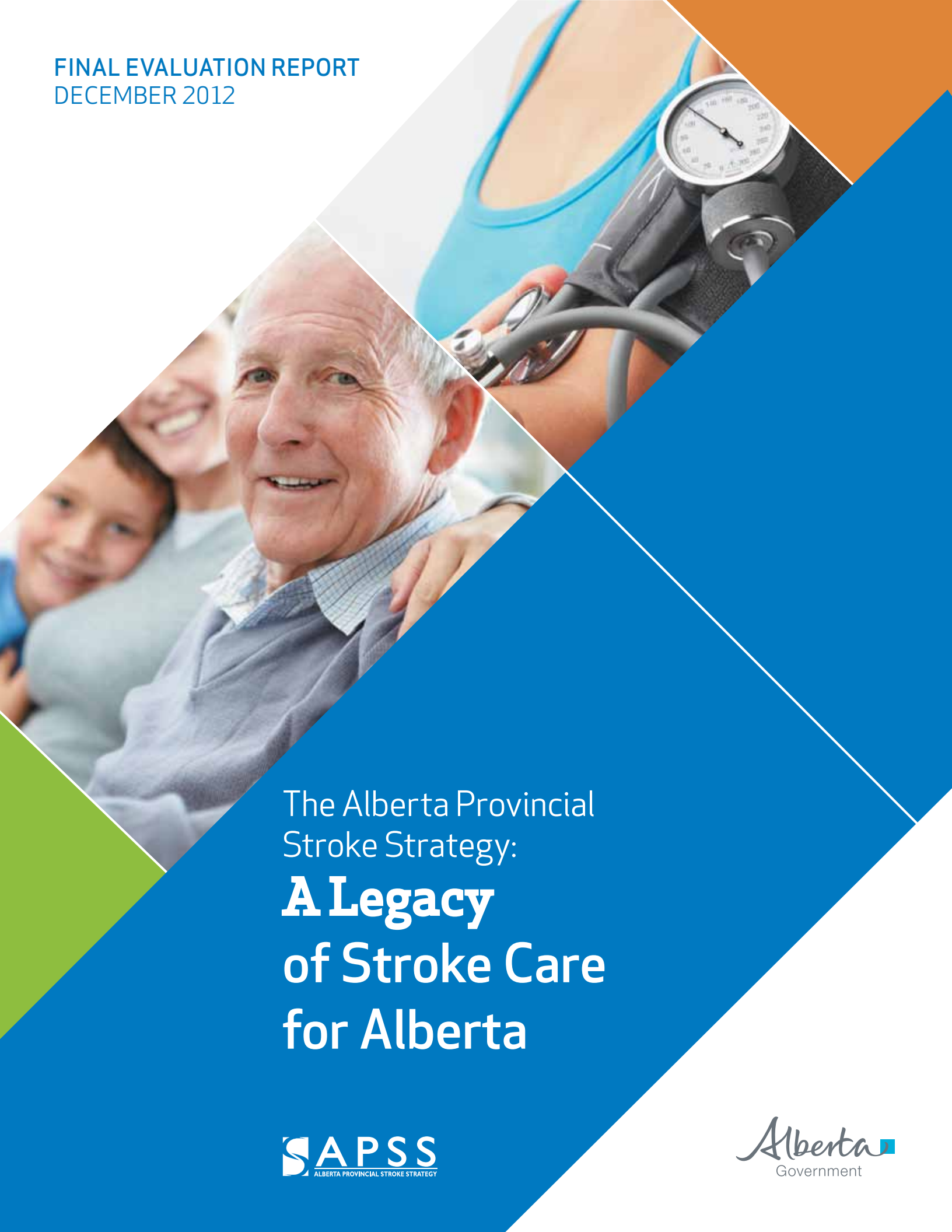


FINAL EVALUATION REPORT
DECEMBER 2012



The Alberta Provincial
Stroke Strategy:
**A Legacy
of Stroke Care
for Alberta**



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DECEMBER 2012

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DEDICATION

*This report is dedicated to all those
who have been affected by stroke....
You have taught us so much.*

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TABLE OF CONTENTS

Title Page	i
Dedication.....	ii
Authors' Affiliations.....	ii
Acknowledgements	iii
Financial Support.....	iii
Organizations Involved in the Report	v
How This Report is Organized	vi
Executive Summary	vii

SECTIONS

I. Momentum and Milestones-the APSS Story.....	1
i. APSS Milestones.....	4
ii. Provincial Maps 2005 and 2012	6
iii. Zone Snapshots	7
II. Educating Albertans About Stroke	13
III. Reducing Stroke Occurrence & Mortality	21
IV. Improving Access to Best Care	41
V. Improving Health Care System Efficiency	69
VI. Improving Satisfaction with Care	75
VII. Alberta Stroke Improvement	81

LIST OF EXHIBITS

<i>Figures</i>	88
<i>Tables</i>	90
Tables	92

APPENDICES

A. <i>Glossary of Terms and Abbreviations</i>	107
B. <i>Summary of Evaluation Plan</i>	110

ORGANIZATIONS INVOLVED IN THIS REPORT

THE ALBERTA PROVINCIAL STROKE STRATEGY

The Alberta Provincial Stroke Strategy (APSS) is a network of stroke services, knowledge dissemination, inter-regional clinical referrals and information sharing. Initiated in 2005, the APSS was designed to:

- Advocate for healthier lifestyles by working with community stakeholders
- Protect the health of Albertans with enhanced screening and prevention services
- Improve access to health services by use of inter-disciplinary teams
- Utilize a contemporary workforce by collaborating with health authorities, and
- Improve health services outcomes by managing chronic health conditions.



The APSS is a recipient of the Premier's Award of Excellence.

The APSS is composed of stroke experts within the following Pillars, or specialty areas, that inform stroke programming:

- Health Promotion and Disease Prevention (Pillar I)
- Emergency Services and Acute Care (Pillar II)
- Rehabilitation and Community Reintegration (Pillar III)
- Evaluation and Quality Improvement (Pillar IV)

The Evaluation and Quality Improvement Committee is a composite of health professionals with diverse backgrounds and areas of expertise related to stroke care. This committee is responsible for developing and implementing strategies for evaluation, monitoring performance measures, and providing a sustainable system of stroke surveillance and quality control.

HOW THIS REPORT IS ORGANIZED

This is the final evaluation report describing the progress and outcomes of the APSS. The evaluation was designed to generate information that will support improved stroke care and provide information to ensure quality services are in place for Albertans.

This report will be of interest to health services consumers, professionals, administrators, and researchers. It provides information on progress across the care continuum and at multiple levels of analysis.

This report is organized according to the following sections:

I. Momentum and Milestones-the APSS Story

- i. APSS Milestones
- ii. Provincial Maps 2005 and 2012
- iii. Zone Snapshots

II. Educating Albertans About Stroke

III. Reducing Stroke Occurrence and Mortality

IV. Improving Access to Best Care

V. Improving Health Care System Efficiency

VI. Improving Satisfaction With Care

VII. Alberta Stroke Improvement

Best practice recommendations created by each Pillar of the APSS provide the basis of evaluation data. References are provided to corresponding technical exhibits located at the back of the report. Each section concludes with recommendations based on measurement outcomes.

EXECUTIVE SUMMARY

Summary of findings and recommendations

I. Educating Albertans About Stroke

- Television, radio and print media improved public awareness of hypertension as a risk factor for stroke as well as the signs and symptoms of stroke. Other findings were:
 - Declines in awareness occur in the absence of continued messaging;
 - The level of knowledge in the population remains relatively low for some symptoms of stroke;
 - The majority of Albertans are still not aware that monitoring and controlling blood pressure can prevent stroke although the vast majority are aware that high blood pressure is a serious health problem.
- A shorter stroke onset to Emergency Department (ED) arrival time allows potential timely treatment with clot busting drugs. By 2008/09 there was a nearly 90 minute reduction in the average time to reach the ED for patients with a transient ischemic attack (TIA).
 - By 2010/11 this response time had lengthened but it was still significantly better than 2004/05.
 - The proportion of TIA patients arriving within 3.5 hours and 4.0 hours increased significantly by 2010/11.
- The average response times for stroke patients remained constant over time without improvement or worsening.
- The proportion of stroke patients presenting within 4.0 hours increased by 2010/11, which represents an improvement.
- The highest proportion of favourable response times occurred in 2008/09 for both TIA and stroke.

More information on these findings can be found in Tables 2.1 to 2.4 (pages 93-94)

Key Recommendations

1. Sustained public messaging is required in regards to risk factors and signs and symptoms of stroke. This might consist of repeated multimedia campaigns or an exploration of other methods to reach the public such as interventions in schools, workplaces or the use of social media.
2. Continued emphasis on in-the-field stroke recognition, rapid pre-hospital transport and transport to the correct health facility, are also required to further improve median onset to ED times and the percentage of patients arriving within treatable time windows.

II. Reducing Stroke Occurrence & Mortality

- There was an increase in the prescribing of antihypertensive agents at discharge for ischemic stroke. The level peaked in 2008/09 at about 75%, and then declined to the consistent provincial average of about 72% (in 2010/11), which is still relatively high. However, there was considerable variability between zones.
- The proportion of patients with intracranial hemorrhage who receive antihypertensive medications was lower at baseline (42%) and did not improve over time. It is unclear why prescription rates remained low for antihypertensive therapy in hemorrhagic stroke patients at time of discharge from hospital.
- Although lipid lowering agent use continued to increase significantly between 2004/05 and 2010/11, these medications are still underused, with only 65% of ischemic stroke and TIA patients receiving

prescriptions for their use on discharge. Most ischemic stroke and TIA patients will benefit from the risk reduction for recurrent stroke, myocardial infarction, and death afforded by these agents. There was variability between zones with prescription rates ranging between 46.5% and 74.4%. For reference, the national average for prescription use in 2008/09 for ischemic stroke and TIA was approximately 65% (1).

- Across Alberta, for patients without atrial fibrillation, there was improvement in prescription of antiplatelet agents on discharge in 2007/08 followed by a slight decline by 2010/11. There was some variability between zones with improvements for some and declining trends for other zones.
- There was fluctuation in the proportion of stroke/TIA patients with atrial fibrillation receiving anticoagulants on discharge from hospital from 63% to 55% between 2004/05 and 2010/11. However, this followed an initial increase to 75% in 2007/08. The decline in patients receiving anticoagulants was clearly due to a choice made by clinicians to use the much less effective but generally safer antiplatelet agents rather than anticoagulants. The percentage of patients receiving one or the other type of medication declined as well, but stayed above 90%. There was variability between zones.
- The median time from stroke or TIA to carotid revascularization surgery decreased from 12 to 7 days, which is a decrease in wait time of 42%. The proportion of patients undergoing the surgery within the recommended period of two weeks from symptom onset increased from 53% to 70%.
- There was a statistically significant decline in the age-standardized rate of ED and inpatient hospital visits for stroke between 2004/05 and 2011/12. Many factors might contribute to this decline, including improved primary prevention practices and chronic disease management programs, which are external to the APSS. However, improved secondary prevention measures in patients with stroke and TIA are likely to account for 20-30% of the decline in ED and inpatient hospital visits. The decline in standardized

stroke occurrence rates appears to have plateaued in recent years.

- There was a 29% reduction in inpatient 30-day mortality for ischemic stroke and a 32% decline for hemorrhagic stroke between fiscal years 2004/05 and 2011/12. For both subtypes of stroke, nearly all of the reduction in mortality occurred after implementation of the APSS as mortality was unchanged in the preceding years. The declining trend in case fatality also plateaued after 2009/10.

More information on these findings can be found in Tables 3.1 to 3.9 (pages 95-98)

Key Recommendations

3. Stroke programs and clinicians should continue to ensure that antihypertensive therapy is initiated in stable patients with ischemic stroke who have elevated blood pressure at the time of discharge from hospital.
4. Understanding the reasons for the low rate of antihypertensive use in hemorrhagic stroke patients should be a major priority. Clinicians are advised to institute antihypertensive therapy as early as possible in patients with hemorrhagic stroke who have above-normal blood pressures.
5. The use of lipid-lowering agents (HMGCoA reductase inhibitors) to lower cholesterol after ischemic stroke and TIA should continue to increase across Alberta.
6. The reason for declining warfarin use following ischemic stroke and TIA in atrial fibrillation needs more study. The contributions of such factors as patient complexity, frailty or comorbidity and the role of new anticoagulants available since 2010 need to be understood. Since anticoagulants such as warfarin and the newer agents are more effective than antiplatelet agents in preventing stroke in atrial fibrillation, their use should increase once a minimum safe interval following a stroke has passed.
7. Building on progress made to date, the median time from stroke and TIA to carotid revascularization surgery should decrease further with a target of more

than 80% of the procedures done within two weeks of stroke or TIA.

8. Given a possible recent plateau in the previously declining rate of stroke occurrence, it is critical that the quality of primary and secondary stroke prevention services be further enhanced. This is

necessary to avoid a further plateau or even an increase in occurrence over time.

9. Stroke Unit care and other inpatient services for stroke initiated by Pillar II of the APSS need to be continued and enhanced across Alberta in order to maintain trends towards decreasing stroke mortality.

III. Improving Access to Best Care

Access to thrombolysis for stroke patients:

- The number of centres in the province capable of giving tissue plasminogen activator (tPA) more than tripled going from 5 to 18 over 6 years.
- The proportion of patients with ischemic stroke who received intravenous tPA continued to increase across Alberta reaching 12.7% in 2010/11. These figures can be compared to the Canadian national average where it is estimated that less than 8% of all ischemic stroke patients received intravenous tPA in 2008/09. (1)
- The median ED arrival to treatment time decreased significantly from 81 minutes to 67 minutes from 2004/05 to 2010/11. However, it remains above the best practice target of less than 60 minutes.
- The proportion of patients treated within one hour of arrival in the ED did not change significantly and remains just above the national average.
- Thrombolytic therapy is more effective the earlier it is given and the national best practice target is treatment in less than one hour after arrival in ED. Currently, this remains a difficult target to meet internationally, nationally, and within Alberta.

More information on these findings can be found in Tables 4.1 to 4.3 (pages 99-100)

Key recommendations regarding access to thrombolysis:

10. Although median ED arrival to treatment times have decreased, stroke service programs should continue to expedite the assessment, investigation and management of acute ischemic stroke patients to

decrease this time to less than 60 minutes.

11. Considering a higher cure rate with earlier treatment, the proportion of patients who receive tPA within one hour of arrival in the ED should increase with an eventual goal of 80% of patients receiving tPA in this timeframe.

Access to best inpatient care for stroke:

- The proportion of ischemic stroke patients receiving brain imaging before discharge from hospital increased significantly to 98.8% province-wide. For hemorrhagic stroke patients the proportion increased to 99.5% which represents near-perfect performance.
- 98-100% of TIA patients received brain imaging before discharge in Edmonton and Calgary, which is near-perfect performance. Performance in South zone (Zone 1) and Central Zone (Zone 3) was excellent (89% - 92%). However, North Zone (Zone 5) could achieve this near perfect target only 75% of the time although this still represents substantial improvement.
- The proportion of patients with ischemic stroke or TIA who received imaging of their carotid arteries prior to discharge increased significantly from 54% to 69% for the province overall. There was a plateau in improvement in 2008/09 for the province and considerable variability between zones.
- The percentage of stroke patients across Alberta who spent some portion of their inpatient stay in a Stroke Unit increased significantly, essentially doubling from 27% to 54% over the course of the strategy. There was a plateau in 2008/09 and great variability between zones.

- Province-wide, the percentage of ischemic stroke or TIA patients who receive antiplatelet therapy within 48 hours of admission did not change significantly between 2004/05 and 2010/11. The rate remained at approximately 75%. It is understood that another 8-10% of patients receive anticoagulant therapy within 48 hours instead of antiplatelet therapy. However, that information was not captured in the most recent chart review program and so is not reported.
- The proportion of all stroke patients experiencing a potentially preventable complication dropped significantly province-wide from 14.7% to 12.3% between 2004/05 and 2010/11.
- The proportion of stroke patients receiving a rehabilitation assessment within 48 hours of hospital arrival increased by 18% in absolute terms and 32% in relative terms between 2004/05 and 2010/11 with all zones experiencing statistically significant improvements.
- Province-wide the proportion of stroke or TIA patients receiving referrals to outpatient rehabilitation on discharge increased significantly from 11.7% to 19% between 2004/05 and 2010/11.
- The proportion of stroke or TIA patients receiving referrals to home care/community support on discharge improved significantly for the province overall by 2008/09 then declined by 2010/11 back to baseline. There was variability between zones as Central Zone (Zone 3) and Edmonton Zone (Zone 4) were able to maintain relative improvements of over 35% in 2010/11 compared to 2004/05.
- The proportion of stroke patients receiving an initial screen or assessment for dysphagia increased significantly for the province overall going from 22% to 58%.
- Although there was no change for ischemic stroke patients, the proportion of hemorrhage patients discharged back to their pre-admission place of residence increased significantly by 2007/08 and continued to rise, plateauing after 2008/09. The baseline value was 52% and it increased to 66%. There was a similar significant trend for TIA patients although it was less dramatic, going from 91% in 2004/05 to 94% in 2010/11. Together this represents

109 more Albertans per year who are able to avoid an increase in the level of care they require as a result of their stroke.

More information on these findings can be found in Tables 4.4 to 4.13 (pages 100-105)

Key recommendations for inpatient care:

12. Access to brain imaging for TIA patients in North Zone (Zone 5) needs to increase further to reduce a clear discrepancy with the rest of the province. Access to brain imaging for TIA patients in South Zone (Zone 1) and Central Zone (Zone 3), although very good, could increase further to match access in Calgary and Edmonton.
13. Access to carotid imaging before discharge from hospital should increase for Zones 1, 3, and 4 to allow them to be on par with the Calgary Zone (Zone 2). However, the major priority should be increasing access for North Zone (Zone 5) which is well below the provincial average.
14. Further increasing the proportion of patients receiving care on a Stroke Unit should remain a major provincial priority. The identification of a model of stroke unit care that would work for rural centres that are too small for geographic clustering of beds is also a priority for Alberta.
15. All patients with ischemic stroke or TIA without contraindications should receive antiplatelet agents as soon as possible after stroke onset and certainly within 48 hours. The minority in which anticoagulation is more appropriate should also have that treatment started at the earliest time point judged to be safe by the treating team.
16. More effort should be expended to reduce complications following stroke especially for the most frequent complications of pneumonia and urinary tract infections. To facilitate this, swallow screens and assessments should be performed on all stroke patients prior to initiation of oral intake. Foley catheters should be removed as soon as possible. All stroke patients should be targeted for a stroke-specific rehabilitation assessment within 48 hours to establish and develop a plan to meet their rehabilitation needs.

17. All stroke patients should receive a swallowing screen or swallowing assessment before first oral intake. Alberta should aim for a target of a 90% screening rate. It is not clear that the value of screening is proven in patients with TIA who have completely resolved deficits.
18. Management of transitions in care is improving but referrals to homecare from hospital should increase or be better documented. Referrals to outpatient rehabilitation have increased but could still increase further. Early supported discharge teams may be an important part of transition planning for many patients.
19. Documentation of many best practices in stroke needs to improve. The APSS is creating a set of minimum documentation standards for patients admitted with stroke.

Access to preventive services:

- The number of Stroke Prevention Clinics (SPCs) in Alberta tripled between 2005 and 2012. From June 2007 until December 2012, more than 22,000 patients have been seen in such clinics.
- There were substantial improvements in the proportion of ischemic stroke and TIA patients receiving a documented referral to SPCs before discharge from hospital. However, only 68% of ischemic stroke patients and 54% of TIA patients received such referrals.
- The proportion of hemorrhagic stroke patients referred to SPCs on discharge also increased

significantly but was very low at 29% in 2010/11. The reason for the low rate of referral is unclear but one possibility might be that many of these patients are followed up by neurosurgeons in other clinics.

- A physicians' TIA Hotline was implemented in Alberta to facilitate urgent access to specialist consultation, diagnostic imaging, and stroke prevention measures. We estimate that more than 800 high risk TIA patients have received urgent care through this Hotline since its implementation.

Key recommendations regarding access to preventive services:

20. The proportion of ischemic stroke and TIA patients referred to SPCs on discharge should increase further to allow completion of the management plan, continuity of care, and optimization of stroke prevention strategies. It may be beneficial to increase the proportion of hemorrhagic stroke patients referred to SPCs for follow-up of investigations, transition into the community and risk factor control.
21. Physicians/providers should increase use of the TIA Hotline or other rapid referral systems to maximize the likelihood of urgent access to care for high risk TIA patients. Adequate support should be in place to allow such patients priority access to local brain imaging and vascular imaging, as well as carotid revascularization procedures to reduce the high short-term risk of stroke occurrence after TIA or minor stroke.

