of the SRA requires funding support in the following areas:

6.6.1 Stroke Patient Visitation Program

The SRA is piloting a stroke patient visitation program in the Vancouver Island Health Authority. The visitation program is designed to help patients with discharge planning, and to establish connections with stroke survivors so that they can obtain support once they return to their community. The patient visitation program should be expanded in consultation with the health authorities to address a major gap in the continuum of stroke care.

6.6.2 Community Support Counselors

The SRA has established a program whereby one counselor will be placed in each health authority to assist stroke patients with re-integration back to their community, including assisting with navigation to access stroke resources. Training in counseling will be provided by GF Strong, and all counseling will be non-medical (lifestyle only).

6.6.3 Peer Group Support Program

The SRA will place two staff at GF Strong for one day per week to provide patient support for community reintegration. This will assist patients with discharge planning, and for linking with Community Support Counselors.



6.6.4 Stroke Patient Community Support

The SRA will host open houses for stroke patients on a quarterly basis in each health authority. Open houses will be designed in consultation with stroke experts and the health authorities. The open houses will provide stroke survivors with access to information on all aspects of stroke recovery, navigation of the health care system and community re-integration. Funding will support development, advertising and delivery of the open houses.

Funding for staff positions will be cost shared with the Stroke Recovery Association. An evaluation program will be established to assess the effectiveness of the community support program, and will feed into the overall evaluation of the stroke business case.

6.7 Strategies Supporting All Stroke Pillars

6.7.1 Provincial Stroke Coordinator

Target:

- Establish a provincial coordinating function for stroke, along with designated managers in each health authority.

Improving stroke care in British Columbia requires the participation and cooperation of all levels of government, non-government organizations and community organizations. While progress has been achieved over in the last two years, there needs to be stronger coordination at the provincial level and between health authorities. A provincial stroke coordinator position and support is recommended with the following responsibilities:

- Facilitating system-wide changes such as telestroke, program evaluation, protocol implementation and development of a stroke registry.
- Coordinating provincial stroke collaboratives and planning teams.
- Facilitating integration among health authorities.
- Providing integration with the Ministry's Primary Health Care Charter.
- Assisting with policy development and research on stroke.
- Participating in the Canadian Stroke Strategy.
- Promoting the roles of NGOs and community groups to assist with all aspects of stroke prevention and treatment.
- Developing an inventory of regional stroke patient resources that can be used by GPs and health care professionals to support patient recovery.

6.7.2 Health Authority Coordination

Program managers need to be assigned in all health authorities to facilitate implementation of regional stroke programs within the provincial context. Responsibilities should include developing a regional stroke charter, leading implementation, coordinating with the front line staff to implement the ED protocol and other operational changes, and providing coordination and education within the health authority.

6.7.3 Stroke Registry

Target:

- Establish a stroke registry for British Columbia by 2009.

Stroke prevention and management is hampered by an absence of a database that characterizes the number and type of strokes in the province from the onset of symptoms to the patient's care and condition in the post-stroke environment. A stroke registry would have the capability of identifying patients at risk, and tracking case management and health outcomes including:

- Identifying the characteristics (age, gender, stroke severity, associated conditions and risk factor profile) of patients with stroke and TIA.
- Tracking and documenting patient care using stroke quality of care indicators.
- Determining the impact on patient outcomes of variations in age, gender, stroke type and the type of services and interventions received.
- Evaluating patient outcomes after stroke.

The registry should be linked to other databases, including the Cardiac Registry, the Medical Services Plan and Pharmacare to identify patterns of health risk, medical practice and appropriate drug use. It should also link to the cancer and renal registries for information sharing and risk factor screening.

The Provincial Health Services Authority is currently redesigning the cardiac registry. Given similarities in measures and interventions, this presents an opportunity to add a stroke module. The Canadian Stroke Network has also developed a registry under the banner of SPIRIT – Stroke Performance Indicators for Reporting, Improvement and Translation. SPIRIT provides a standardized data collection system to support accountability and ongoing quality improvement of prevention, stroke care access and stroke service delivery across the continuum of care.

Assessing the feasibility of either option for a stroke registry is recommended. Registry data will support the outcome evaluation of the stroke initiative.

6.7.4 Stroke Collaboratives

Target:

- Establish action oriented collaboratives for developing implementation strategies for stroke interventions by the fall of 2007.

Stroke collaboratives are recommended, utilizing the Institute of Health Improvement model, to enable teams of health care providers to develop intervention strategies that can be quickly put into practice on a province-wide scale. The model for improvement consists of the following four phases:

- Plan:** the team develops a plan for how they will change the quality of care delivered
- Do:** the team implements the change, collects quality of care and patient outcome data
- Study:** based on the data collected, the team analyses what happened
- Act:** the team devises next steps based on their analysis of what happened.

Three priority areas are initially recommended for collaborative planning and action:

1. development of a rehabilitation strategy for health authorities;
2. implementation of secondary prevention functions; and
3. improvements to acute care for stroke patients.

Collaborative planning in these areas will complement the ED Protocol working group and address the need for additional planning and to determine the most effective actions, which may be specific to each health authority.

6.7.5 Stroke Business Case Evaluation

Target:

- Develop performance measurement indicators aligned to implementation of the business case by summer 2007.
- Consolidate and report benchmark and longitudinal data on stroke interventions by the end of 2007.

Measuring progress toward achieving the priorities and outcomes outlined in the business case requires a concise set of measurement indicators and dedicated resources to collect data. Measurement indicators will be developed in consultation with the Canadian Stroke Strategy, and based on implementation priorities established in the business case.

Once baseline measures are obtained, targets will be set for improvement and data collected to measure and evaluate progress. The results will be reported annually through the office of the provincial stroke coordinator.

The business case recommends establishing a working group, which would include the Canadian Stroke Strategy, to develop a concise set of measurement indicators and to develop the data collection and evaluation program.

6.7.6 Continuing Medical Education (CME)

CME for physicians, nurses and health care providers is ongoing within the health care system and has been identified as a priority for stroke. This includes education on patient risk assessment, knowledge of the signs and symptoms of stroke, stroke patient triage and management, medication, patient referral for both primary and secondary prevention and rehabilitation.



Information sessions for the Emergency Department Stroke/TIA Protocol are an important step in continuing medical education for acute care. However, education initiatives need to go beyond emergency department staff to include primary care physicians and other health care professionals involved with stroke.

CME needs to be implemented for stroke using qualified neurologists to deliver curriculum based education sessions to physicians, nurses and

other health care professionals. The business case recommends establishing a curriculum based, stroke education program for health care professionals in consultation with the UBC Faculty of Medicine. This should include the use of video conferencing, on-line learning modules, and learning sessions at health care sites. Stroke education should be combined with other continuing education opportunities where applicable.

Education/training support for participating health care professionals is included within the BCMA agreement with the Ministry of Health. Additional costs for CME include curriculum development, instructor fees, program promotion and documentation, and technology support.

The cost for health care professionals to participate in the education sessions may be covered under the BCMA agreement.

6.7.7 Regional Stroke Strategy Best Practices Forums

Health Authorities have made significant progress in developing and implementing regional stroke strategies. As health authorities begin to implement coordinated approaches to managing stroke, support is required to bring health care professionals together to learn about best practices in stroke and the changes happening in their health authority.

The business case provides support to each health authority to conduct up to two, one-day workshops each year. Workshop will provide education for health care professionals including nurses, physicians, rehab specialists, social workers, dieticians, pharmacists, BC Ambulance and other staff who may benefit from an interdisciplinary approach to stroke prevention and care. Support includes funding for event coordination, setup and management, and for information materials and support.

Information and education on stroke will also be included in ongoing health authority education programs and events.



7. Stroke Program Costs and Return on Investment

7.1 Business Case Funding Request

Full implementation of the business case will require a funding commitment of \$14,970,000.

Of the total funding requirement, \$3.6 million would be addressed by the province through the GP fee incentive. Additional funding will also be provided by the Heart and Stroke Foundation and the private sector. The funding requirement is summarized in Table 1 and presented in detail in Appendix B.

Table 1

Stroke Business Case Funding Summary

	2007	2008	2009	Total
Total Funding Required for the Business Case	\$4,730,000	\$5,392,500	\$4,847,500	\$14,970,000
GP Incentive	-\$1,200,000	-\$1,200,000	-\$1,200,000	-\$ 3,600,000
NGO Contribution	- \$ 250,000	- \$ 250,000	- \$ 250,000	-\$ 750,000
Private Sector	- \$ 250,000	- \$ 250,000	- \$ 250,000	-\$ 750,000
Net Funding Required	\$3,030,000	\$3,692,500	\$3,147,500	\$9,870,000

7.2. Economic and Societal Impact of the Business Case

The economic and societal impact of the business case has been modeled based on actual measured outcomes from the Ontario Stroke Strategy (OSS). In the spring of 2003, the Ontario government supported the development of a comprehensive stroke evaluation to assess the impact of the OSS from 2000 through to 2004. Seventy indicators were used to measure stroke system performance in the areas of (i) access to health information and care; (ii) integration of care across the continuum; (iii) outcomes of care; (iv) client and provider perceptions; and, (v) research and innovation¹.

The evaluation clearly demonstrated that the OSS has had a positive measurable impact on access to stroke-related services, the integration and coordination of stroke care, treatment for stroke and client and provider satisfaction. Notable benefits included:

- The number of stroke patients receiving the clot-busting drug rt-PA across Ontario increased from 9.9% to 32% since 2000-01.
- A decrease of 11.2% in the number of acute inpatient hospitalizations in all stroke centers has freed up health care resources to address other priorities.
- The average length of stay for acute care stroke separations decreased 2.3 days, from 17 to 14.7 days.
- The average in-hospital 30-day mortality rate for stroke dropped from 17.2% to 15.9%.
- Hospital inpatient readmission rates within one year decreased from 9% to 7.5% provincially.
- The number of stroke patients discharged from hospital who were referred for home care services decreased from 35% to 28%.