More information on these findings can be found in Table 4.14 (page 106)

IV. Improving Health Care System Efficiency

- EMS bypass protocols are now in place across Alberta to allow patients to be diverted to PSCs.
- Alberta's median length of stay for stroke remained fairly constant over time and was 6 days in 2008/09 which compares favourably with the national average of 7 days for the same year. It remains to be seen whether a decline to 5 days in 2011/12 will persist.
- Although all zones had a median length of stay that was at or below the national average there was significant variability between zones. Zone 4's length of stay was longer than the other zones; Zone 1 and 2 had longer length of stay than Zone 3 and Zone 5; Zone 3 had a longer length of stay than Zone 5.
- Intravenous tPA is considered a dominant therapy in terms of cost-effectiveness associated with a cost

avoidance while still producing reduced disability. With increased use of intravenous tPA (from 8.2% of all ischemic stroke patients in 2004/05 to 12.7% in 2010/11) the province avoided an additional \$81,000 in 1-year costs and is projected to avoid an additional \$445,000 in 30-year costs. At the same time the number of patients cured or improved increased by 64% in relative terms.

Key recommendations:

- 22. Cross communication between zones is encouraged to determine the factors influencing the variability length of stay including waits for rehabilitation access and long term care as well as patient complexity.
- 23. Intravenous tPA is an important treatment in ischemic stroke to reduce disability for patients and to reduce cost to the health care system. To further improve access new rural PSCs should be created.

Through quality improvement programs in existing PSCs and Comprehensive Stroke Centres (CSCs), the proportion of patients treated should increase and door to treatment times decrease. The province should strive to increase intravenous tPA use to a target level of 20% of all ischemic stroke patients.

- 24. Although intravenous tPA is an important treatment for stroke the province should participate actively in the development and accessibility of catheter-based intra-arterial recanalization strategies. This recommendation recognizes the fact that the most severe ischemic stroke syndromes respond poorly to intravenous tPA and these will become a major burden in personal and financial terms as the population ages.
- 25. More data on the value for cost of the APSS will become available after the detailed economic report is completed by the Institute for Health Economics.

V. Improving Satisfaction with Care

- Overall 94-95% of patients were moderately or very satisfied with the inpatient care they received in all four years surveyed.
- Satisfaction levels were lower for care received after leaving hospital and a number of community support services were targeted. Between 2007 and 2009, there was a significant improvement in satisfaction with care received after leaving hospital, rising from 75% to 85%. However, the province was unable to sustain the gains as of 2011 and levels of satisfaction dropped to 78%.

Key recommendations:

- 26. The high rate of satisfaction with inpatient care should be maintained. The proportion of stroke survivors 'Very satisfied' with their inpatient care should increase further. An increase in stroke unit care province-wide may help patient satisfaction as well.
- 27. The province should increase its efforts to increase satisfaction with care after discharge into the community. It will be extremely important to continue to build homecare and community support programs such as early supported discharge as well as partnerships with community support organizations.



Momentum & Milestones The Alberta Provincial Stroke Strategy Story

4,500 Albertans suffering a stroke each year.

25,000 Albertans living with the effects of stroke.

\$300-\$400M the annual cost of stroke in Alberta.

In 2005, these alarming statistics provided a strong case for what was to become a province-wide campaign against the fourth leading cause of death and the primary cause of long-term disability in adults. The formation of the APSS was a deliberate intent to develop and implement a strategy to enhance care and provide information to improve stroke services.

The APSS model and the manner in which the strategy was implemented has generated programs and services that improved the quality of care, increased access to services, reduced stroke rates and decreased mortality. Over the years, this network of stroke services evolved and Alberta is now recognized throughout Canada as a leader in stroke care.

Today, Albertans have greater access to a number of highly effective stroke therapies and services. Health care professionals have access to learning resources and practice guidelines that help with clinical decision-making. Historically, stroke did not receive the attention of the public and health care systems in comparison to other diseases such as cancer and cardiac disease. It was considered an “orphan” disorder; under-researched and under-funded. While many Albertans knew of someone who had a stroke, knowledge of the signs of stroke or causes of stroke was low. Uptake of clinical practice recommendations by health care professionals was not consistent across the province and Albertans were missing out on potentially life-altering treatments.

In 2005, the Government of Alberta committed \$20M over two years to support a strategy whose purpose was to identify enhancements and develop solutions to strengthen the stroke system of care. Nationally, this was a significant investment by a provincial government.

The Alberta Stroke Council (ASC) was formed to oversee the activities of the APSS. Membership included representatives from the Alberta Government, the Heart & Stroke Foundation of Alberta, NWT & Nunavut (HSFA), regional health authorities and physician experts.

The long-term goals of the APSS were defined:

- Reduce stroke incidence in the province
- Improve stroke care at all levels by implementing national standards of care and service delivery
- Optimize recovery and quality of life for stroke survivors and their caregivers
- Reduce the financial burden of stroke.

Developed in 2006, the APSS Blueprint laid the foundation for stroke programs and partners to share information and implement new services. Committees of stroke experts within the following Pillars, or specialty areas, informed stroke programming:

- Primary and Secondary Prevention
- Acute Care
- Rehabilitation and Community Reintegration, and
- Evaluation and Quality Improvement.

In 2008, the Alberta Government renewed its commitment to improving stroke care for Albertans

with a further \$22.5M over the next three years. These funds were used to sustain the gains made to date, implement new programs and put in place a legacy of stroke services, knowledge dissemination and information sharing.

HOW THE APSS WORKED

Stroke programs across Alberta had representation on a provincial Implementation Committee. Program leads had the opportunity to share ideas, discuss concerns, and develop areas for collaboration. APSS Best Practice and Pillar Recommendations as well as Canadian Best Practice Recommendations informed clinical practice and learning resources for stroke care. To guide planning and implementation of services, “Key Components of Optimal Stroke Care” were developed. The ASC allocated grant funds to fill gaps in services that spanned the continuum of stroke care. A significant investment was made in health care provider education, public awareness, evaluation, and quality improvement.

WHY THE APSS WORKED

- Stroke champions, the engines of the APSS, generously provided their time and energy to speak on behalf of clinical improvements and the varying service needs throughout the province.
- “Sharing the wealth” – areas of the province with more developed, mature programs provided advice and nurtured emerging programs.
- Inclusiveness – direction and decision-making occurred through the involvement of a diversity of stakeholders.
- Performance followed decisions - the governance structure of the APSS permitted flexibility and responsiveness in meeting strategy objectives.
- Funding was available that permitted the strategy to implement large-scale projects.
- When health care in Alberta was reorganized, the APSS provided a unifying structure as roles and geographic boundaries changed. It was perceived as a provincial “community of practice” that provided a bridge to the new Alberta Health Services model.

Lessons Learned

- Ensure local representation at the decision-making level.
- Ensure input from patients, families, caregivers and the community along the way.
- Start the evaluation process as soon as possible - having interim evaluation results early provides important information and direction in achieving goals.
- Employ quality improvement methods at the start-up phase of new programs.

This report describes the outcomes of the APSS by examining areas of success and those needing improvement. It is a culmination of the work of many and builds on the province’s diversity. But most importantly, the APSS is the result of people who have:

Listened – to the stories of stroke survivors and families

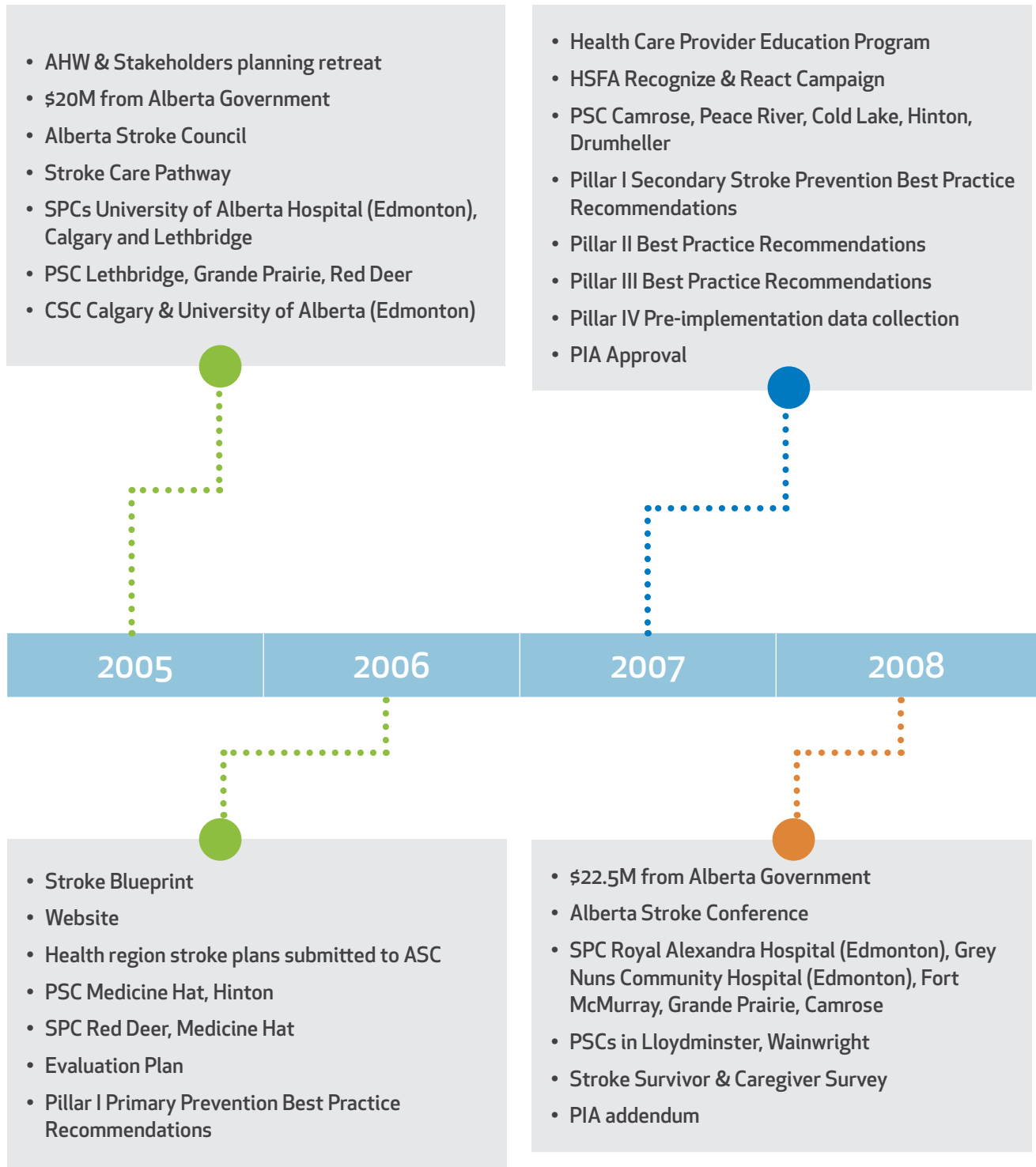
Shared – what worked, what did not and why

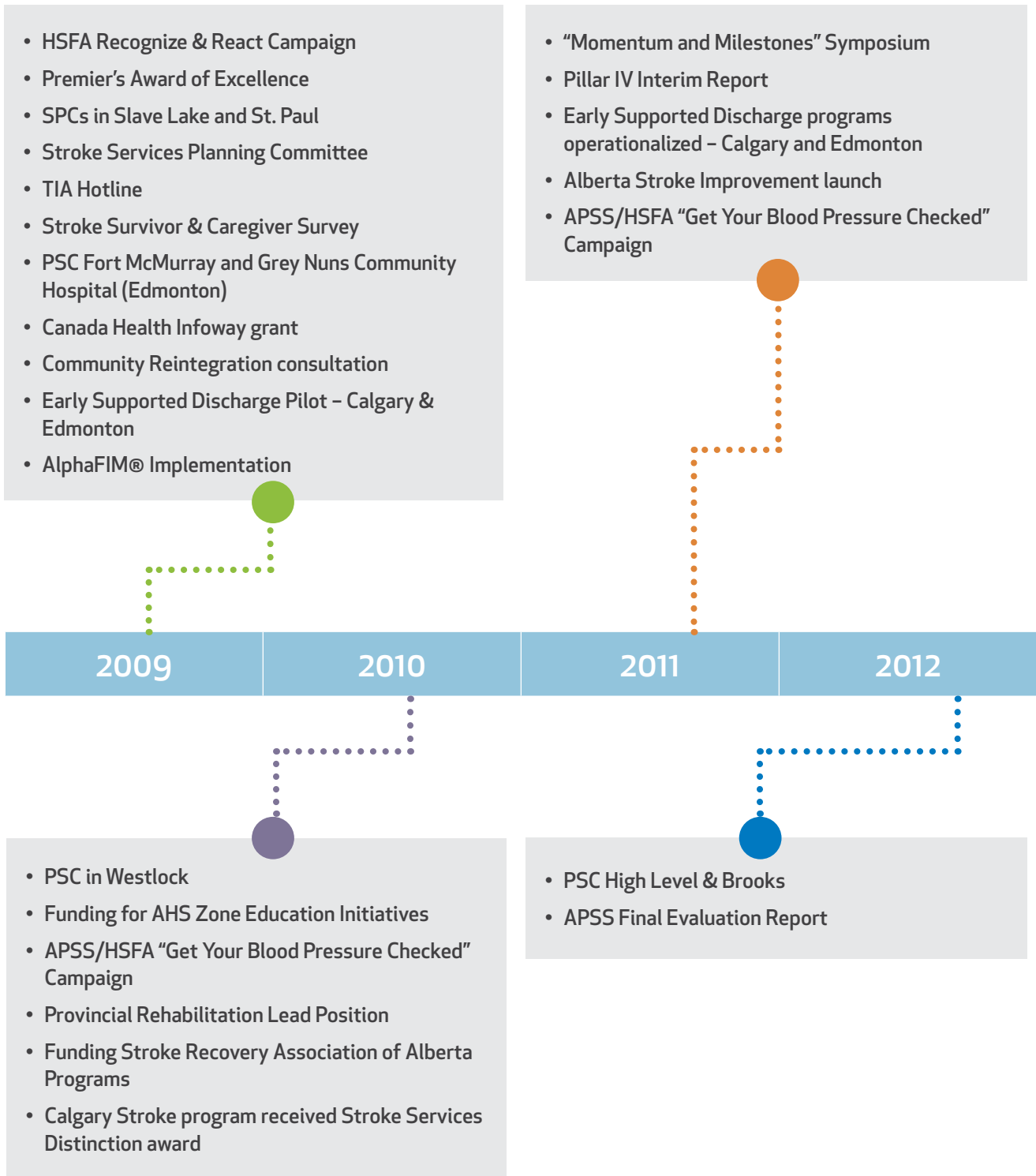
Participated – in teleconferences and meetings, provided insight, input and expertise, and travelled across the province.

Behind every statistic, a human experience with stroke occurred. It is the hope of the authors of this report that the APSS will leave a legacy that will lead to a better understanding of stroke for all those who follow.

APSS MILESTONES

FIGURE 1.1



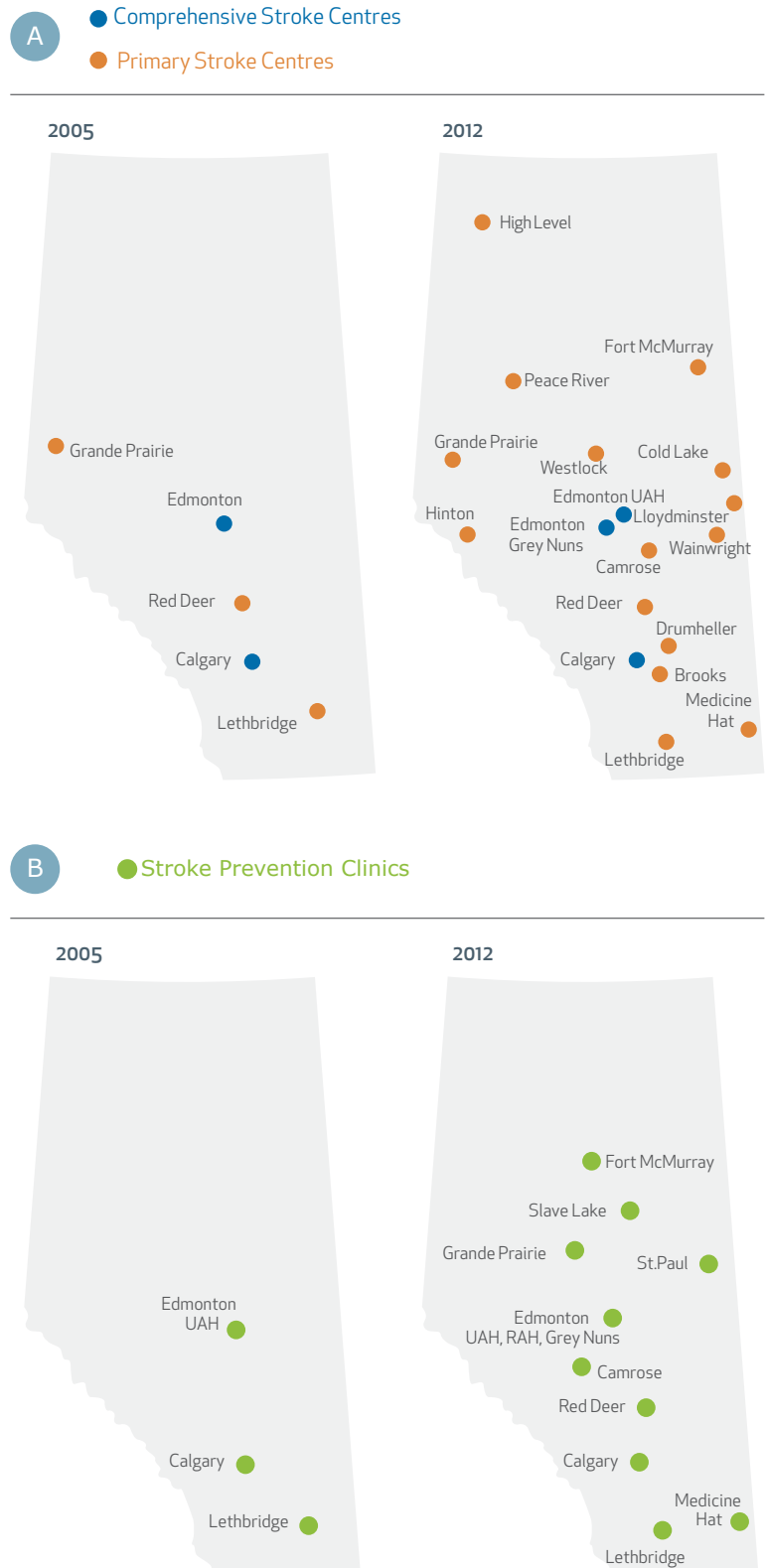


PROVINCIAL MAPS

Provincial maps 2005 and 2012 of Stroke Prevention Clinics, Comprehensive and Primary Stroke Centres

FIGURE 1.2

The province saw a substantial increase in rural Primary Stroke Centres capable of giving clot busting drugs for stroke, going from three to 15 between 2005 and 2012. The Grey Nuns Community Hospital in Edmonton was added to the existing Comprehensive Stroke Centres at the Foothills Medical Centre in Calgary and the University of Alberta Hospital in Edmonton (see A). Similarly, the number of Stroke Prevention Clinics increased from 3 to 12 during the same time period (see B).



ZONE SNAPSHOTS

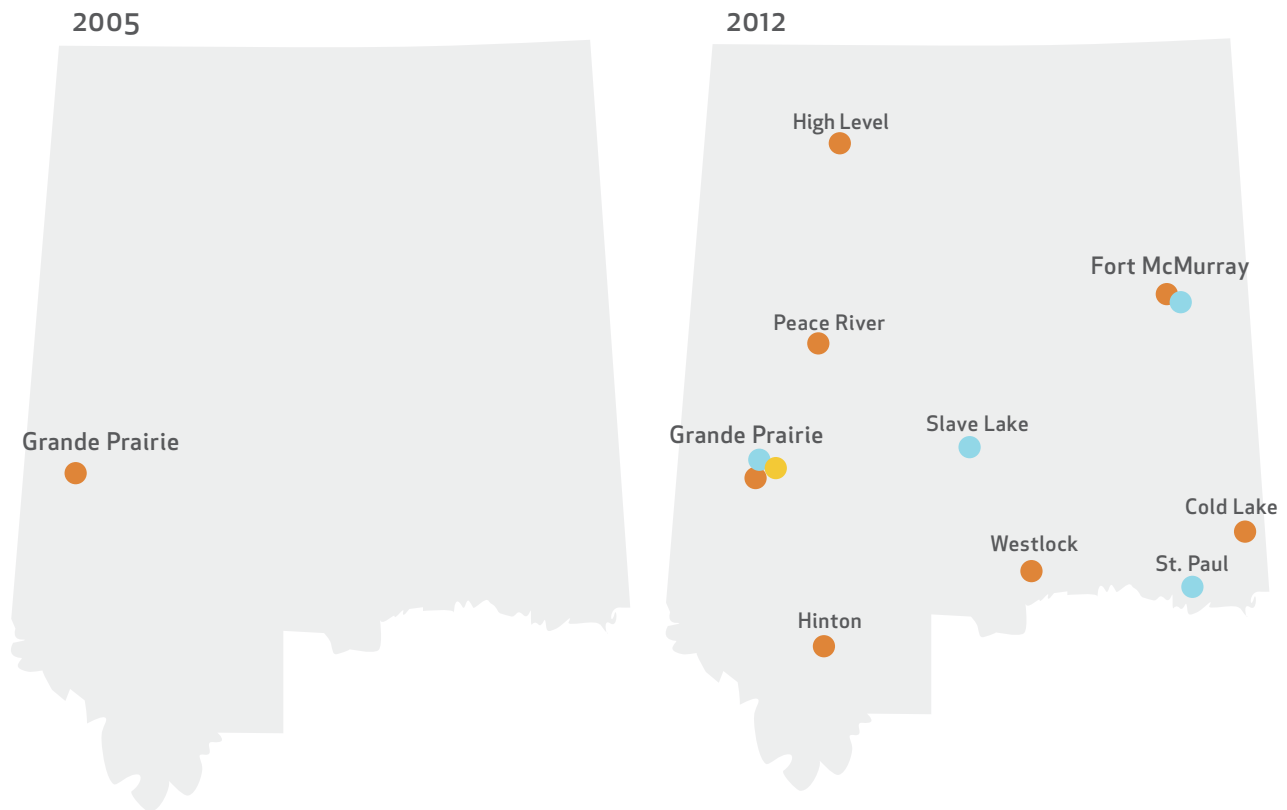
NORTH ZONE (ZONE 5)

North Zone, geographically the largest in Alberta, was created in 2008 from a merger of three former health regions: Northern Lights, Aspen and Peace Country. In 2005, one PSC in Grande Prairie serviced the northwest area of the province. The year 2007 marked significant changes to stroke services with the addition of PSCs in Hinton, Cold Lake, and Peace River. These sites link to the Comprehensive Stroke System in Edmonton.

They were followed by PSCs in Ft McMurray, Westlock, and finally High Level, giving North Zone the largest number of PSCs of any zone in the province. The first SPCs for North Zone were established in 2008 in Fort McMurray and Grande Prairie, followed by Slave Lake and St. Paul, thereby expanding the scope of stroke services to northern Alberta.

FIGURE 1.3

Stroke Services in 2005 and 2012 for North Zone



North Zone Highlights

- Two thirds the size of France!
- From 2007/08 to 2010/11 100% of patients with ischemic stroke/TIA and atrial fibrillation were discharged on antiplatelet agents or anticoagulants
- The lowest stroke mortality of any zone in Alberta
- Seven PSCs – the most of any zone

- Comprehensive Stroke Center
- Primary Stroke Centers
- Stroke Prevention Clinics
- Rehabilitation Services/Programs

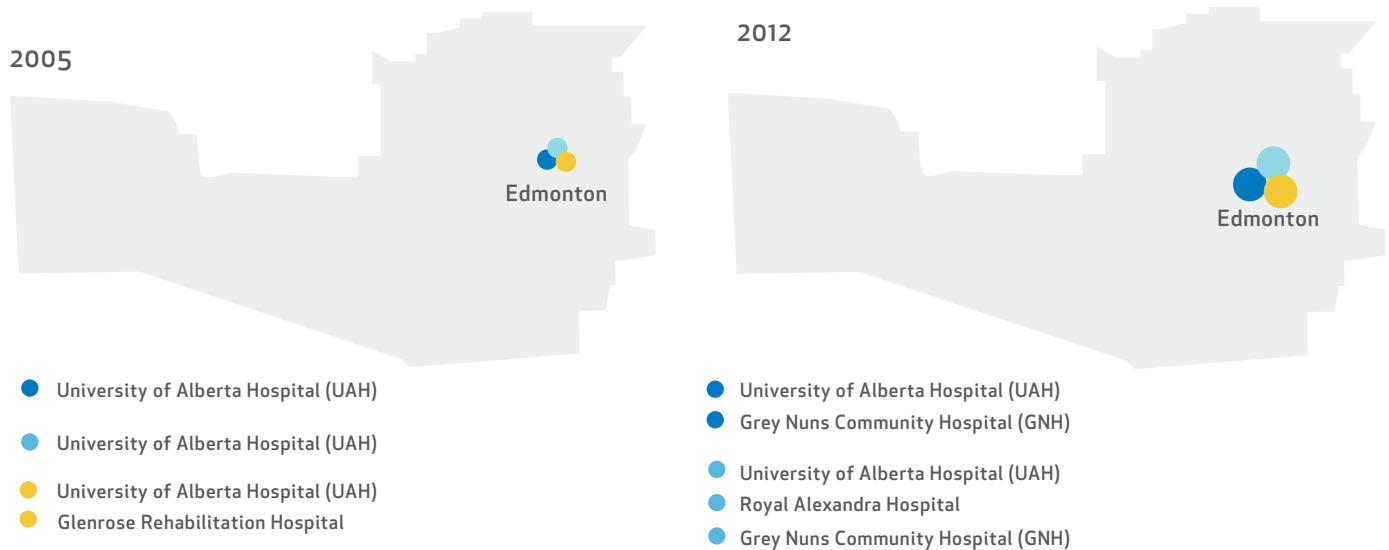
EDMONTON ZONE (ZONE 4)

Edmonton Zone, formerly the Capital Health Region, provides comprehensive stroke services and a critical supportive role to the PSCs in northern and central Alberta. Through coordination of pre-hospital transport processes and collaboration between sites, the University of Alberta and Grey Nuns Community Hospital form a Comprehensive Stroke System, offering increased access to acute stroke treatments. Edmonton Zone's Comprehensive Stroke System is also home to SPCs and Stroke Inpatient Units at the University of

Alberta, Royal Alexandra and Grey Nuns Community Hospital. Stroke prevention expertise is also accessible to residents of northern and central Alberta through Telehealth linkages to these clinics. Innovations in stroke rehabilitation occurred with the establishment of the Community Dysphagia and Early Supported Discharge programs. Edmonton Zone has provided provincial leadership in development of clinical practice recommendations and health care provider education resources.

FIGURE 1.4

Stroke Services in 2005 and 2012 for Edmonton Zone



Edmonton Zone Highlights

- One of the largest Telestroke systems in the world
- Supports acute care and preventive care to 11 PSCs and many other small rural centres
- Has the highest proportion of patients discharged on cholesterol medications, blood pressure medications and antithrombotics in the province
- Edmonton's Comprehensive Stroke System has two thrombolysis (clot busting) centres and three stroke prevention clinics

● In addition to the Glenrose Rehabilitation Hospital, rehabilitation programs operate at the UAH, GNH and Royal Alexandra Hospitals. Also available are Community Rehabilitation Interdisciplinary Services and the Stroke Early Supported Discharge Program. Additionally, there are six private neuro-rehab clinics in Edmonton.

- Comprehensive Stroke Center
- Primary Stroke Centers
- Stroke Prevention Clinics
- Rehabilitation Services/Programs

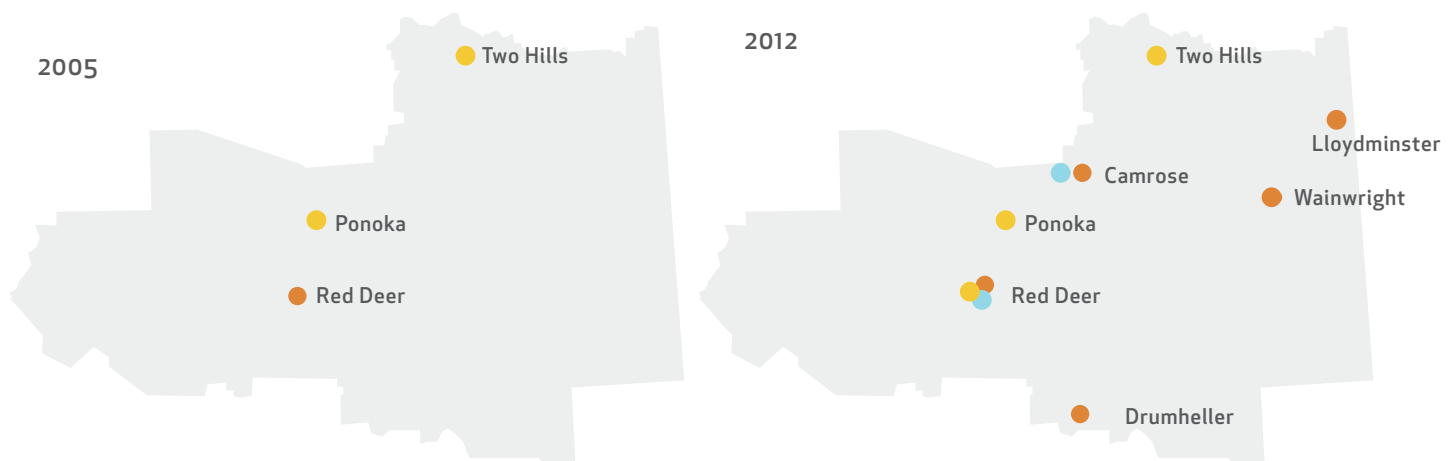
CENTRAL ZONE (ZONE 3)

Central Zone was formed when the former David Thompson and East Central Health Regions merged. Though the Central Zone is geographically diverse, a combination of local expertise and access to CSCs in Calgary and Edmonton has improved the availability and quality of stroke services. Starting with a single

PSC in Red Deer in 2005, other PSCs have since been established in Camrose, Drumheller, Lloydminster and Wainwright. Inpatient rehabilitation is available in Red Deer, Ponoka and through the SAGE program in Two Hills. SPCs operate from Camrose and Red Deer, utilizing onsite and Telehealth neurology coverage.

FIGURE 1.5

Stroke Services in 2005 and 2012 for Central Zone



- Comprehensive Stroke Center
- Primary Stroke Centers
- Stroke Prevention Clinics
- Rehabilitation Services/Programs

Central Zone Highlights

- Contains five PSCs
- As of June 2012, St. Mary's Hospital Camrose had the fastest door to tPA treatment time of any PSC and the second fastest (after Foothills Hospital Calgary) treatment time of all stroke centres in the province
- The highest consistent proportion of hemorrhagic stroke patients discharged on antihypertensive agents was from 2008/09 to 2010/11
- Went from lowest to highest in the province for percentage of patients receiving rehabilitation assessment within 48 hours of admission

CALGARY ZONE (ZONE 2)

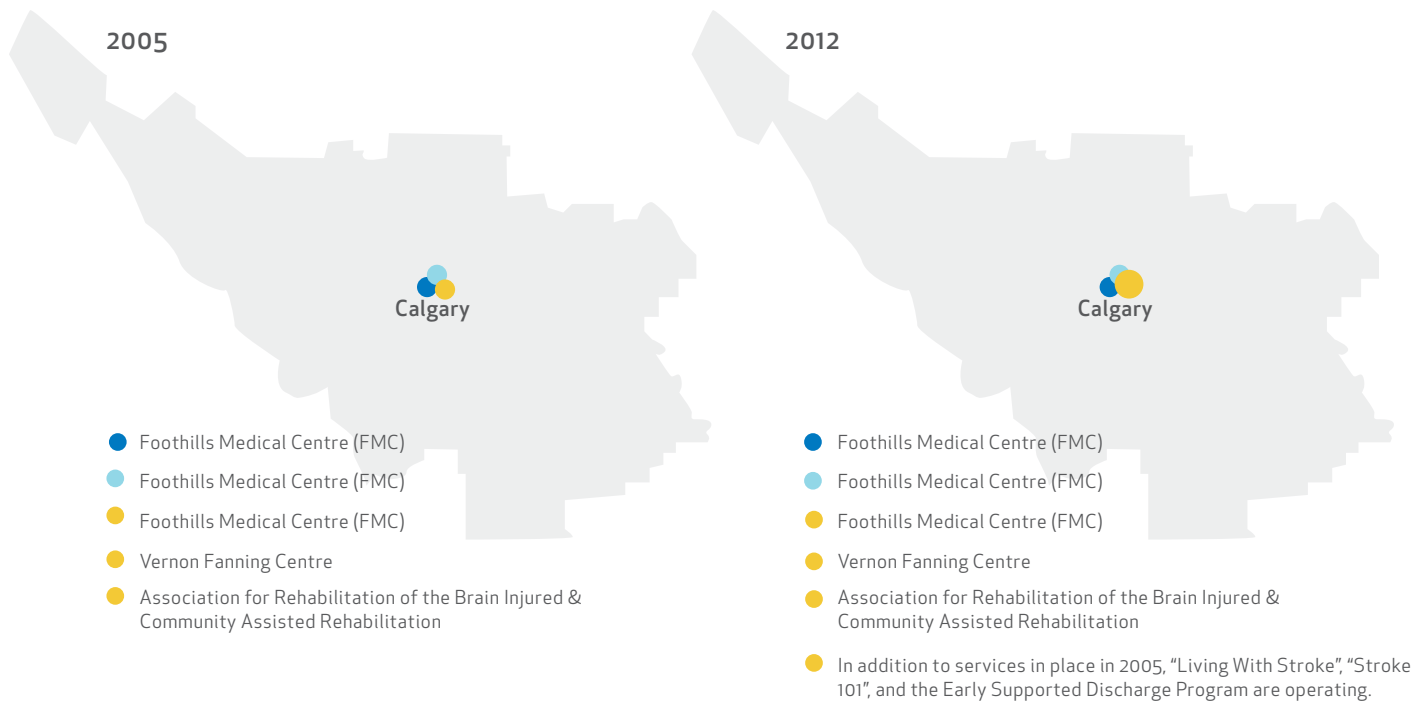
One of Alberta’s first Comprehensive Stroke Centres is located at the Foothills Medical Centre in Calgary. Telehealth linkages with PSCs in Red Deer, Drumheller, Lethbridge, Medicine Hat and now Brooks extend access to stroke neurologist expertise. Emergency Medical Services (EMS) protocols, a central rehabilitation referral process and the Early Supported Discharge program streamline access to services. Other innovations in stroke programming include development of:

- a “Patient Passport”, designed to improve awareness of stroke services
- a Patient Reference Group which advises on patient and family experiences with care
- a comprehensive performance measurement plan, guiding quality improvement initiatives.

The Calgary Stroke Program is a recipient of the Stroke Services of Distinction Award from Accreditation Canada - the first comprehensive program in the country to receive this award.

FIGURE 1.6

Stroke Services in 2005 and 2012 for Calgary Zone



Calgary Zone Highlights

- The fastest door to tPA treatment time in the province
- The highest proportion of patients receiving carotid imaging prior to discharge
- The highest proportion of patients receiving care in a stroke unit in the province
- A highly skilled team of quality improvement experts providing services province-wide

- Comprehensive Stroke Center
- Primary Stroke Centers
- Stroke Prevention Clinics
- Rehabilitation Services/Programs

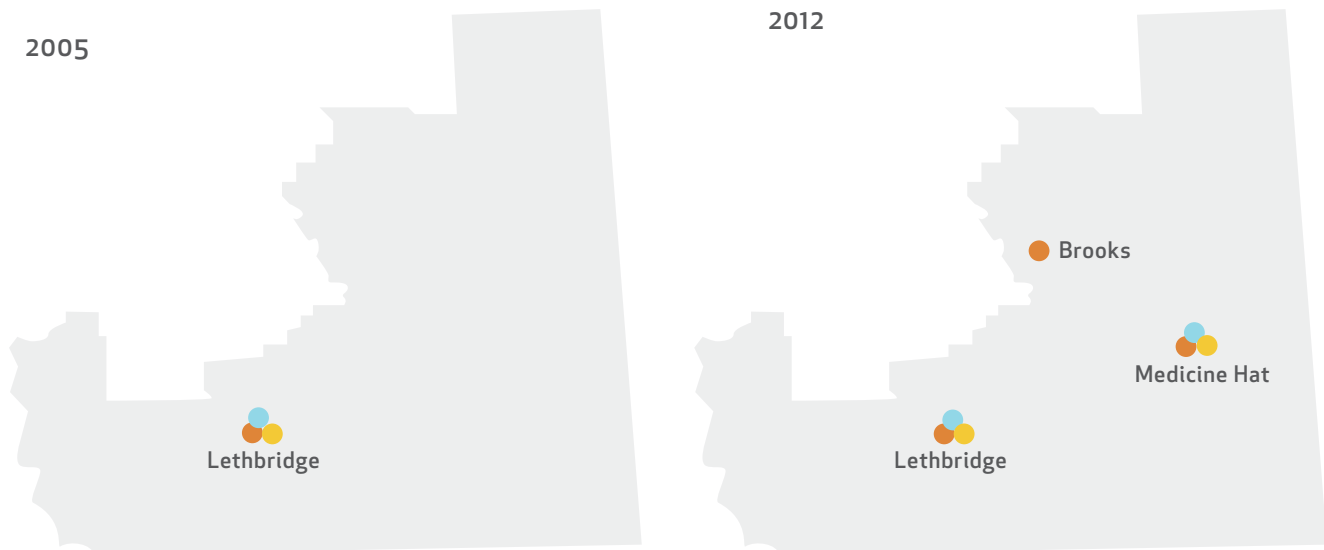
SOUTH ZONE (ZONE 1)

In 2008, the former Palliser and Chinook Health Regions merged to form South Zone. Through Telehealth linkages with the CSC in Calgary, Lethbridge, Medicine Hat and Brooks now offer expanded acute stroke services to residents of southern Alberta. The year 2005 marked the launch of one of Alberta's first SPCs located in Lethbridge. With the addition of Medicine Hat, prevention services are now available to residents of the southeast part of the province.

Standardized assessment tools are used in stroke rehabilitation assessment and discharge processes, such as TOR-BSST and AlphaFIM. At the zone and site level, the collection and distribution of stroke information and clinical outcomes data has improved clinical processes and provides the opportunity to evaluate the impact of changes to stroke service delivery.

FIGURE 1.7

Stroke Services in 2005 and 2012 for South Zone



South Zone Highlights

- Averaged over time, the highest proportion of swallowing screens of any zone
- Second highest for proportion of patients treated with stroke unit care
- Created a stroke information dashboard for quality improvement
- Tied with Calgary for second lowest risk adjusted stroke mortality of all zones in the province

- Comprehensive Stroke Center
- Primary Stroke Centers
- Stroke Prevention Clinics
- Rehabilitation Services/Programs



Educating Albertans About Stroke



Rose K. has family members who suffered a stroke but she did not know what she could do to prevent this from happening to herself. Recalling a recent newspaper ad about high blood pressure as a risk factor for stroke, she booked an appointment with her family doctor. She was found to have high blood pressure or “hypertension”. Rose was prescribed medication and is now on an exercise and weight loss program.



APSS INDICATOR

1

KNOWLEDGE OF STROKE RISK

Performance Measure: Proportion of population who can identify risk factors for stroke

Preventing stroke takes skilled health care providers, but more importantly, a population that is knowledgeable and motivated to look after their health. Knowing about the causes of stroke and what to do to prevent an occurrence is a cost-effective public health initiative that builds self-efficacy. The APSS, in collaboration with the Heart & Stroke Foundation of Alberta, Northwest Territories & Nunavut (HSFA), conducted multi-media public awareness campaigns in 2011 to increase awareness of high blood pressure as the primary risk factor for stroke. The key message of the “Get Your Blood Pressure Checked” campaign was to prompt Albertans to form a connection between high blood pressure and stroke. Validated surveys were conducted before and after each campaign showing improvements in awareness of this important risk factor.

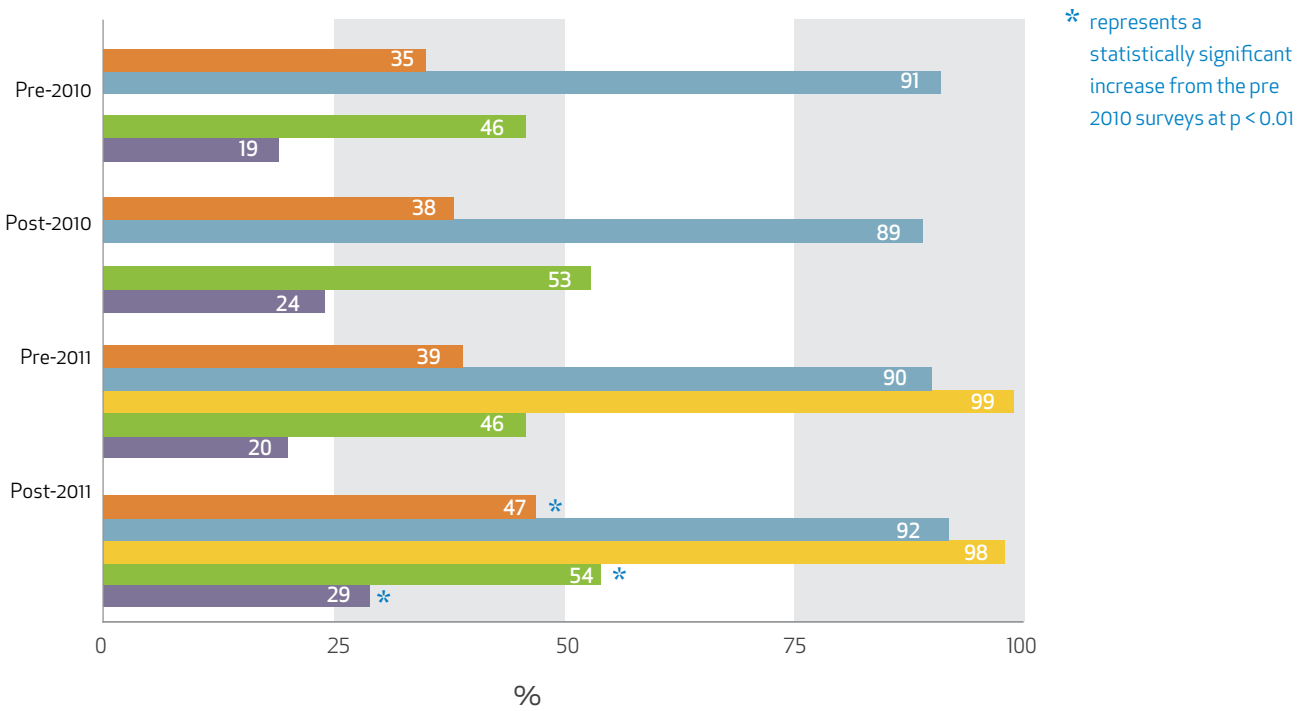


Findings

FIGURE 2.1

Blood pressure awareness campaigns 2010-11

- Hypertension is a risk factor for stroke (unaided)
- Hypertension is a risk factor for stroke (aided)
- Hypertension is a serious condition
- Hypertension is the biggest risk factor for stroke
- Monitoring and controlling blood pressure can prevent stroke



There was a statistically significant increase in the percentage of Albertans that could identify hypertension as a risk factor for stroke (unaided), as the biggest risk factor for stroke, and that monitoring and controlling one's blood pressure can prevent stroke.