1 Lewis. M, Trypuc. J, Lindsay. P, O’Callaghan. C, Dishaw. A, Has Ontario’s Stroke System Really Made A Difference, Healthcare Quarterly Vol. 9 No. 4, 2006

STROKE PROGRAM COSTS AND RETURN ON INVESTMENT

Using the actual results from the Ontario Stroke Strategy, the Canadian Stroke Network assessed the health and economic impact of priorities identified in the business case. The effectiveness of the priorities was based on measurements made in the Ontario Stroke System collected in the Registry of the Canadian Stroke Network and supplemented by published meta-analyses of health state and treatment strategies.

The analysis was coordinated by health care experts from the Regional Stroke Centre at the Ottawa Hospital and the University of Ottawa, and in association with the Caro Research Institute, an independent consulting firm specializing in disease modeling and economic analysis (Appendix C). The results are summarized in the following points and shown in Table 2.

1. The analysis assumes that the priority interventions will reach at least 50% of the BC population, with particular emphasis on the areas of higher population density.
2. Economic benefits reflect the funding requested in the business case, plus the value of the GP incentive, health authority initiatives and the emergency department protocol work.
3. All interventions are complimentary to achieving the health care and economic benefits, and are not modeled or evaluated independently.
4. The analysis maintains a societal perspective and uses a discount rate of 5% for both benefits and costs to generate the present value.
5. Societal costs include lost time for patient and caregiver change in employment status, home modifications, asisstive devices, and informal caregiver time in addition to direct medical costs.
6. The analysis evaluates the business case over 10 years, providing 3 year, 5 year and 10 year net avoided cost and health care benefits.
7. Assumptions are conservative and do not include benefits from the avoidance of dementia, cardiac, renal, and peripheral arterial disease all of which are linked to hypertension.
8. Benefits of secondary prevention are also conservative and do not reflect additional benefits which might accrue through the treatment of atrial fibrillation, carotid stenosis, dyslipidemia and diabetes.

Table 2

Health Care and Financial Outcomes

	Implementation over 3 Years	Implementation Over 5 Years	Implementation Over 10 Years
Initial strokes prevented	6,100	10,300	21,600
Secondary strokes prevented	1,100	2,600	8,100
Stroke deaths prevented (initial strokes)	1,100	1,800	3,600
Stroke deaths prevented (recurrent strokes)	230	600	1,100
Disabling strokes prevented	3,100	5,500	11,800
Net Avoided Cost	\$160 Million	\$420 Million	\$1.3 Billion
Life years gained	2,200	7,100	28,000
Quality adjusted life years gained	5,500	15,000	53,000

Fig. 2

Strokes Prevented, Deaths and Disabling Strokes Avoided

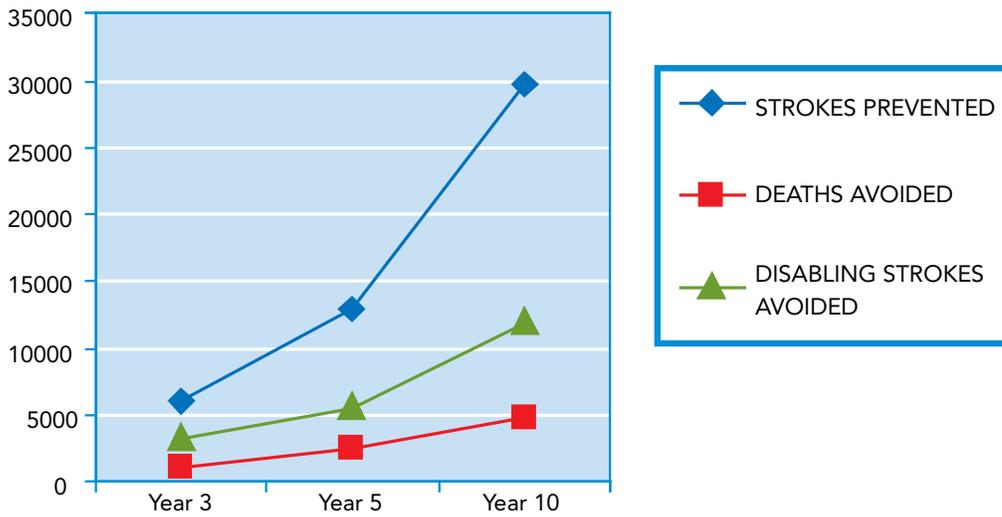
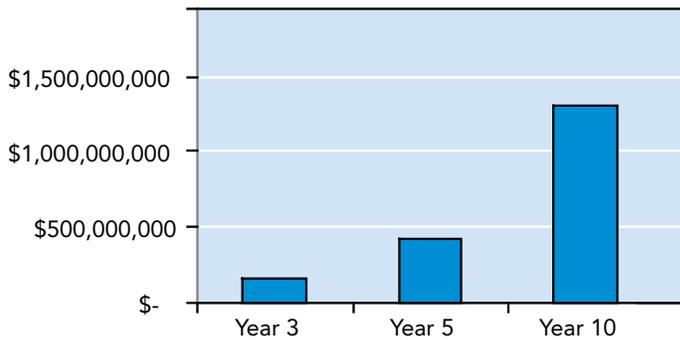