Source – population internet and telephone surveys.

FIGURE 2.2

Recognize and React Public Awareness Campaigns 2007 and 2009

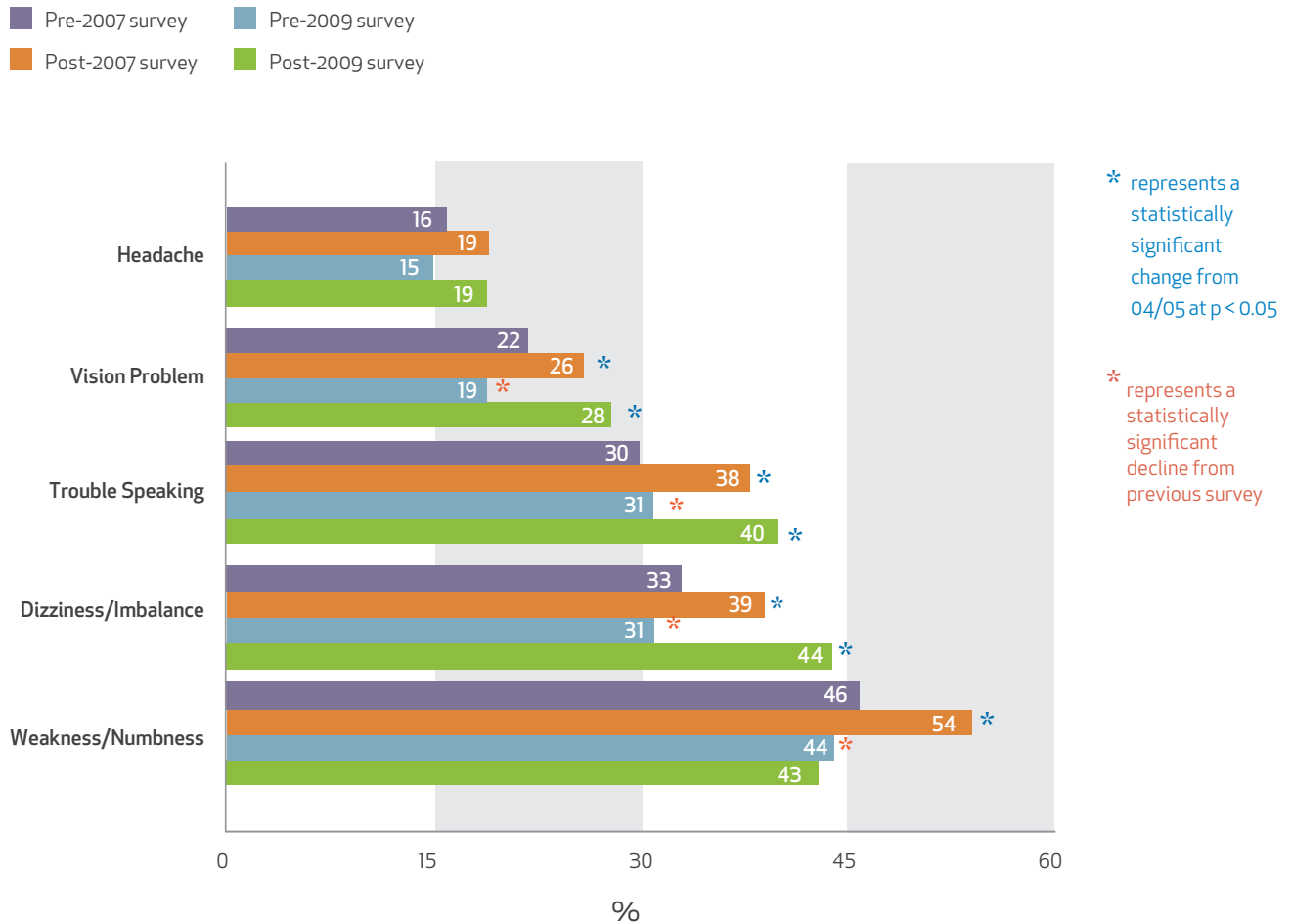


Figure 2.2 The APSS, partnering with the Heart and Stroke Foundation of Alberta, Nunavut and NWT, conducted the 2007 and 2009 Recognize and React campaigns. These demonstrated statistically significant increases of 4-13% in awareness of stroke symptoms after each campaign. In between campaigns, however, awareness diminished to pre-campaign levels. This suggests that without sustained messaging the population of Alberta will again be at risk for losing the gains of awareness in stroke symptoms.

Source – telephone surveys of the population with random sampling.

APSS INDICATOR 2	KNOWLEDGE OF STROKE SIGNS & SYMPTOMS Performance Measure: Percentage of the population that can name two or more stroke symptoms
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FIGURE 2.3

Median Time from Last Seen Well to ED Arrival for TIA and Stroke Patients

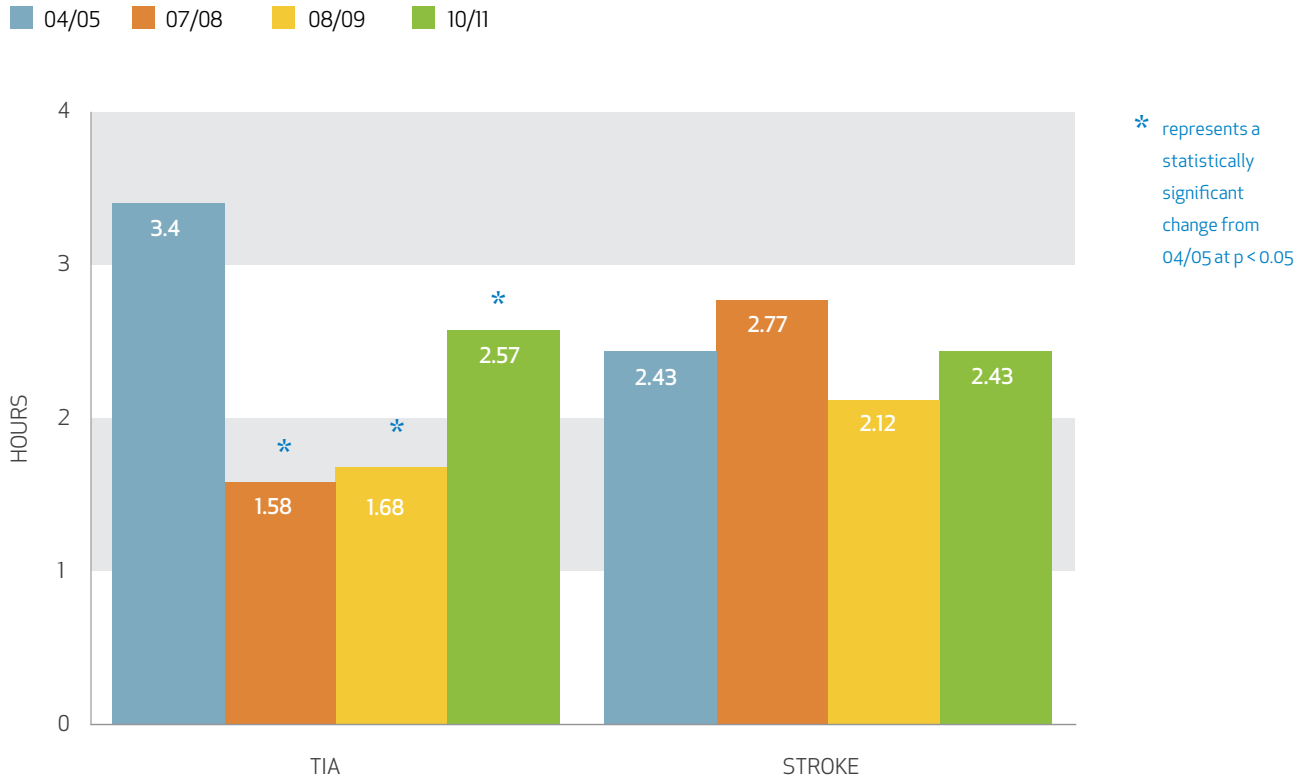


Figure 2.3 The response time from time last seen well to ED arrival decreased significantly for patients with TIA for all subsequent waves of chart reviews compared to 2004/05. A lower time is better and the best response times occurred in 2007/08 and 2008/09 with a lengthening of response time in 2010/11. For patients with stroke, response time did not change significantly over the four waves of chart reviews. Only those patients with an exact last seen well time were included in this analysis.

Source – APSS chart reviews.

<p>APSS INDICATOR</p> <p>3</p>	<p>AWARE OF NEED FOR URGENT MEDICAL ATTENTION</p> <p>Performance Measure: Mean/median time from stroke symptom onset to presentation at an emergency department</p>
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FIGURE 2.4

Percentage of TIA and Stroke Patients Arriving to ED within 2.5, 3.5, and 4.0 hours of LSW Time

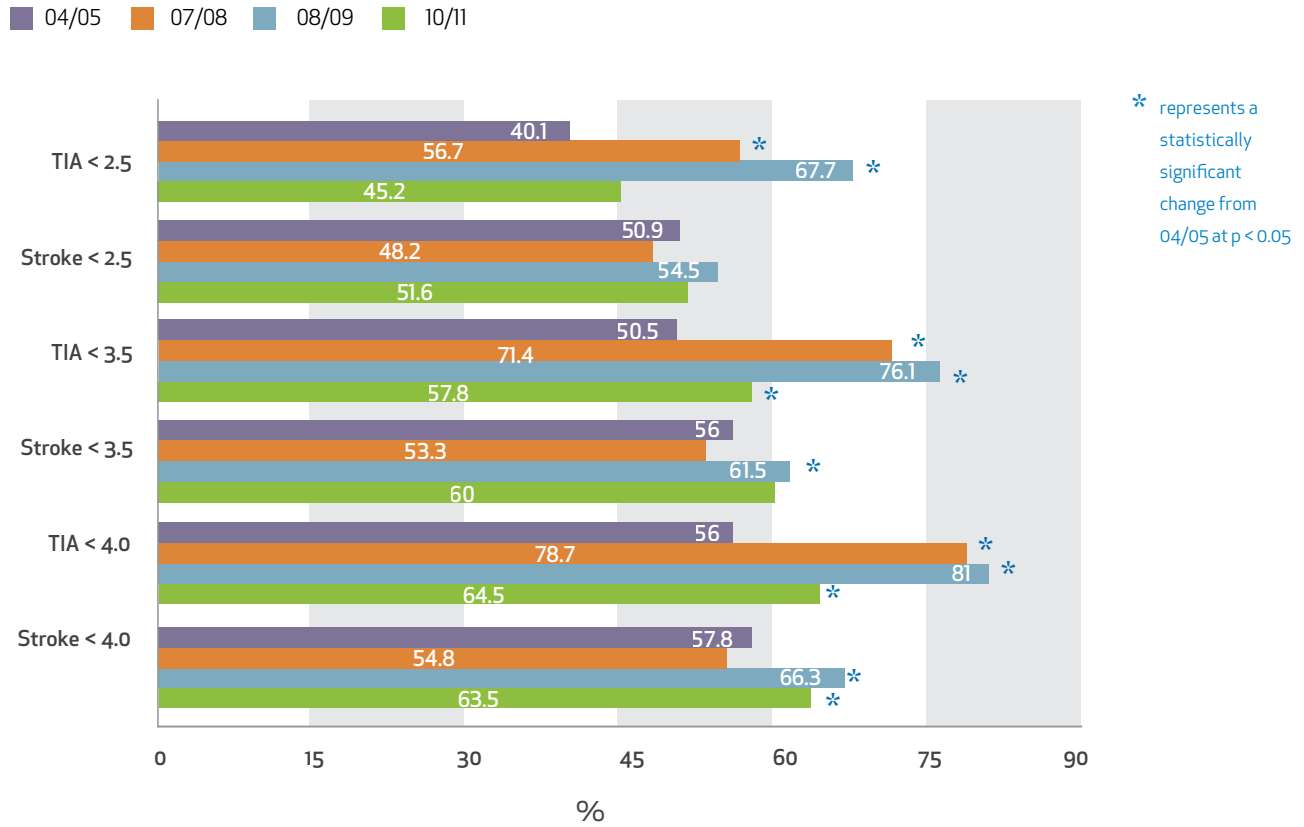


Figure 2.4 There was a significant increase in the percentage of TIA patients arriving at hospital within 2.5, 3.5 and 4.0 hour time windows in 2007/08, 2008/09 and 2010/11 compared to 2004/05. There was a significant increase in the proportion of stroke patients arriving within 3.5 and 4.0 hours as well. A higher percentage is better and the best response seemed to occur in 2008/09 for both TIA and stroke.

Source – APSS chart reviews.

APSS INDICATOR

4

AWARE OF NEED FOR URGENT MEDICAL ATTENTION

Performance Measure:
Percentage of patients who seek medical attention within 2.5 hours and also within 4 hours of stroke symptom onset

“Time is Brain”!

An important aspect of the “Recognize & React Campaigns” was the advice to Albertans to seek medical care as soon as signs and symptoms of stroke occur.

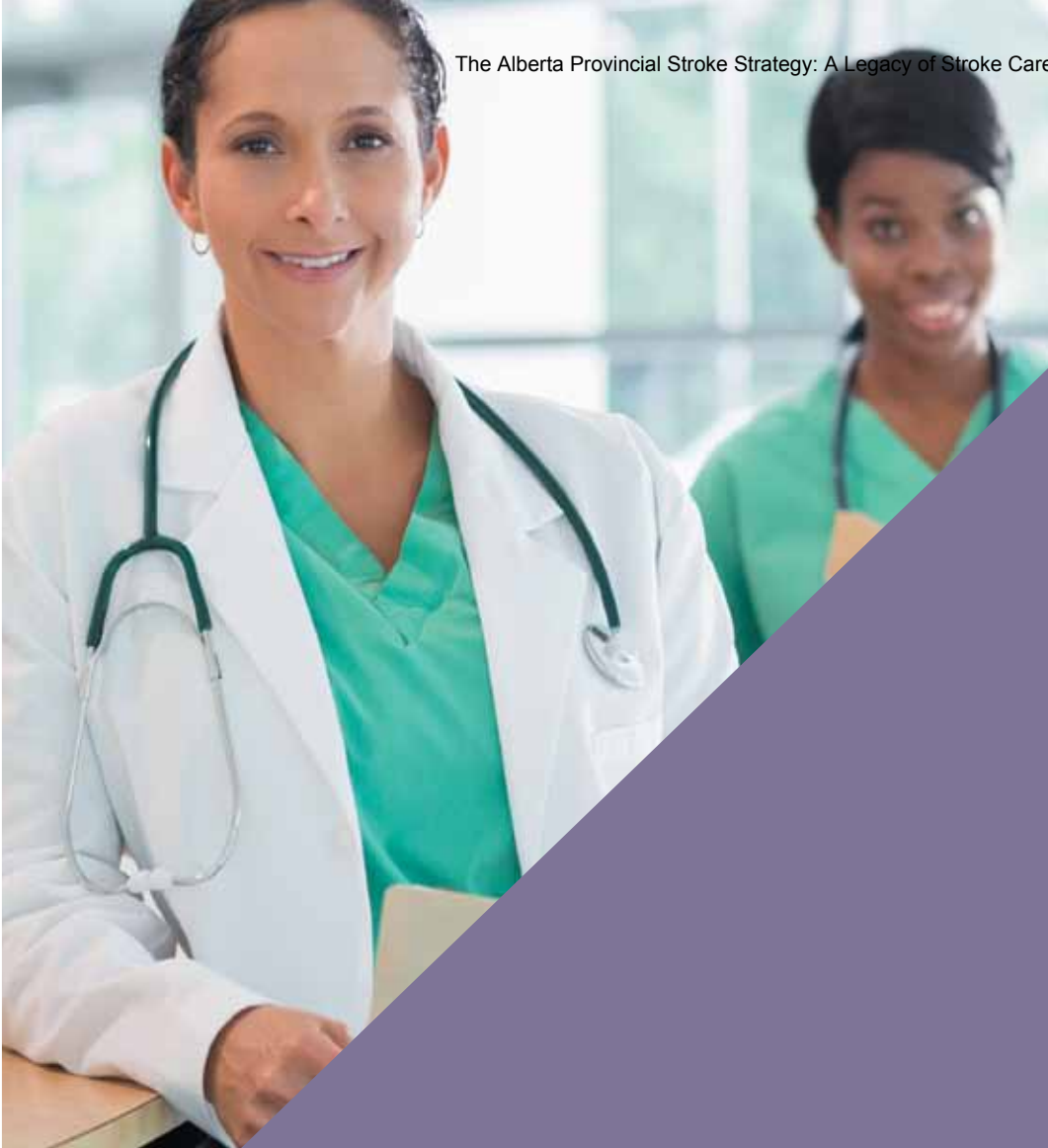
Summary of Findings

- Television, radio and print media improved public awareness of hypertension as a risk factor for stroke as well as the signs and symptoms of stroke. Other findings were:
 - Declines in awareness occur in the absence of continued messaging.
 - The level of knowledge in the population remains relatively low for some symptoms of stroke
 - The majority of Albertans are still not aware that monitoring and controlling blood pressure can prevent stroke.
- A shorter stroke onset to ED arrival time allows potential timely treatment with clot busting drugs. By 2008/09 there was almost a 90 minute reduction in the average time to reach the emergency department for TIA patients.
 - By 2010/11 this response time had lengthened but it was still significantly better than 2004/05.
 - The proportion of TIA patients arriving within 3.5 hours and 4.0 hours increased significantly by 2010/11.
- The average response times for stroke patients remained constant over time without improvement or worsening.
- The proportion of stroke patients presenting within 4.0 hours increased by 2010/11, which represents an improvement.
- The highest proportion of favourable response times occurred in 2008/09 for both TIA and stroke.

More information on these findings can be found in Tables 2.1 to 2.4 (pages 93-94)

Recommendations

- ▶ Sustained public messaging is required in regards to risk factors and signs and symptoms of stroke. This might consist of repeated multimedia campaigns or an exploration of other methods to reach the public such as interventions in schools, workplaces or the use of social media.
- ▶ Continued emphasis on in-the-field stroke recognition, rapid pre-hospital transport and transport to the correct health facility, are also required to further improve median onset to ED times and the percentage of patients arriving within treatable time windows.



Reducing Stroke Occurrence & Mortality



REDUCING STROKE OCCURRENCE

Dr. Fairfax is seeing Linda M. for an annual physical examination. Linda tells the physician that for the past month she has been feeling occasional “fluttering” in her chest, fatigue and shortness of breath. After laboratory and diagnostic testing, Linda was found to have atrial fibrillation; a heart condition that places a person at risk for stroke due to the potential to form blood clots that may travel to the brain. Linda is prescribed a “blood thinner”.



Preventing a stroke from occurring can save a life and preserve quality of life. Prevention can also significantly reduce health care expenditures because stroke is the most common neurological condition requiring admission to hospital.

Individuals who have had an ischemic stroke or a TIA have an increased risk of a recurrent stroke and other vascular events. Recurrent strokes are more likely to result in disability and death than initial strokes. 20% to 40% of strokes are preceded by a TIA or non-disabling stroke.

What are the risk factors for stroke?

- High blood pressure (hypertension)
- Diabetes
- Dyslipidemia (abnormal cholesterol levels)
- Cardiac disease
 - Atrial fibrillation
 - Coronary artery disease
- Smoking
- Excessive alcohol consumption
- Drug abuse
- Obesity
- Physical inactivity

There is good evidence that the risk of stroke can be reduced through lifestyle modification, treatment of risk factors and appropriate drug therapy. The APSS has supported health professionals by developing education programs and practice guidelines that aid in clinical decision-making regarding stroke prevention. Preventive therapies should be started at the time of a hospital admission for stroke to minimize the chances of recurrence.

Findings

<p>APSS INDICATOR</p> <p style="font-size: 48px; font-weight: bold; margin-top: 20px;">8</p>	<p>BLOOD PRESSURE MANAGEMENT</p> <p>Performance Measure: Percentage of stroke patients who have received a prescription for blood pressure lowering agents OR have a BP under target upon discharge</p>
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FIGURE 3.1

Ischemic Stroke/TIA Patients Receiving Antihypertensive Medications on Discharge

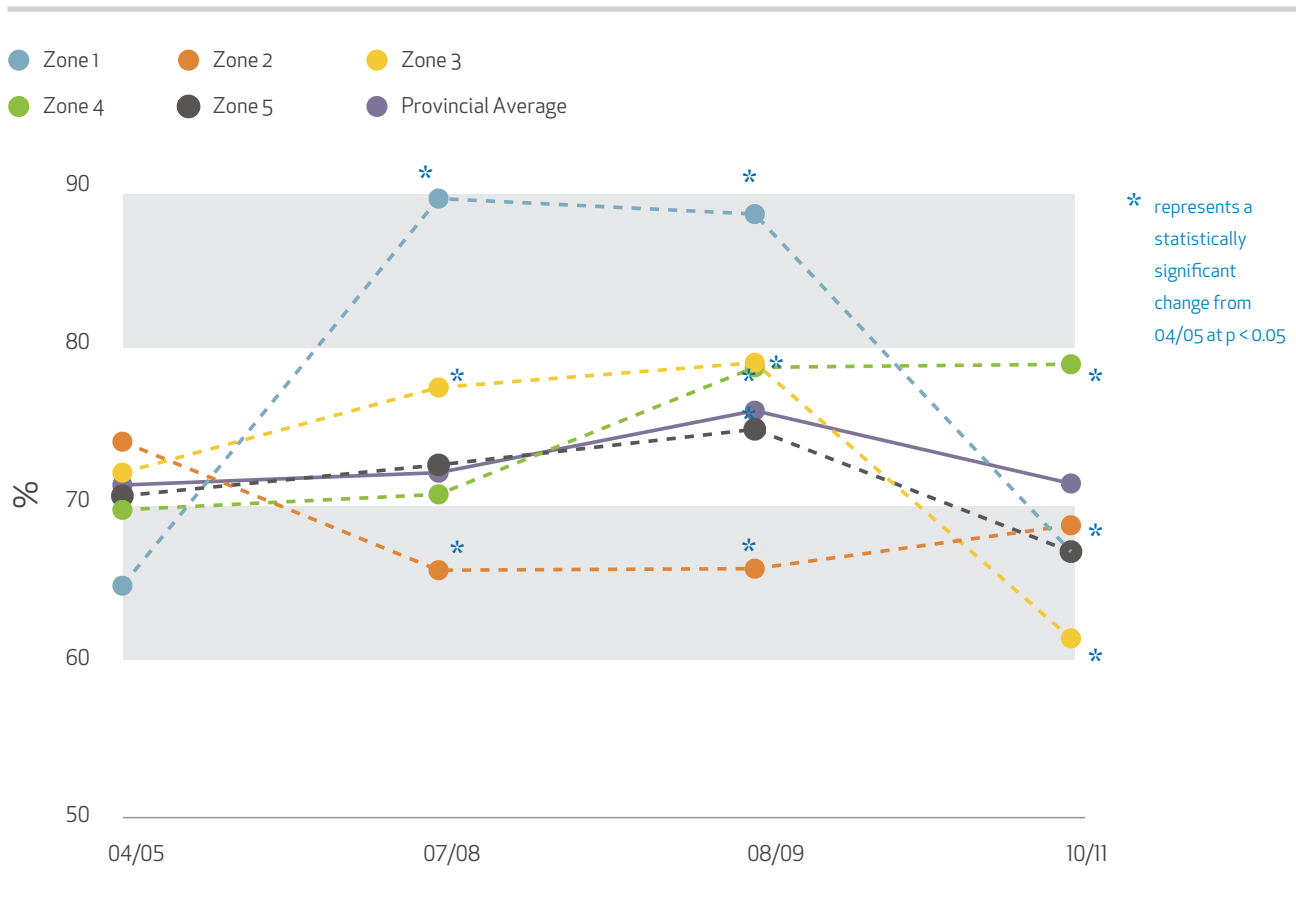


Figure 3.1 There was a significant increase between 2004/05 and 2008/09 in the proportion of ischemic stroke and TIA patients who were prescribed antihypertensive medications on discharge but then a decline as of 2010/11. According to guidelines, in some cases it is appropriate to defer antihypertensive therapy until after the first week following a stroke. (1)

From a provincial perspective, the percentage receiving antihypertensive therapy on discharge matches that from national averages (2). There was substantial variability between, and even within zones, between chart review waves with some zones experiencing an increase in antihypertensive prescriptions while others declined.

Source – APSS chart reviews.

FIGURE 3.2

Hemorrhagic Stroke Patients Receiving Antihypertensive Medications on Discharge

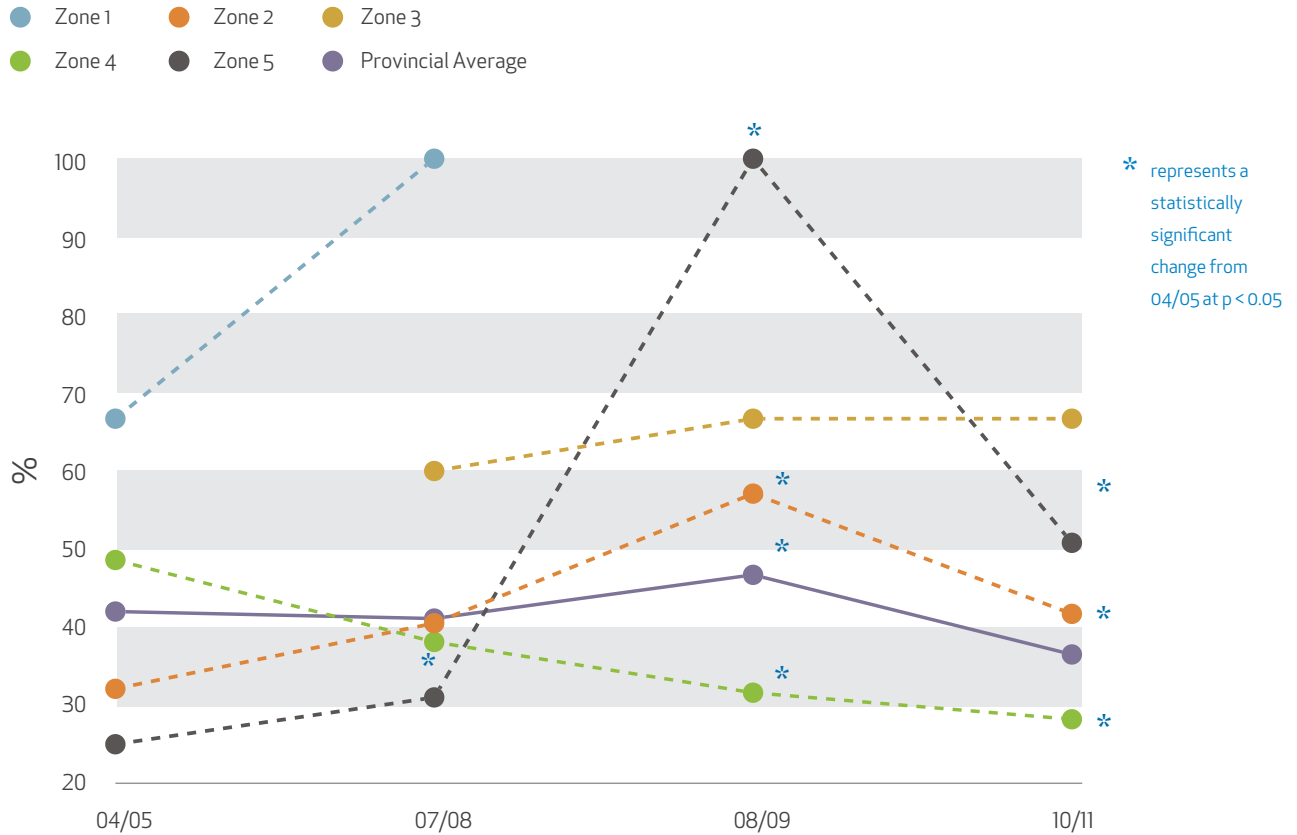


Figure 3.2 Prescription of antihypertensive medications on discharge for patients with hemorrhagic stroke was much lower than for ischemic stroke and TIA despite the fact that hypertension is the major risk factor for hemorrhagic stroke. Since hemorrhage is a less frequent event than ischemia, the number of charts available

for review was very low in some zones. This means that some estimates may not be accurate. Recognizing this limitation, there was still variability evident between zones and no increase in prescriptions over time.

Source – APSS chart reviews.

FIGURE 3.3

Proportion of Ischemic Stroke/TIA Patients Receiving Lipid Lowering Medications on Discharge

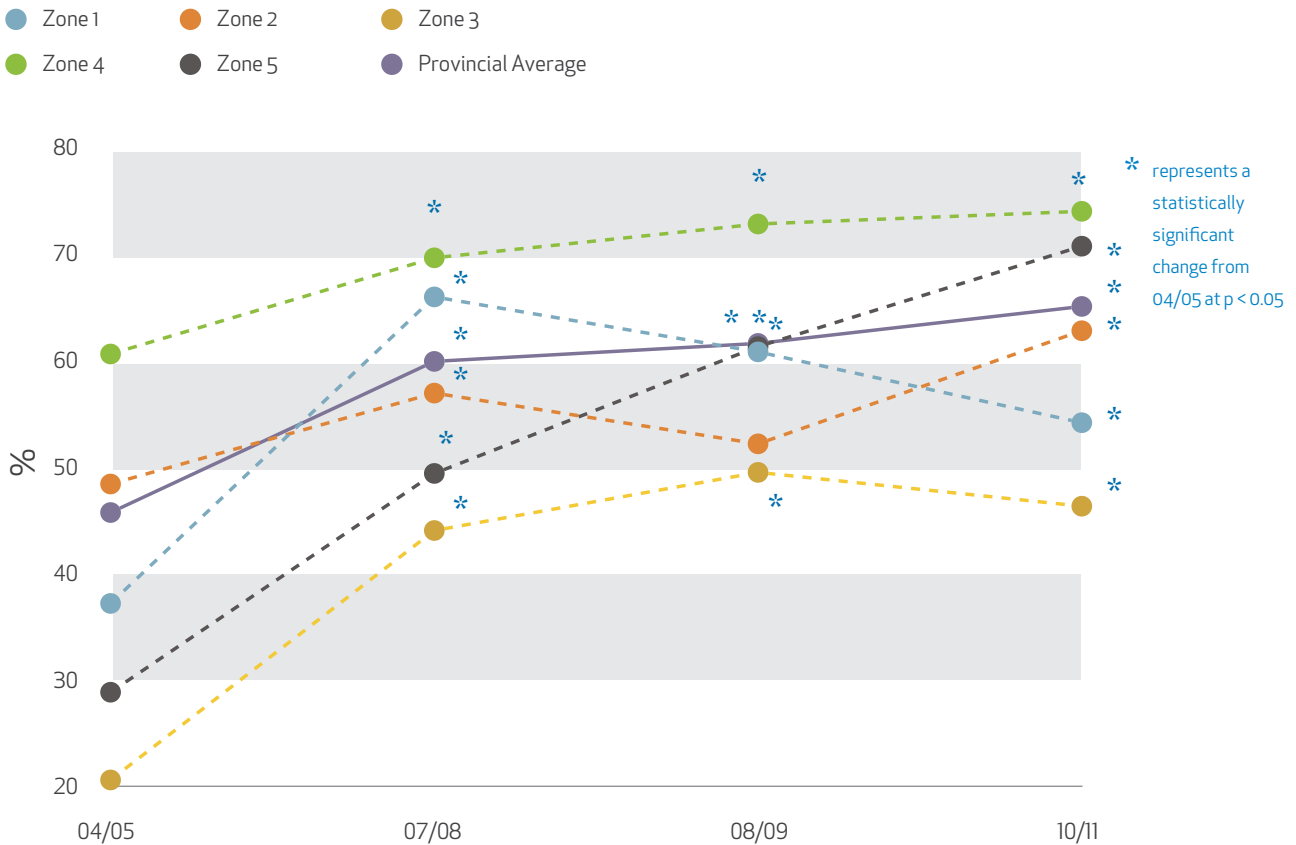


Figure 3.3 For the province overall, there was a statistically significant increase in the proportion of patients with ischemic stroke and TIA who were prescribed lipid-lowering agents on discharge compared to 2004/05. There was variability between zones with some zones displaying an increasing trend and others not.

Source – APSS chart reviews.

APSS INDICATOR 10	LIPID MANAGEMENT Performance Measure: Percentage of stroke/TIA patients prescribed lipid-lowering agents for secondary prevention – either at discharge from acute care or through a secondary prevention clinic
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FIGURE 3.4

Ischemic Stroke/TIA Patients Without Atrial Fibrillation Discharged on Antiplatelet Agents or Anticoagulants

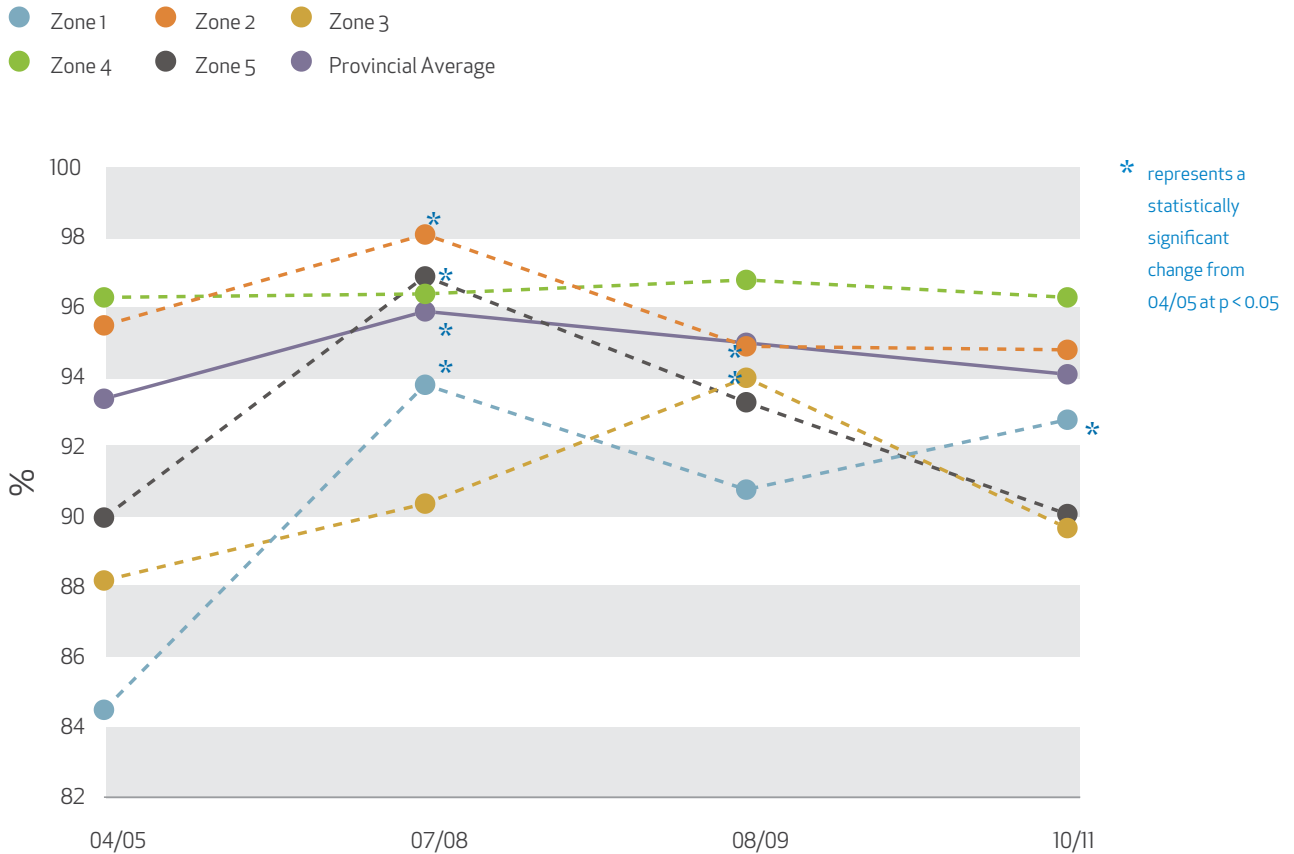


Figure 3.4 Although the percentage of ischemic stroke and TIA patients without atrial fibrillation receiving any blood thinners (either antiplatelet agents or anticoagulants) on discharge was already high province-wide in 2004/05, there were significant increases across the subsequent years followed by a slight decline in 2010/11. All zones had improvement compared to baseline. There was variability between zones with some experiencing a steeper decline towards 2010/11.

Source – APSS chart reviews.

<p>APSS INDICATOR</p> <p style="font-size: 2em; font-weight: bold; margin: 0;">11</p>	<p>ANTIPLATELET THERAPY</p> <p>Performance Measure: Percentage of ischemic stroke/TIA patients without atrial fibrillation prescribed antiplatelet therapy or anticoagulant therapy on discharge from acute care</p>
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FIGURE 3.5

Ischemic Stroke/TIA Patients With Atrial Fibrillation Discharged on Anticoagulants

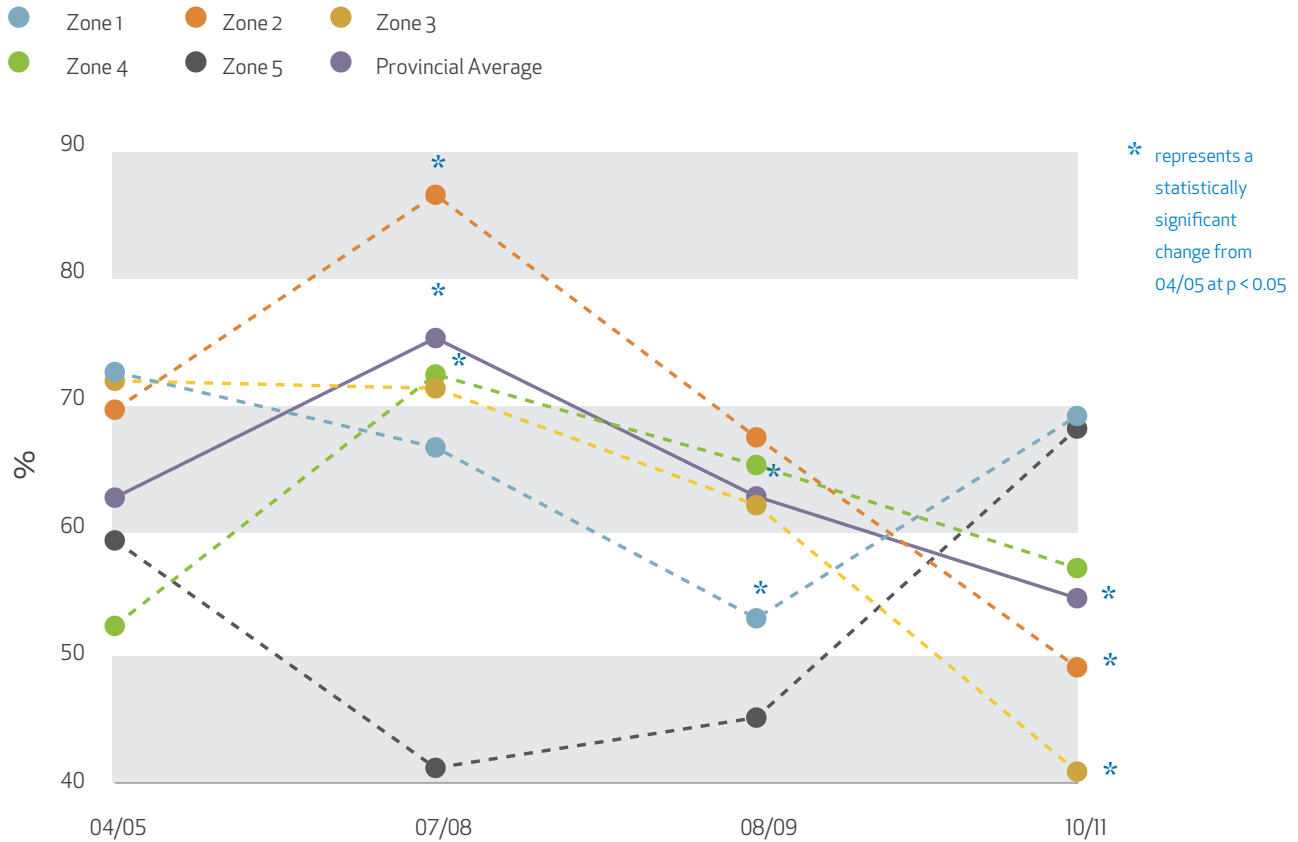


Figure 3.5 Although there was an increase in the proportion of patients with atrial fibrillation receiving anticoagulant therapy by 2007/08, there was a subsequent decline province-wide. Variability was noted between zones, with two zones showing declines and then improvements. The APSS chart review program may underestimate anticoagulant therapy from October 27 2010 onwards (the last 4 months of the 2010/11 fiscal year), as prescriptions for a newly approved anticoagulant medication were not tracked.