Fig. 3

Net Economic Benefit from Business Case Investment



Modeling results, summarized in Table 2 and Figures 2 and 3, show that over three years 6100 strokes will be prevented, 2,400 life years gained and \$160 million in health care costs will be avoided. The benefits rise exponentially. After five years 10,300 new strokes will be averted, 8,100 life years will be gained and \$420 million in health care costs will be avoided. By year 10, avoided health care costs reach \$1.3 billion.

These savings do not include those generated by reductions in cardiac disease, renal failure and dementia which would be expected from preventive therapies applied to those at risk of stroke.

7.2.1 Alternative Approach to Determining Benefits

Specific outcomes from the Ontario Stroke Strategy can also be applied to individual priorities identified in the business case. This approach, however, presents a constraint in that the health care and economic benefits of business case interventions do not accrue individually or in isolation of other related health care activities. Economic benefits need to be assessed based on the interaction among all the interventions.

Recognizing this constraint, three specific health care outcomes from the OSS were matched with potential outcomes in BC.

1. Reduced number of acute inpatient hospitalizations:

Actual Ontario Stroke System Outcome: The number of acute inpatient hospitalizations in all stroke centres decreased 11.2% .

BC has approximately 6,600 registered strokes each year. An 11.2% decrease in the number of inpatient hospitalizations would result in 740 fewer strokes in the province. At an average acute care cost of \$27,000² , a reduction of 740 strokes would yield a savings of \$20 million each year.

This benefit could be expected to increase over the next decade due to the aging population, resulting in higher cost savings³ .

2. Stroke patients spent less time in the acute care hospital and fewer stroke patients died in hospital.

Actual Ontario Stroke System Outcome: The average length of stay (LOS) for acute care stroke separations decreased 2.3 days from 17 to 14.7 days, or 13.5%.

In BC, the average LOS for acute care patients is 16.7 days⁴ . A 13.5% reduction in the length of stay would result in 2.25 fewer days per patient in acute care. Based on a cost of \$750 per day⁵ , this would result in a savings of \$1,688 per stroke patient or about \$10 million for 5,860 stroke patients remaining after the initial decrease in the incidence of stroke.

3. Reduced Time for In-Patient Rehabilitation

Actual Ontario Stroke System Outcome: The average LOS for inpatient rehab decreased 5 days from 43 to 38 days, or 11.6%.

Teasell et.al. (2006)⁶ provided cost/benefit projections for improvements to stroke patient rehabilitation. Early access to stroke rehabilitation was identified as a major area of cost savings. Admitting stroke patients to rehabilitation early reduces the LOS in acute care, in rehabilitation, and improves functional outcomes resulting in more independent and productive stroke survivors.

Reducing the time for inpatient rehabilitation by 5 days through more aggressive rehabilitation admission policies would have a value of about \$3,750 per patient. Approximately 75% of stroke patients require some level of rehabilitation with about

2 The Ontario Joint Stroke Strategy Working Group (2000), Report of the Joint Stroke Strategy Working Group noted that the acute care costs alone of treating a first-time stroke in Toronto averaged \$27,000 per patient.

3 Field TS, Green TL, Roy K, Pedersen J, Hill MD. Can J Neurol Sci. 2004 Aug;31(3):387-93. Trends in hospital admission for stroke in Calgary.

4 Heart and Stroke Foundation of BC and Yukon, 2005 BC Stroke Strategy

5 \$750 per day is 50% of the cost per day for a CHF patient bed used in by Vancouver Coastal Health in the Congestive Heart Failure Business Case. A lower value has been used to provide a conservative estimate.

6 Teasell, Robert MD, et.al., 2006, A Blueprint for Stroke Rehabilitation: Improving Outcomes and Maximizing Efficiencies, Department of Physical Medicine & Rehabilitation, St. Joseph's Health Care London and Schulich School of Medicine and Dentistry, University of Western Ontario

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50% requiring moderate to high levels of rehabilitation. Of the 5,860 stroke patients in BC (adjusted for reduced incidence), about 2,930 would require moderate to high levels of rehabilitation. Reducing the amount of time required for rehab by 5 days for the moderate to high level group would result in a cost savings of about \$11 million.

Achieving outcomes demonstrated by the OSS in British Columbia would have significant and immediate economic benefits. Table 3 provides a summary with projected savings of \$38 million per year.