Source – APSS chart reviews.

<p>APSS INDICATOR</p> <p style="font-size: 48pt; font-weight: bold;">13</p>	<p>ANTITHROMBOTIC THERAPY IN ATRIAL FIBRILLATION</p> <p>Performance Measure: Percentage of eligible stroke/TIA patients with atrial fibrillation prescribed anticoagulant therapy or antiplatelet therapy on discharge from acute care</p>
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FIGURE 3.6

Ischemic Stroke/TIA Patients With Atrial Fibrillation Discharged on Anticoagulants or Antiplatelet Agents

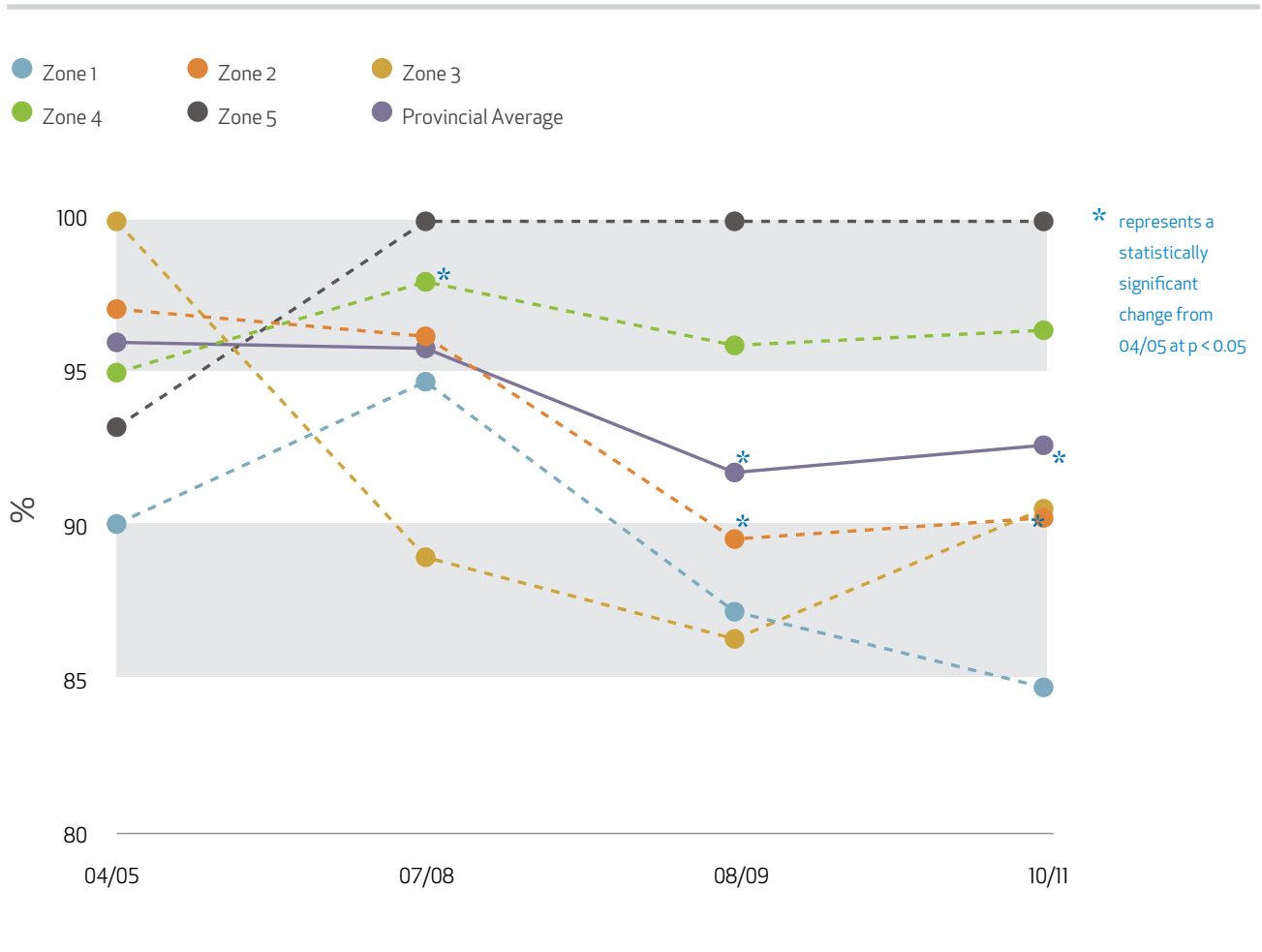


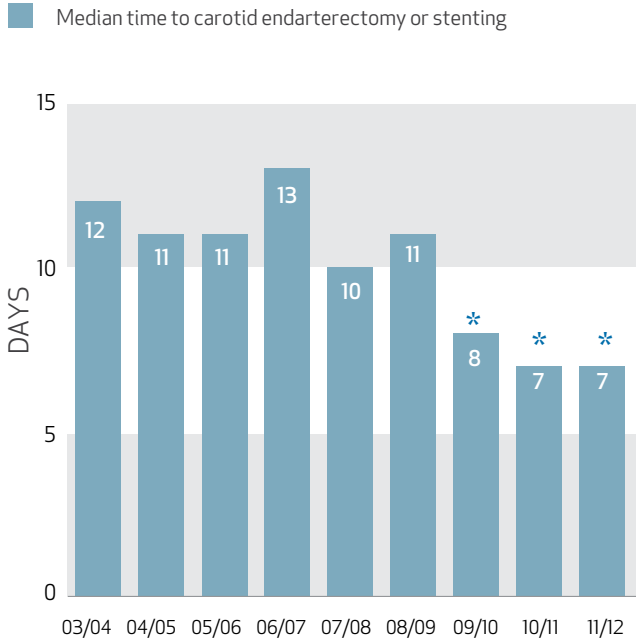
Figure 3.6 The proportion of patients with atrial fibrillation who received either anticoagulant therapy or antiplatelet therapy at discharge was high at baseline (94%) and, similar to the trend with anticoagulation, decreased overall by 2008/09. However, the combined

proportion was still above 90%. This suggests that when clinicians did not prescribe anticoagulants, they did prescribe antiplatelet agents, thus providing the patient some protection against recurrent stroke.

Source – APSS chart reviews.

FIGURE 3.7

Median Time from TIA or Stroke Event to Carotid Revascularization Surgery



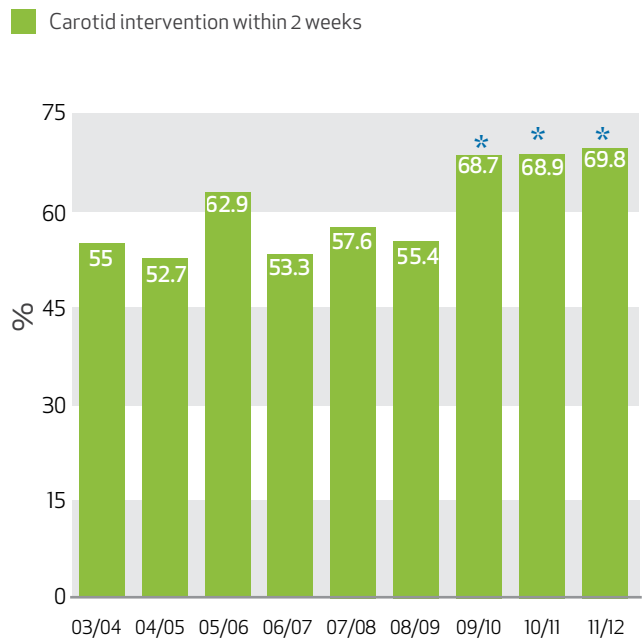
* represents a statistically significant change from 04/05 at p < 0.05

Figure 3.7 The median time from onset of stroke and TIA symptoms to completion of revascularization surgery decreased from 11 days in 2004/05 to 7 days in 2010/11.

Source – APSS chart reviews.

FIGURE 3.8

Patients Receiving Carotid Intervention Who Undergo it Within 2 Weeks of a Stroke/TIA



* represents a statistically significant change from 04/05-05/06 and from 06/07-08/09 at p < 0.05

Figure 3.8 The proportion of patients receiving carotid intervention within two weeks of their index TIA or stroke event remained constant for 6 years, then increased in 2009/10 and peaked in 2011/12. Examined in 3-year groups, the years 2009/10 - 2011/12 showed significantly higher proportions than 2006/07 - 2008/09 and 2003/04 - 2005/06.

APSS INDICATOR	REVASCULARIZATION SURGERY
16	Median time from stroke or TIA symptom onset to carotid endarterectomy surgery or stenting

APSS INDICATOR	REVASCULARIZATION SURGERY
17	Percentage of stroke/TIA patients requiring carotid intervention who undergo the procedure within two weeks of their stroke/TIA event

Summary of Findings

- There was an increase in the prescribing of antihypertensive agents at discharge for ischemic stroke. The level peaked in 2008/09 at about 75%, and then declined to the consistent provincial average of about 72% (in 2010/11), which is still relatively high. However, there was considerable variability between zones.
- The proportion of patients with intracranial hemorrhage who receive antihypertensive medications was lower at baseline (42%) and did not improve over time. It is unclear why prescription rates remained low for antihypertensive therapy in hemorrhagic stroke patients at time of discharge from hospital.
- Although lipid lowering agent use continued to increase significantly between 2004/05 and 2010/11, these medications are still underused. Only 65% of ischemic stroke and TIA patients receive prescriptions for their use on discharge. Most ischemic stroke and TIA patients will benefit from the risk reduction for recurrent stroke, myocardial infarction, and death afforded by these agents. There was variability between zones with prescription rates ranging between 46.5% and 74.4%. For reference, the national average for prescription use in 2008/09 for ischemic stroke and TIA was approximately 65%.
- Across Alberta, for patients without atrial fibrillation, there was improvement in prescription of antiplatelet agents on discharge in 2007/08 followed by a slight decline by 2010/11. There was some variability between zones with improvements for some and declining trends for other zones.
- There was fluctuation in the proportion of stroke/TIA patients with atrial fibrillation receiving anticoagulants on discharge from hospital from 63% to 55% between 2004/05 and 2010/11. However, this followed an initial increase to 75% in 2007/08. This decline in patients prescribed anticoagulants was clearly due to a choice made by clinicians to use the much less effective but generally safer antiplatelet agents rather than anticoagulants. The percentage of patients receiving one or the other type of medication declined as well, but stayed above 90%. There was variability between zones.
- The median time from stroke or TIA to carotid revascularization surgery decreased from 12 to 7 days, which is a decrease in wait time of 42%. The proportion of patients undergoing the surgery within the recommended period of two weeks from symptom onset increased from 53% to 70%.



More information on these findings can be found in Tables 3.1 to 3.7 (pages 95-97)

Recommendations

- ▶ Stroke programs and clinicians should continue to ensure that antihypertensive therapy is initiated in stable patients with ischemic stroke who have elevated blood pressure at the time of discharge from hospital.
- ▶ Understanding the reasons for the low rate of antihypertensive use in hemorrhagic stroke patients should be a major priority. Clinicians are advised to institute antihypertensive therapy as early as possible in patients with hemorrhagic stroke who have above-normal blood pressures.
- ▶ The use of lipid-lowering agents (HMGCoA reductase inhibitors) to lower cholesterol after ischemic stroke and TIA should continue to increase across Alberta.
- ▶ The reason for declining warfarin use following ischemic stroke and TIA in atrial fibrillation needs more study. The contributions of such factors as patient complexity, frailty or comorbidity and the role of new anticoagulants available since 2010 need to be understood. Since anticoagulants such as warfarin and the newer agents are more effective than antiplatelet agents in preventing stroke in atrial fibrillation, their use should increase once a minimum safe interval following stroke has passed.
- ▶ Building on progress made to date, the median time from stroke and TIA to carotid revascularization surgery should decrease further with a target of more than 80% of the procedures done within two weeks of stroke or TIA.

HAS THE OCCURRENCE RATE OF STROKE IN ALBERTA DECREASED?

The incidence of stroke triples with each successive decade of life. The aging of the population threatens a major increase in stroke occurrence with subsequent

personal, social and financial burden. Reducing the occurrence of stroke and its impact on the health care system is of great importance.

Findings

APSS INDICATOR 6	STROKE OCCURRENCE Performance Measure: The annual occurrence of stroke in Alberta by subtype
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FIGURE 3.9

The Number of Inpatient and ED Stroke Events by Year in Alberta

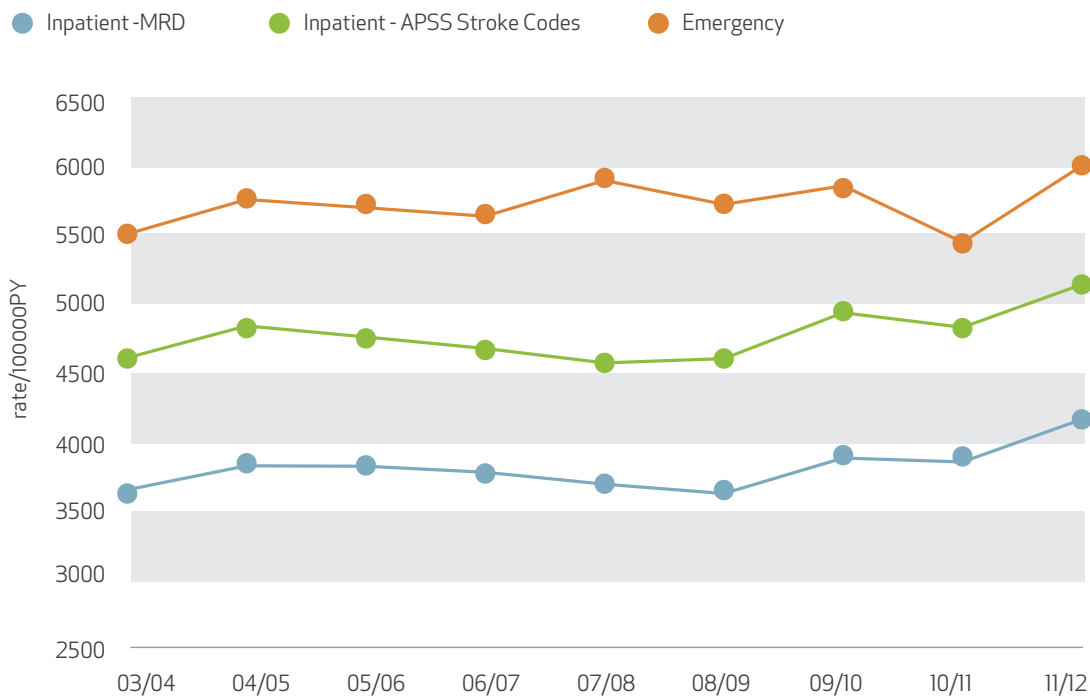


Figure 3.9 There was a decline in the actual numbers of stroke events requiring hospitalization in Alberta between 2004/05 and 2008/09. This occurred regardless of whether patients were identified using a most responsible diagnosis (MRD) for stroke or the broader set of APSS codes was used. One interpretation

was that despite the aging population more aggressive measures in primary and (to a lesser extent) secondary prevention may be paying off. However, after 2008/09 the province saw a progressive increase in stroke hospitalizations. Since stroke occurrence triples with each successive decade of life it is possible that the

aging of the population is counteracting any progress made in the preceding years. The number of ED visits has remained relatively stable. For this analysis any duplications between the inpatient and emergency

patient population were removed so the graph lines can be added together to understand total stroke events per year in the province.

Source – APSS discharge abstracts for inpatient and ambulatory.

FIGURE 3.10

Stroke Hospitalizations and ED Visits APSS Definition (age, gender standardized)

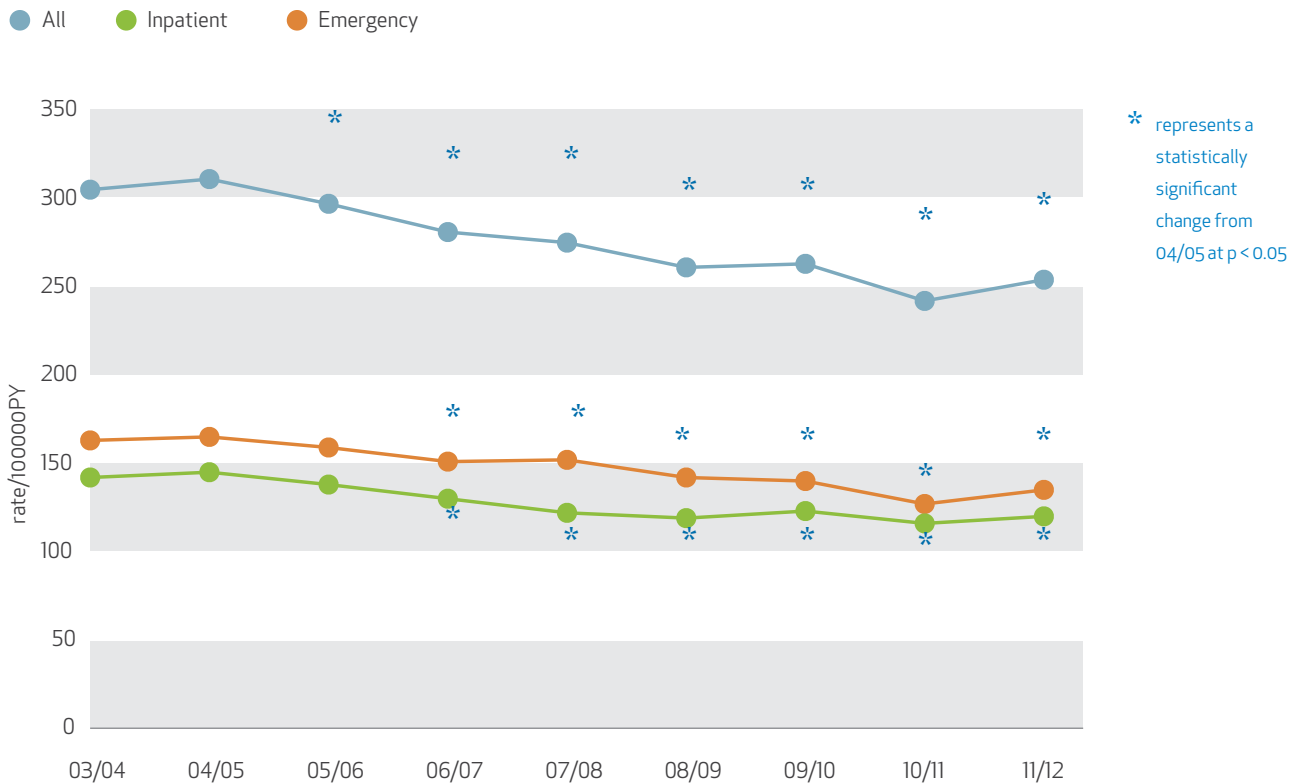


Figure 3.10 Using an expanded set of diagnostic codes compared to the interim report the APSS found a 22% decline in stroke hospitalizations and ED visits between 2004/05 and 2010/11. This was followed by a slight increase in 2011/12 for an overall reduction of 18%. APSS rates include ED visits and hospital admissions (duplications excluded) for ischemic stroke, hemorrhage and TIA, and include recurrent visits for a particular patient in the same fiscal year with the main objective

of examining resource use. Therefore, APSS rates are higher than rates calculated by the Canadian Institute for Health Information (CIHI) which include only hospital admissions and exclude TIA and recurrent admissions within 28 days for a particular patient. For CIHI – compatible rates see Figure 3.12.

Source – APSS hospital discharge abstracts and emergency visit abstracts. Using APSS administrative data surveillance definition.

FIGURE 3.11

Stroke ED and Hospital Visits by Stroke Subtype APSS Definition (age, gender standardized)

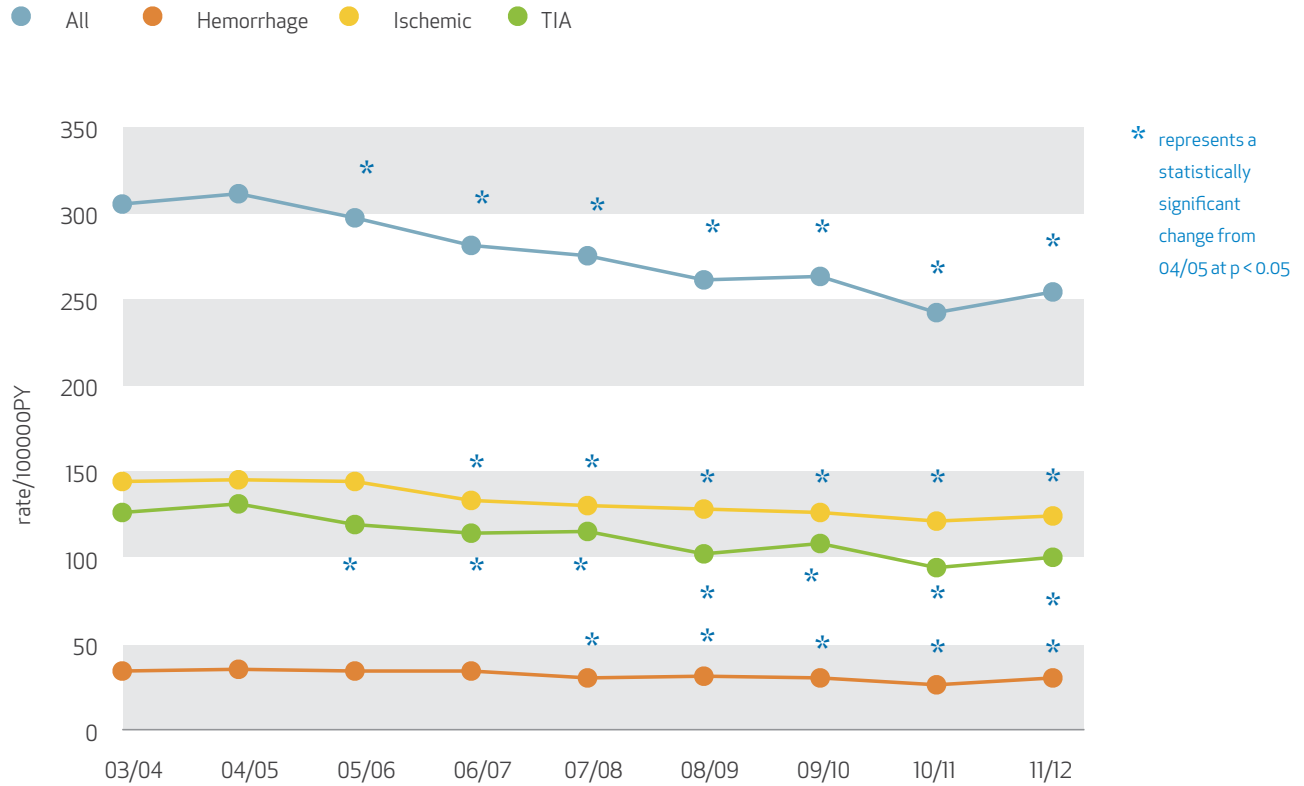


Figure 3.11 There were statistically significant declines in ischemic stroke, hemorrhagic stroke and TIA. For an explanation of APSS rates see caption for figure 3.10

Source – APSS hospital discharge abstracts and emergency visit abstracts. APSS administrative data surveillance definition.

FIGURE 3.12

Stroke Hospitalizations by Stroke Subtype CIHI Definition (age, gender standardized)

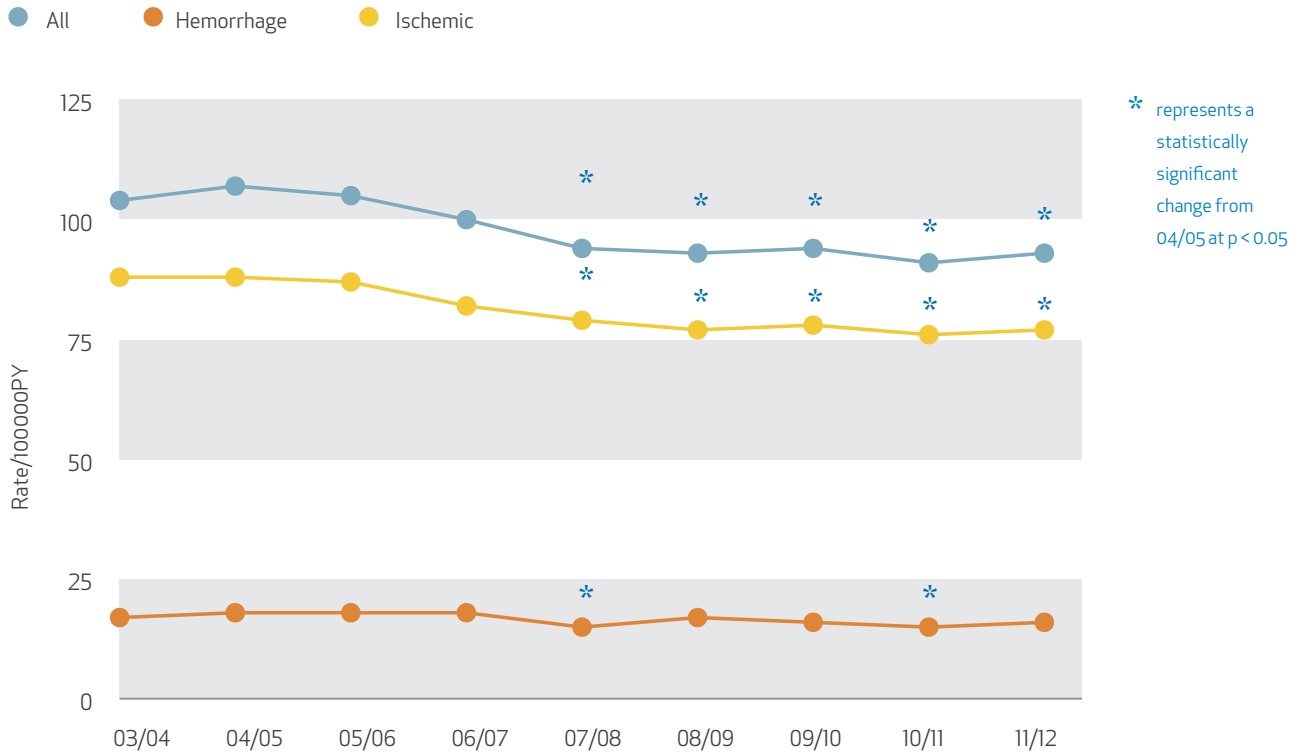


Figure 3.12 Using a CIHI-compatible definition of stroke incidence there has been a 13% reduction in hospitalizations for stroke between 2004/05 and 2011/12. This definition differs from the APSS definition as it includes only hospital admissions (not ED visits) for stroke but not TIA, and excludes repeat admissions for a particular patient within the subsequent 28 days.

As expected, rates are lower than when using the APSS definition but the declining trend is similar. There appears to be a recent plateau in the declining rates.

Source – APSS hospital discharge abstracts and emergency visit abstracts. APSS administrative data surveillance definition.

REDUCING MORTALITY

Stroke is the fourth leading cause of death in Canada. Over the next two decades, the number of Albertans who are over the age of 65 will increase. There is a concern that the number of deaths from stroke will also increase as the population ages.

Findings

<p>APSS INDICATOR</p> <p style="font-size: 2em; font-weight: bold; color: white;">7</p>	<p>STROKE MORTALITY</p> <p>Performance Measure: Stroke mortality rates across the province, including in-hospital or 30-day and one-year</p>
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FIGURE 3.13

Stroke 30d In-hospital Mortality by Stroke Subtype - Adjusted Rates (for a female aged 60-84)

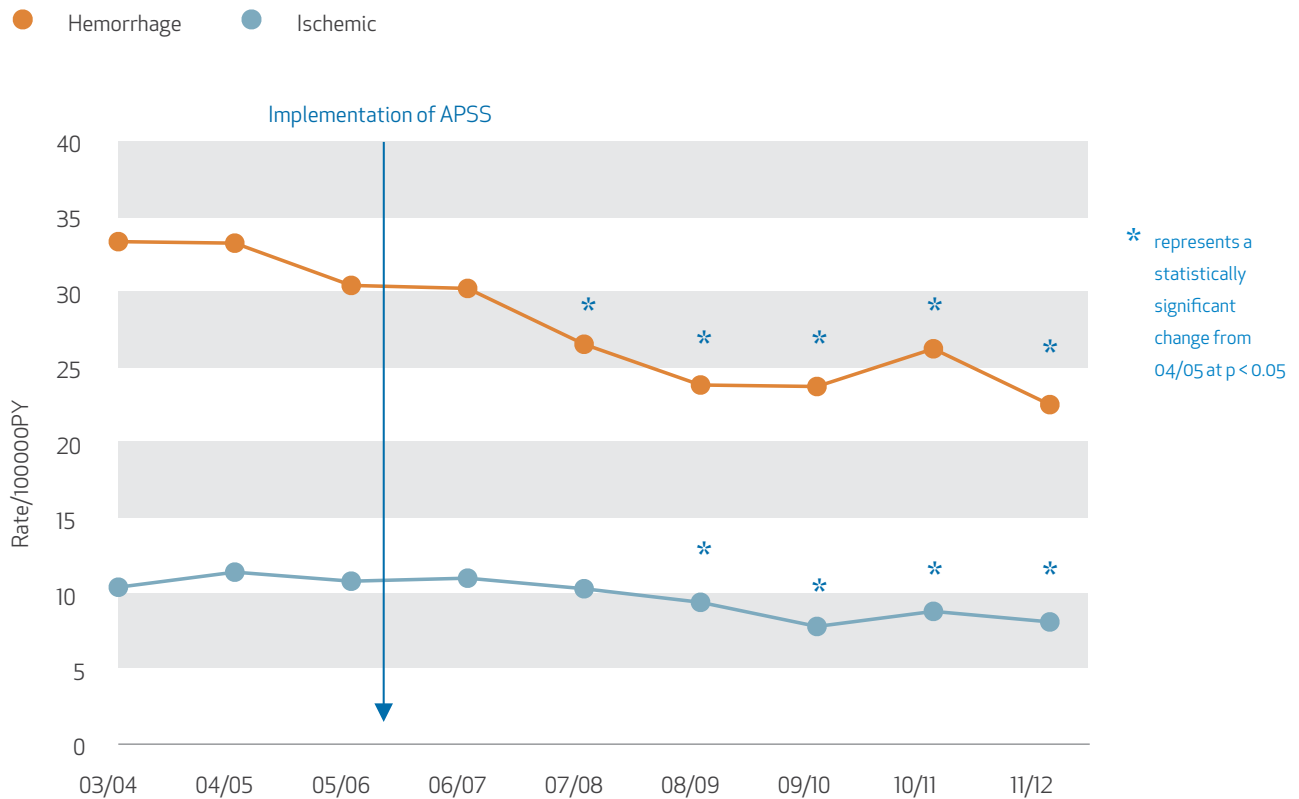


Figure 3.13 There was a 32% reduction in 30-day in-hospital case fatality for hemorrhagic stroke and a 29% reduction for ischemic stroke between 2004/05 and 2011/12. However, the declining mortality seems to have plateaued after 2008/09.

Source – APSS hospital discharge abstracts. Using only most responsible diagnosis of ischemic or hemorrhagic stroke.

FIGURE 3.14

Stroke 30d In-hospital Mortality by Zone - Crude Rates

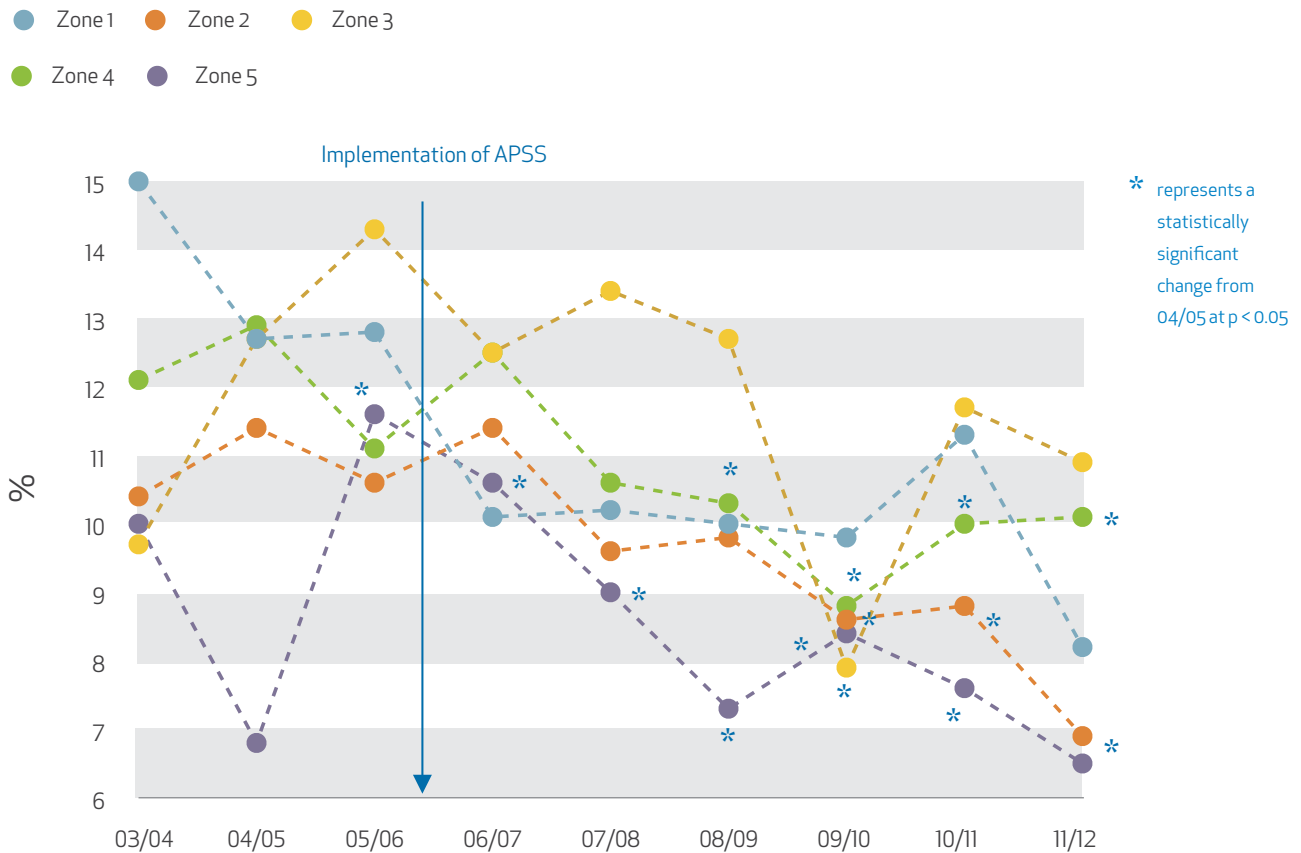


Figure 3.14 For ischemic stroke, hemorrhagic stroke, and TIA combined there was a declining trend in crude rates of 30-day in-hospital mortality across all zones. As expected for smaller zones there was considerable variability from year to year.

Source – APSS hospital discharge abstracts. Using only most responsible diagnosis of ischemic or hemorrhagic stroke.

FIGURE 3.15

Stroke 30d In-hospital Mortality by Zone - Adjusted Rates (age, gender, Charlson Index for a Female Aged 60-84)

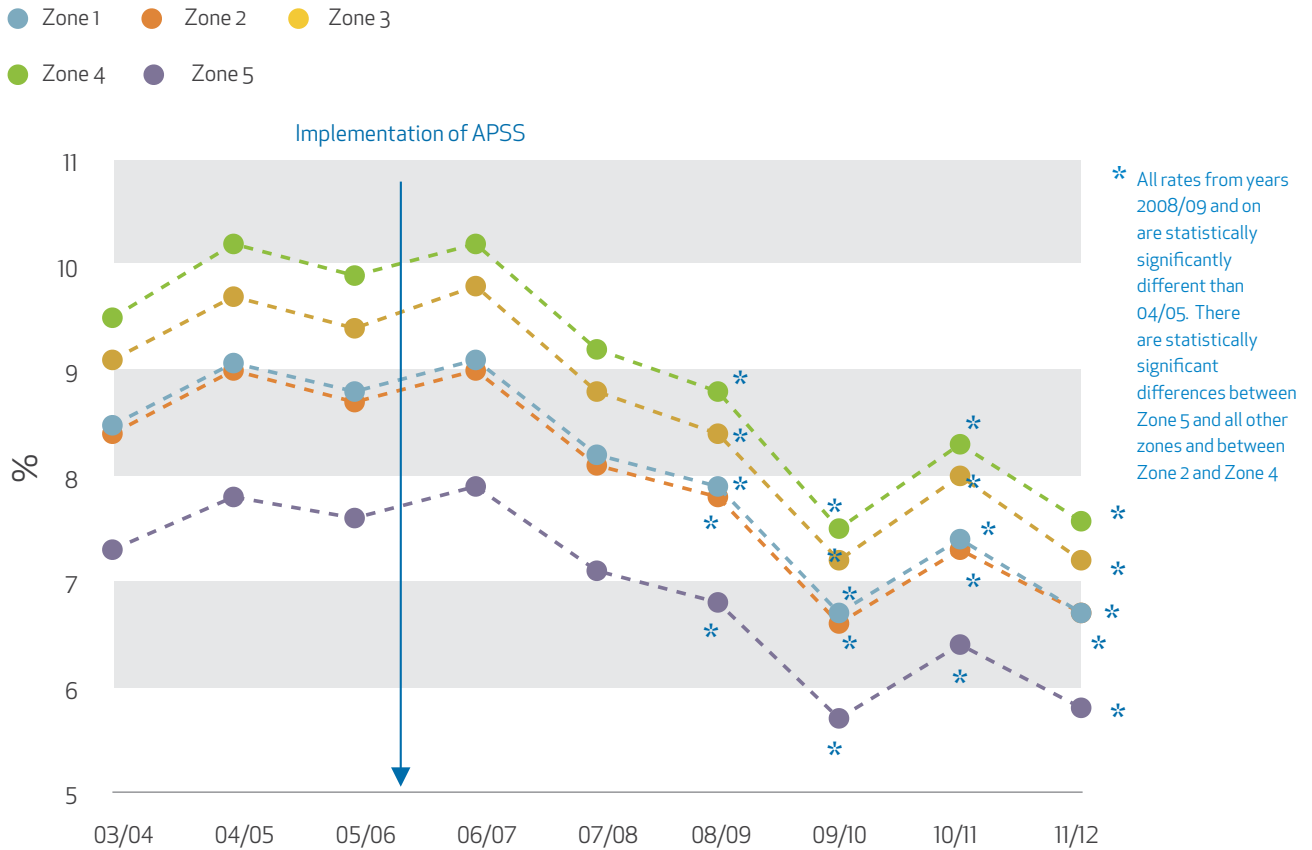


Figure 3.15 Logistic regression mortality rates were adjusted for age, gender and Charlson Index. The predicted stroke mortality for a female patient with a Charlson Index of 1, and age between 60-84 was calculated for each zone. All rates from years 2008/09 and onward are statistically significantly lower than

those of 2004/05 for all zones. Zone 2 had a significantly lower mortality than Zone 4 but there were no other significant differences between zones.

Source – APSS hospital discharge abstracts. Using only most responsible diagnosis of ischemic or hemorrhagic stroke.

Summary of Findings

- There was a statistically significant decline in the age-standardized rate of ED and inpatient hospital visits for stroke between 2004/05 and 2011/12. Many factors might contribute to this decline, including improved primary prevention practices and chronic disease management programs which are external to the APSS. However, improved secondary prevention measures in patients with stroke and TIA are likely to account for 20-30% of the decline in ED and inpatient hospital visits. The decline in standardized stroke occurrence rates appears to have plateaued in recent years.
- There was a 29% reduction in inpatient 30-day mortality for ischemic stroke and a 32% decline for hemorrhagic stroke between fiscal years 2004/05 and 2011/12. For both subtypes of stroke, nearly all of the reduction in mortality occurred after implementation of the APSS as mortality was unchanged in the preceding years. The declining trend in case fatality also plateaued after 2009/10.

More information on these findings can be found in Tables 3.8 to 3.9 (page 98)

Recommendations

- ▶ Given a possible recent plateau in the previously declining rate of stroke occurrence it is critical that the quality of primary and secondary stroke prevention services be further enhanced. This is necessary to avoid a further plateau or even an increase in occurrence over time.
- ▶ Stroke Unit care and other inpatient services for stroke initiated by Pillar II of the APSS need to be continued and enhanced across Alberta in order to maintain trends towards decreasing stroke mortality.



Improving Access to Best Care

IV

Marc J. was assessed for stroke by a physician in the emergency department of the High Level Hospital, a Primary Stroke Centre. A CT scan of his brain was completed. Suspecting an acute ischemic stroke, a consultation was made by the physician to the University of Alberta Hospital in Edmonton. A stroke neurologist in Edmonton was able to view the CT scan results and see images of Marc in the emergency department. With the involvement of the High Level physician, a decision was made to administer tPA. Marc received tPA in the High Level emergency department and convalesced in his community hospital.



Stroke is an emergency and patients with acute stroke or TIA should receive treatment as soon as possible after symptom onset, regardless of where they are situated. The APSS, recognizing the variability of stroke care across Alberta, established a number of PSCs between 2005 and 2012.

A PSC is a regional hospital that receives this designation based on geographic and infrastructure capabilities. It has CT scanning capability, specially trained health care providers and the ability to provide tPA. PSCs can link with CSCs via telehealth (Telestroke) for immediate stroke neurologist consultation or other specialized services.

In 2005, the University of Alberta Hospital in Edmonton, the Foothills Medical Centre in Calgary and hospitals in Red Deer, Grande Prairie and Lethbridge were the only

sites that had the capacity to administer tPA. In 2012, there are now 15 PSCs across the province in addition to the two CSCs. The Grey Nuns Community Hospital and the University of Alberta Hospital form a Comprehensive Stroke System in Edmonton. (See also Figure 1.2 – Provincial Maps 2005, 2012). Prehospital emergency medical teams must be equipped with the knowledge and skills to identify stroke patients and determine if transport to the nearest PSC or CSC is required. Emergency departments must provide timely triaging, assessment, diagnostic imaging and therapies. Inpatient care on a stroke unit, or dedicated stroke beds with protocols in place and specially trained staff, ensures patients receive appropriate care. Stroke unit care has demonstrated improved patient outcomes. Access to secondary prevention clinics is important to minimize the chance of recurrent strokes.