Table 3

Health Care and Financial Outcomes

Health Benefit	1 Year Return	3 Year Return	5 Year Return
Reduce incidence of stroke	\$18 M	\$54 M	\$90 M
Reduce LOS in acute care	\$10 M	\$30 M	\$50 M
Reduced time for inpatient rehabilitation	\$10 M	\$30 M	\$50 M
Total Estimated Cost Savings	\$38 M	\$114 M	\$190 M

These projections represent only a portion of the total savings that could occur by implementing all nine priorities in the business case. However, the economic analysis by the Canadian Stroke Network is a far more accurate assessment of the total benefits that could be achieved, based on an investment of \$15 million over 3 years and resulting in a net economic benefit of \$160 million.



8. Summary

Despite solid evidence, prevention measures, stroke treatments and health practices that could save thousand of lives and millions in health care costs are not being used in British Columbia. These include establishing a network of designated stroke hospitals around the province, proactively engaging the public in managing hypertension, improving the awareness of the signs and symptoms of stroke, using organized stroke units to treat patients, use of clot-busting therapies, managing secondary stroke prevention and improving access to resources for rehabilitation. The lack of organization for stroke prevention and care is costing the province millions of dollars each year.

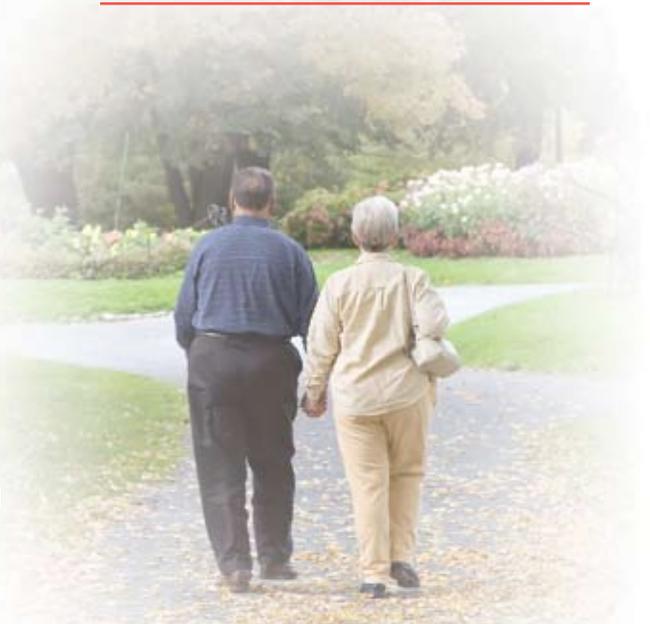
Stroke is highly preventable and treatable with the interventions available within the community and the health care system. But to be effective, interventions must be organized and the basic resources provided to enable both the health care system, the public and patients to respond.

The business case was developed in consultation with health care experts, the health authorities, the Canadian Stroke Network and the Stroke Recovery Association. It builds on a substantial amount of research and planning, and sets a course for an integrated approach to organized stroke care in British Columbia. The results will be dramatic in the short term with 1100 lives saved, 6100 fewer strokes and \$160 million in net avoided health care costs in just three years. In the long term, in ten years, 8100 lives will be saved, 21,600 strokes prevented and \$1.3 billion in health care costs avoided.

The Heart and Stroke Foundation, the Canadian Stroke Network, health authorities and other non-government organizations are committed to making improvements in stroke care. While some improvements are operational and can be made using existing resources, an investment is required to make system-wide changes. Nine priority areas were identified for improvement in stroke prevention and care at the July 2006 Stroke Summit. Further analysis has identified specific actions that require an additional investment by the provincial government of approximately \$10 million over three years.

By providing this funding and leadership, the provincial government will take a significant step forward to achieve its goals of improving the health and wellness of British Columbians, in establishing high quality patient care and in contributing to a sustainable and affordable health care system.

There is indisputable evidence that better organization and delivery of stroke prevention and care has major economic and societal benefits.



Appendix A:

Interviews Conducted for the Business Case Development

1. Mary Lewis, Heart and Stroke Foundation of Ontario
2. Dr. Kit Henderson, Medical Consultant
3. Laurie Gould, Fraser Health
4. Dr. Kerry Yoshitomi, Fraser Health
5. Brenda Hefford, Fraser Health
6. Dr. Kennely Ho, Fraser Health
7. Kori Kingsbury, Provincial Health Services
8. Debra Shera, Ministry of Health
9. Dr. Andrew Penn, Vancouver Island Health
10. Magarita Loyola, Vancouver Island Health
11. Dr. Norm Ashton, Interior Health
12. Susi Wilkinson, Interior Health
13. Dr. Wayne Shtybel, Vancouver Island
14. Dr. Todd Collier, Interior Health
15. Dr. Allan Holmes, Global Medical Services
16. Laura Reeves, Global Medical Services
17. Dr. Heather Manson, Vancouver Coastal
18. Dr. Phil Teal, Vancouver Coastal
19. Victoria Bohm, Vancouver Coastal
20. Mary Nieforth, Vancouver Coastal
21. Linda McCloy, Vancouver Coastal
22. Dr. Brian Evoy, Vancouver Coastal
23. Karen Arthurs, Vancouver Coastal
24. Chris Clement, Vancouver Coastal Health
25. Dr. Rida Baruni, Vancouver Coastal Health
26. Dr. Garey Mazowita, Vancouver Coastal Health
27. Dr. Devin Harris, Vancouver Coastal Health
28. Alexandra Dunn, Stroke Recovery Association
29. Dr. Mike Sharma, Canadian Stroke Network
30. Dr. Patty Lindsay, Canadian Stroke Strategy
31. Luke Ferdinands, UBC Continuing Professional Development, Faculty of Medicine
32. Mark Collison, Heart and Stroke Foundation

Appendix B: Business Case Funding Requirements

INITIATIVE	Targets	2007	2008	2009	Notes
Hypertension Campaign	Increase awareness of hypertension among those who are hypertensive from 20% to 50%				
Hypertension Media Promotion campaign		\$125,000 H&S \$375,000 MOH \$125,000 Partner	\$125,000 H&S \$125,000 MOH \$125,000 Partner	\$125,000 H&S \$125,000 MOH \$125,000 Partner	Cost share funding between H&S, MOH and private sector.
Website design to support campaign		\$5,000	\$5,000	\$5,000	Basic support to manage portal to the HSFC website.
GP/Health Care Provider awareness program		\$15,000	\$15,000	\$15,000	Promote awareness of the campaign through BCMA, health authorities and direct contact.
Patient follow-up and self management coordination		\$50,000	\$50,000	\$50,000	Part time position
Public Awareness on Signs and Symptoms Campaign	Increase recognition of the signs and symptoms of stroke, risk factors and what to do.	\$125,000 H&S \$375,000 MOH \$125,000 Partner	\$125,000 H&S \$125,000 MOH \$125,000 Partner	\$125,000 H&S \$125,000 MOH \$125,000 Partner	Cost share funding between H&S, MOH and private sector.
Establish Stroke Networks	Confirm stroke networks and integrate with EMS system	\$50,000			Training for EMS staff on patient transfer protocols for stroke.
Emergency Dept. Protocol					
Develop protocol and implement health authority training	Implement and sustain protocols in 100% of emergency departments	\$95,000 (1/2 year)	\$187,500	\$187,500	Half time position in each health authority to sustain protocol implementation and integration with health care operations.
Data collection to benchmark evaluation		Already Funded	\$125,000	\$125,000	Budget reflects costs for stroke only> Data collection may be linked with other research. (e.g., COPD and asthma).
Gap analysis to identify priority sites where change management is required			\$15,000	\$15,000	Review data in consultation with regional contacts and highlight priority sites for implementation assistance.
Project management		\$25,000	\$45,000	\$45,000	Consultant costs for management
Telehealth					
Fund a stroke charter as part of a Phase 1 Canada Infoway assessment grant Improve facilities in each HA to enable patient counseling Setup infrastructure and protocols for a province-wide acute stroke diagnosis and referral network.	Complete an infrastructure assessment by 2008.	\$37,500 (\$122,500 federal contribution)	\$500,000	\$500,000	Fund Infoway Phase 1 at 25/75% federal gov't cost share. Cost share funding included in 2008 and 2009 to assist each health authority with infrastructure. Requirement for funds may be offset by federal contributions based on the Infoway study.
Provide staff training			\$25,000	\$25,000	Staff training includes instructor costs only. Staff costs are incurred by each health authority.

Provide stroke neurologists with the equipment, technology and protocols for on-call and remote treatment of stroke.	Assess and implement by 2008.	\$90,000	\$90,000	15,000	Computer equipment, software, telecommunications hardware and connections, protocol development for up to 24 sites (clinic and home locations); Average cost of \$7,500 per site for hardware, software, tech support, wiring.
Stroke Wards & Stroke Teams					
Promote cohorting of stroke patients on stroke wards for more effective treatment. Promote interdisciplinary care for stroke patients by stroke teams.	System change at the health care facility level. No incremental costs				Stroke unit care is characterized by a coordinated interdisciplinary team approach for preventing stroke complications, recurrence, and accelerating mobilization and early rehab therapy.
Clinical Care Pathways					
Develop care pathways for all facilities providing treatment for stroke. Care pathways are facility specific, and need to be developed as an operational tool.	System information at the health care facility level. No incremental cost.	\$100,000	\$50,000		Establish a working group to develop region specific care pathways that will guide how patients are transitioned from pre-hospital care, through emergency, acute and subacute care, rehab and reintegration.
		Care pathway development and protocols.	Implementation in each health authority		
Secondary Prevention Functions	Establish one secondary stroke prevention function per 400,000 to 500,000 population with allowance for population distribution and age profiles.				Funding is provided for staffing and infrastructure development where new facilities are required. Each budget includes an allocation for rental of 1000 sq.ft of office space at \$30 sq. ft., plus an operating subsidy.
Vancouver Coastal Health		\$170,000	\$170,000	\$170,000	Additional nurse and clerical costs to expand VGH SPC to full time.
FHA Stroke Prevention Functions at Royal Columbian and Surrey Memorial or MSA		\$285,000	\$285,000	\$170,000	Each budget includes \$130,000 in staffing for 1.5 persons (RN, plus clerical). Clinic operates 3 days per week with case management on other 2 days.
NHA Stroke Prevention Function in Prince George		\$285,000	\$170,000	\$170,000	As above
IHA Stroke Prevention Function in Kamloops – upgrade second location in IHA.			\$285,000	\$170,000	As above
VIHA – Secondary Prevention Clinic/RAU in second location to VGH (Nanaimo)			\$285,000	\$170,000	As above
Establish a secondary stroke prevention guideline					Secondary Stroke Prevention Guideline will be developed by the GPAC and distributed to physicians.

Community Support and Re-integration					
Facilitate improved community support for stroke patients and their families, to improve access to rehabilitation services and community re-integration.		\$75,000 Grant to SRA	\$75,000 Grant to SRA	\$75,000 Grant to SRA	Patients and their families require improved support to access rehabilitation services and to overcome the physical and emotional burdens experience by many stroke patients.
Stroke Rehabilitation Collaborative		\$100,000 to fund collaborative			Establish a stroke rehabilitation collaborative to determine the most effective way to implement rehab functions on a health authority basis.
Provincial Stroke Coordinator	Establish provincial coordination and support staff	\$230,000	\$230,000	\$230,000	Establish a Provincial Stroke Coordinator, a program manager and a support person to guide implementation.
Stroke Collaboratives for action on acute care and secondary prevention functions		\$100,000	\$100,000		Establish two province-wide collaboratives to address improvements to acute care and the best approach for establishing secondary prevention functions in each health region.
Stroke Registry	Establish a stroke registry in BC by 2009	\$100,000	\$100,000		A stroke registry would be part of a larger database for managing chronic disease. The database would be electronic and accessible to physicians in hospital and clinical settings. It would include the following information: <ul style="list-style-type: none"> - patient demographic data - medical history - history of stroke and treatment - changes in risk factor conditions - change in patient condition
	Data Collection		\$125,000	\$250,000	
Support to Health Care Professionals					
GP Guidelines for stroke risk assessment and primary prevention (to be developed by the Guideline and Protocol Advisory Committee)		No direct cost			Guidelines for assessing stroke risk, and for primary and secondary prevention are required as part of the chronic disease management approach.
GP Incentive for Stroke Risk Assessment, including stroke (\$75 x 1500 GPs x 32 patients)		\$1,200,000	\$1,200,000	\$1,200,000	33% physician up-take over 3 years. Average number of patients based on diabetes model. Fee represents the incremental time required to assess the patient and record management.

Continuing Medical Education					
UBC CME Curriculum Development		\$35,000	\$25,000	\$25,000	Learning modules developed in consultation with stroke neurologists
Program promotion and coordination		\$15,000	\$15,000	\$15,000	Promotion through health care facilities, direct contact and BCMA.
Program instruction		\$20,000	\$20,000	\$20,000	Twice annual program delivery
Health Authority forums		\$100,000	\$50,000	\$50,000	Held twice annually in each health authority in year one and once annually in 2008 and 2009.
Stroke Program Performance Measurement	Develop performance indicators for implementation and monitoring stroke in 2007. Setup and implement data collection in 2008/09	\$75,000	\$250,000	\$250,000	Establish indicators in 2007. Consolidate benchmark data in 2008/09
Stroke Program Steering Committee	Establish a steering committee from health authorities, government, NGOs and health care experts	\$100,000	\$150,000	\$150,000	Budget for coordination, travel, quarterly meetings and project management.
Total Direct Expenditures		\$4,730,000	\$5,392,500	\$4,847,500	\$14,970,000

Appendix C: Canadian Stroke Network Press Release



Canadian Stroke Network

Réseau canadien contre
les accidents cérébrovasculaires



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BILLIONS OF DOLLARS, TENS OF THOUSANDS OF LIVES AT STAKE - Why aren't proven stroke solutions being used consistently in Canada?

June 14, 2006

OTTAWA _Widespread access to organized stroke care could prevent more than 160,000 strokes, prevent disability in 60,000 Canadians and save \$8 billion net in health-care costs over the next 20 years in Canada, according to an economic analysis released today by the Canadian Stroke Network (CSN) and the Heart and Stroke Foundation of Canada (HSF).

Despite solid evidence, prevention measures, stroke treatments and health practices that could prevent death, reduce disability and save billions in health-care costs are not being routinely used in Canada. These include organized stroke care units, use of clot-busting therapies, better access to rehabilitation and building awareness of the signs and symptoms of stroke among the public and health workers.

"If we implement proven stroke therapies and practices across the country, the savings in lives and dollars will be significant," says Dr. Mike Sharma, a neurologist and spokesperson for the CSN and HSF. "Most proposals to improve health care result in substantial costs to provide benefits to people. With eight billion in net savings, our model demonstrates that the benefits of a comprehensive stroke program far outweigh the costs."

The economic analysis was developed by Dr. Sharma and the Caro Research Institute for the Canadian Stroke Strategy, a partnership between the Canadian Stroke Network and the Heart and Stroke Foundation of Canada to revamp the health-care system by doing what research has proven to work in stroke prevention, treatment and rehabilitation. The Strategy will provide tools and support to provinces in areas like defining best practices, building awareness, and coordinated research, so that they can build provincial stroke strategies appropriate to their needs and resources. The ultimate goal is to ensure that all Canadians have access to organized stroke care by 2010.

National data released last week by the Canadian Institute for Health Information showed that we are not moving the needle when it comes to stroke survival. "We can clearly do much better in improving stroke outcomes," says Sally Brown, CEO of the Heart and Stroke Foundation of Canada. "Prevention, specialized care and rehabilitation made a huge difference in improving survival and quality of life for cancer and heart disease patients, and we can do the same in stroke."

"The reality is that patients are not getting the care we know we could provide," says Dr. Antoine Hakim, CEO and Scientific Director of the CSN. "The evidence is so overwhelming. If we just did today what we know works, we can save lives and reduce disability from stroke."

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The projections of savings from organized stroke care are based in part on the experience in Ontario, where a coordinated stroke system has been in place since 2000. The Ontario Stroke Strategy is already showing significant results, including:

- 65% of stroke patients released from hospital emergency department following a “mini-stroke” (TIA, or transient ischemic attack) are followed up in a provincially funded stroke prevention clinic (where available), compared to nine percent in 2000-01. This “secondary prevention” means that many more patients are less vulnerable to a full stroke.
- 32% of stroke patients are receiving clot-busting medications at specialized regional stroke centres, compared to a rate of 9.9% in 2000-01. Use of this medication within three hours after the onset of a stroke can greatly reduce the level of disability that the person may ultimately experience.
- 72% of Ontarians can cite at least two warning signs and symptoms of stroke, compared to 53% in 2003, thanks to public awareness campaigns led by the Heart and Stroke Foundation and funded by the Government of Ontario. Better recognition means faster access to treatment, and therefore better health outcomes.

Progress and momentum are also building in other provinces as they develop integrated stroke strategies.

The HSF and the CSN are working with governments, professional organizations and individuals across the country, through the Canadian Stroke Strategy, to ensure that every province can achieve better stroke care by implementing organized stroke care.

Data used for the economic analysis come from the Registry of the Canadian Stroke Network, the Canadian Heart Health Survey, Statistics Canada and the Institute for Clinical and Evaluative Sciences.

The results do not account completely for indirect costs such as the impact on caregivers, lost productivity and costs to families and communities. As well, they do not account for the substantial impact of stroke prevention measures on rates of related conditions like dementia, heart disease, diabetes and kidney disease.

Dr. Sharma’s work is motivated by his personal experience. “I’ve seen the incredible impact of better stroke care with my own eyes,” he says. “I’ll never forget the smile on the face of the first patient who got up and walked away after what would have been a devastating stroke - because they were seen early and got the right treatment. That image will never leave me.”

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Canadian Stroke Network

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The Heart and Stroke Foundation and the Canadian Stroke Network urge health policymakers in Canada at all levels to act now to support efforts to improve stroke prevention, treatment and rehabilitation underway across the country.

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The Heart and Stroke Foundation (www.heartandstroke.ca) is a leading funder of heart and stroke research in Canada. Our mission is to improve the health of Canadians by preventing and reducing disability and death from heart disease and stroke through research, health promotion and advocacy.

About the Canadian Stroke Network (www.canadianstrokenetwork.ca) The Canadian Stroke Network is made up of more than 100 of the country's best and brightest researchers from 24 universities across the country. The Network, which is headquartered at the University of Ottawa, includes partners from industry, the non-profit sector, provincial and federal governments. The Canadian Stroke Network is part of the federal government's flagship science and technology initiative called the Networks of Centres of Excellence, or NCE program. The Network is committed to reducing the physical, social and economic impact of stroke on the lives of individual Canadians and on society as a whole.

For more information on the economic analysis and the Canadian Stroke Strategy, contact

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For more information on the status of provincial stroke strategies, contact your local Heart and Stroke Foundation media representative -see "contact us" at www.heartandstroke.ca/media

Innovations in Stroke Care

A Powerful Business Case for
Priority Interventions in
British Columbia

February 2007



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