ACUTE STROKE CARE

The incidence of stroke triples with each successive decade of life. The aging of the population threatens a major increase in stroke occurrence with subsequent

personal, social and financial burden. Reducing the occurrence of stroke and its impact on the health care system is of great importance.

Findings – Access to thrombolytic therapy

FIGURE 4.1

Primary and Comprehensive Stroke Centres 2005 and 2012

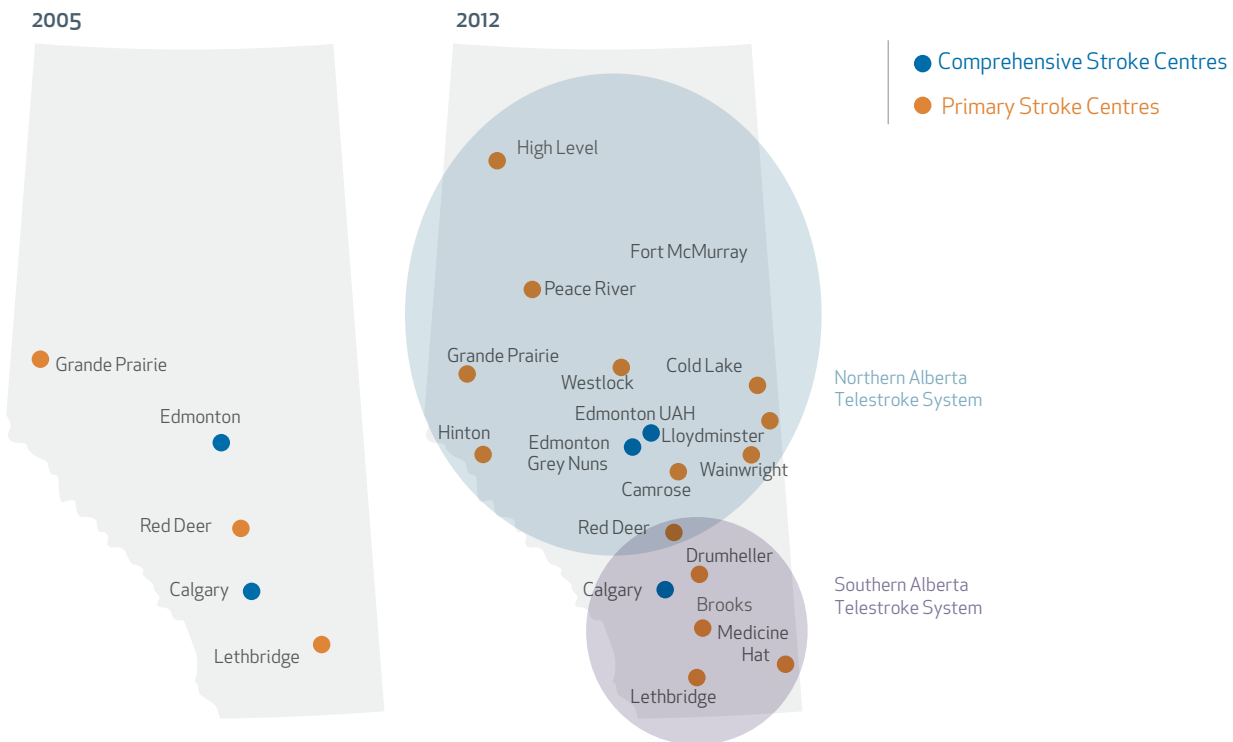


Figure 4.1 The number of centres in the province capable of giving tPA for ischemic stroke more than tripled between 2005 and 2012.

FIGURE 4.2

Percentage of All Ischemic Stroke Patients Receiving TPA Across Alberta

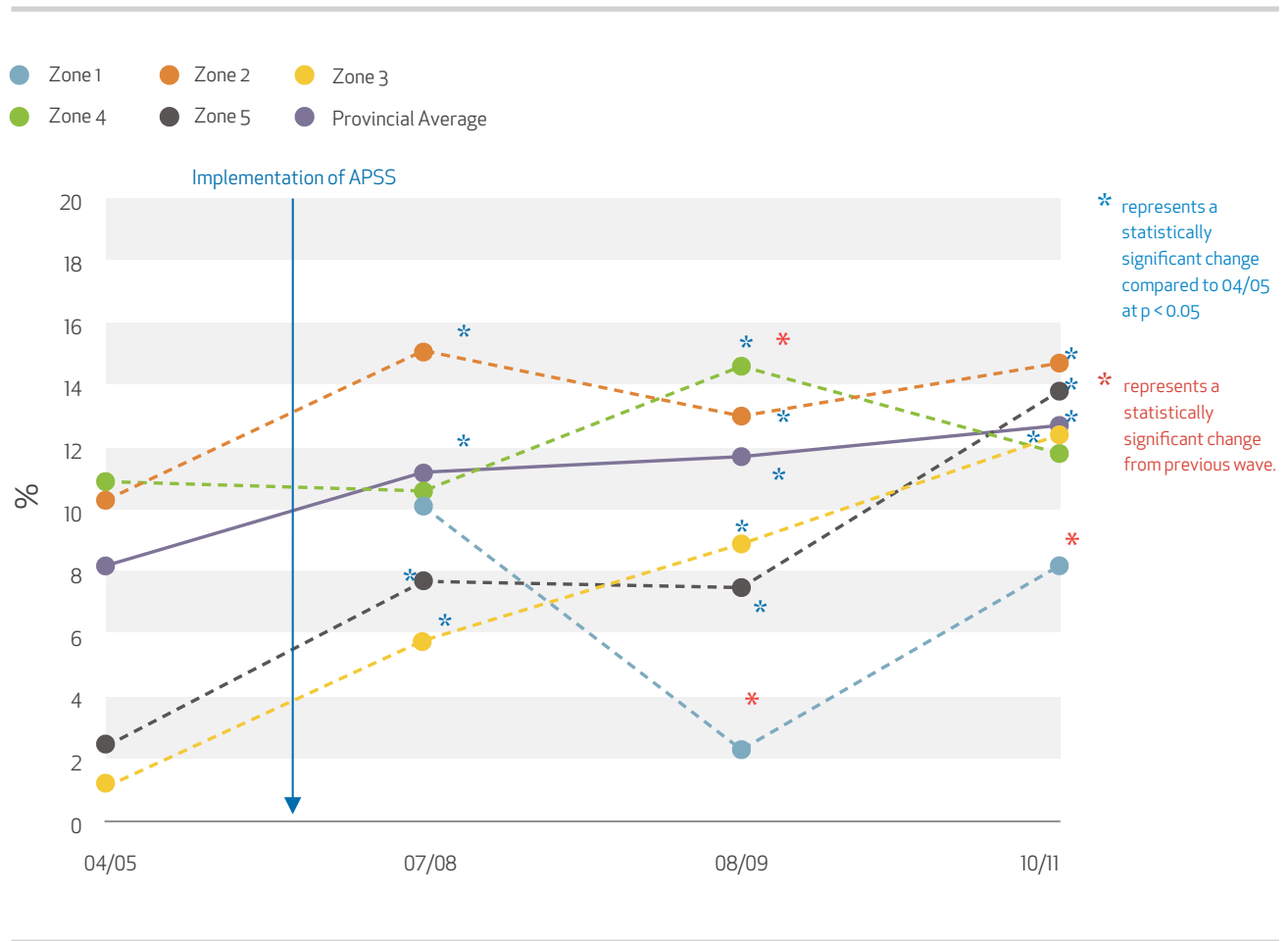


Figure 4.2 The figure shows the percentage of all patients with a final diagnosis of ischemic stroke who received thrombolytic therapy. Province-wide there was a statistically significant progressive increase from 8.2% in 2004/05 to 12.7% in 2010/11 in the percentage of ischemic stroke patients receiving such treatment. Thrombolysis proportions are above 10% for all zones except for Zone 1. Some individual stroke centres have thrombolysis rates consistently over 20% (these are Camrose, Cold Lake, and Hinton).

Source -- APSS Chart Reviews and APSS Prospective tPA Database.

APSS INDICATOR

26

REPERFUSION THERAPY

Performance Measure: Percentage of all ischemic stroke patients who receive acute thrombolytic therapy (tPA) or any other reperfusion therapy

FIGURE 4.3

Median Door to Needle Times for Ischemic Stroke Patients Receiving IV or IV+IA tPA (minutes)

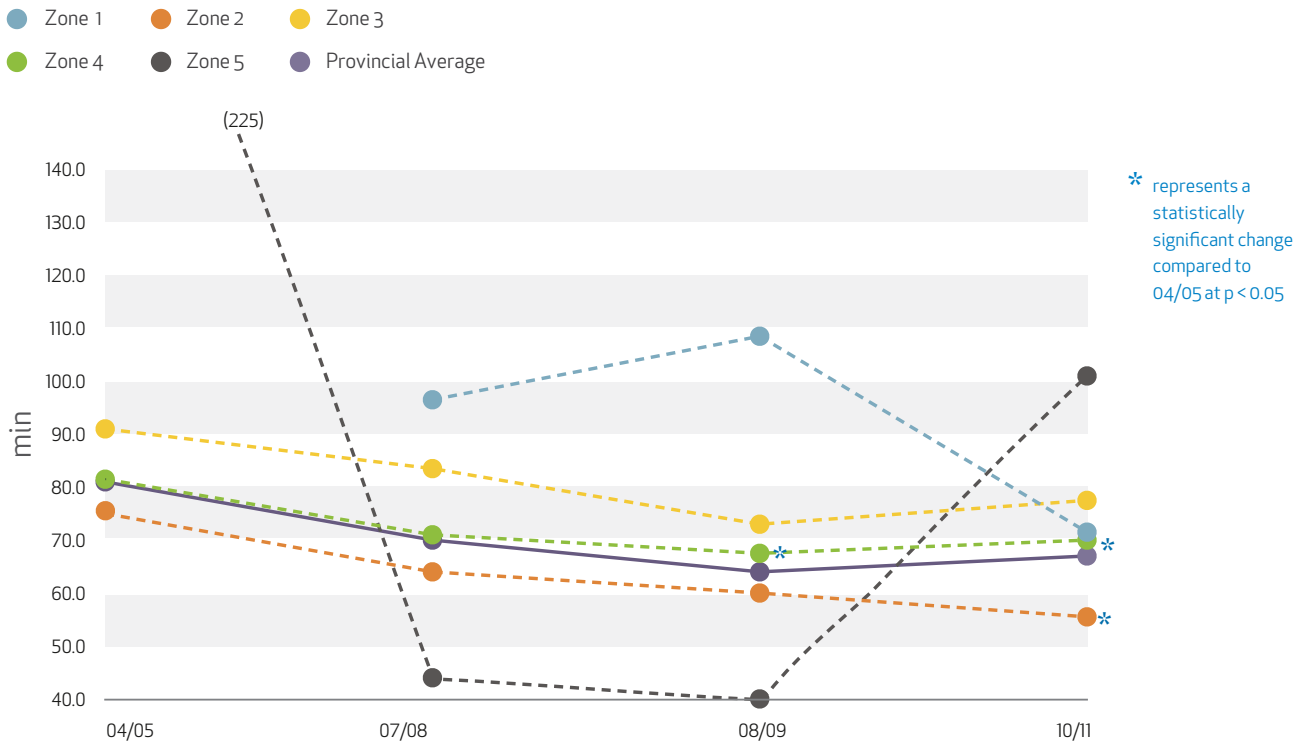


Figure 4.3 The median door to treatment time for patients receiving intravenous tPA decreased significantly province-wide from 81 minutes in 2004/05 to 64 minutes in 2008/09 and plateauing at 67 minutes in 2010/11. Only Calgary zone achieved a median door to treatment time of less than 60 minutes in 2010/11.

Source – APSS chart reviews.

<p>APSS INDICATOR</p> <p>27</p>	<p>TIME TO tPA</p> <p>Performance Measure: Earliest time from patient arrival in ED to administration of acute thrombolytic agent (average in minutes)</p>
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FIGURE 4.4

Patients receiving tPA who are given the medication within less than 60 minutes

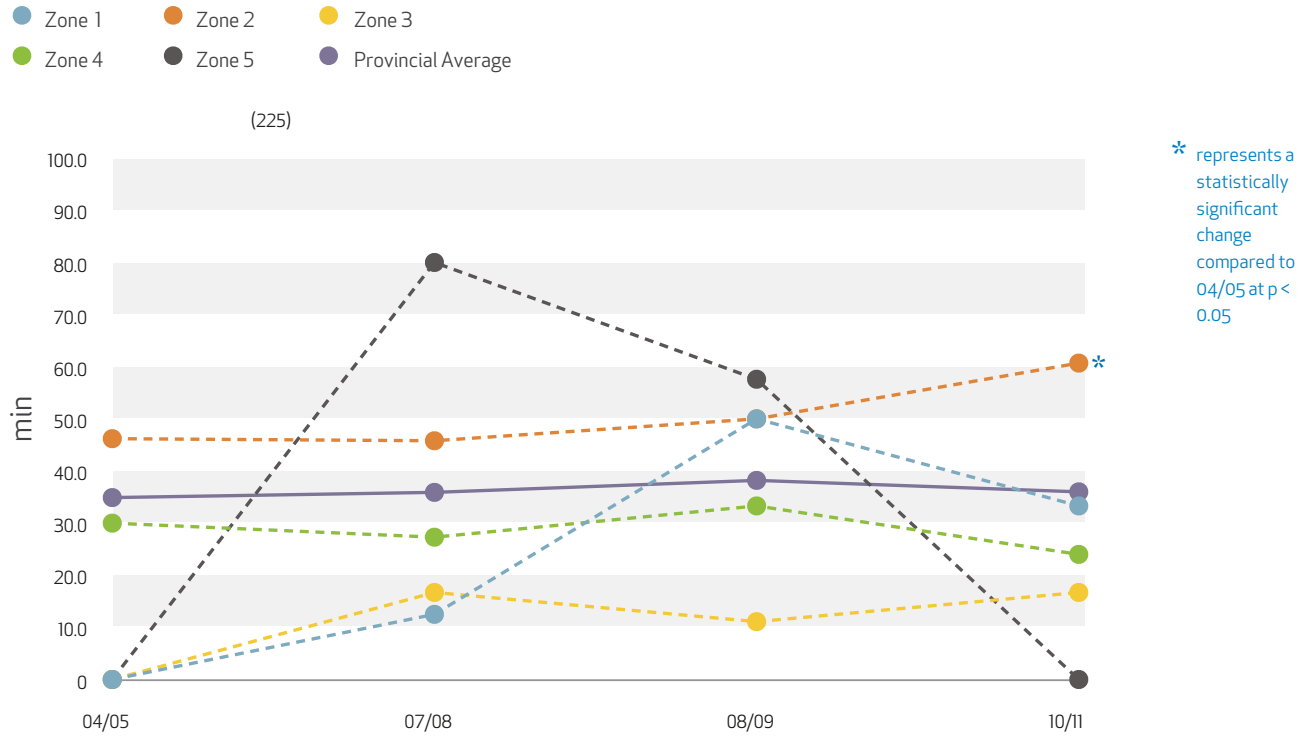


Figure 4.4 Province-wide the proportion of patients receiving intravenous tPA who were treated within 1 hour of arrival in the ED did not change significantly over the four waves of chart reviews remaining at 36% in 2010/11 just above the national average of 34%. Only Calgary Zone was able to substantially progress in this area obtaining a thrombolysis proportion of 60%. A province-wide door-to-needle campaign was launched in 2012 to address this issue working alongside the Alberta Stroke Improvement Initiative.

Source – APSS chart reviews.

APSS INDICATOR

28

TIME TO tPA

Performance Measure: Percentage of all thrombolysed ischemic stroke patients who receive acute thrombolytic therapy within one hour of hospital arrival

Summary of Findings- Access to thrombolytic therapy

- The number of centres in the province capable of giving tPA more than tripled going from 5 to 18 over 6 years.
- The proportion of patients with ischemic stroke who received intravenous tPA continued to increase across Alberta, reaching 12.7% in 2010/11. These figures can be compared to the Canadian national average where it is estimated that less than 8% of all ischemic stroke patients received IV tPA in 2008/09.
- The median ED arrival to treatment time decreased significantly from 81 minutes to 67 minutes from 2004/05 to 2010/11. However, it remains above the best practice target of less than 60 minutes.
- The proportion of patients treated within one hour of arrival in the ED did not change significantly and remains just above the national average.
- Thrombolytic therapy is more effective the earlier it is given and the national best practice target is treatment in less than one hour after arrival in ED. Currently, this remains a difficult target to meet internationally, nationally, and within Alberta.

More information on these findings can be found in Tables 4.1 to 4.3 (pages 99-100)

Recommendations

- ▶ Although median ED arrival to treatment times have decreased, stroke service programs should continue to expedite the assessment, investigation and management of acute ischemic stroke patients to decrease this time to less than 60 minutes.
- ▶ Considering a higher cure rate with earlier treatment, the proportion of patients who receive tPA within one hour of arrival in the ED should increase with an eventual goal of 80% of patients receiving tPA in this timeframe. To continue to make progress in this area a quality improvement initiative was launched province-wide in 2012 to improve arrival to treatment times with tPA.

Findings – Quality of inpatient care for stroke

FIGURE 4.5

Ischemic Stroke Patients Receiving Brain Imaging Prior to Discharge

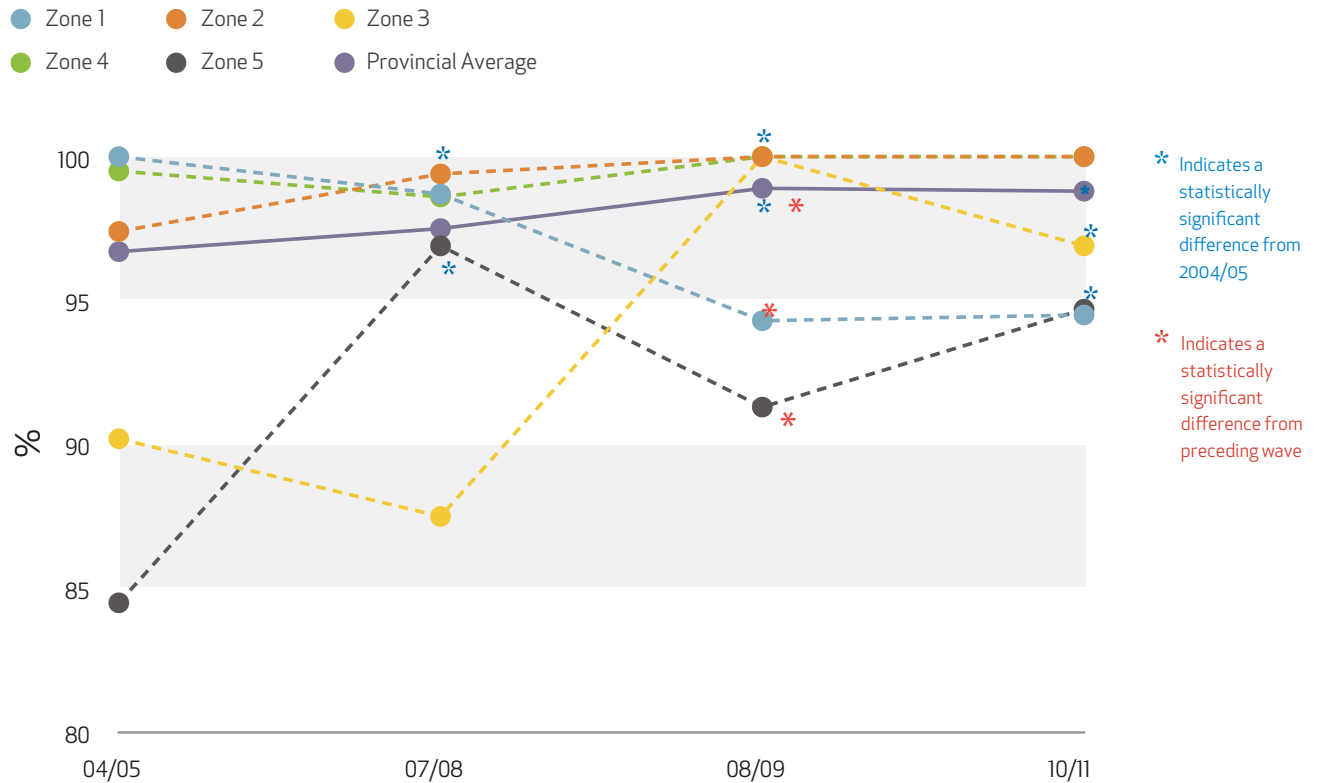


Figure 4.5 The percentage of ischemic stroke patients receiving brain CT or MRI prior to discharge from hospital increased significantly and all zones made progress on this indicator resulting in a provincial average of 98.8% in 2010/11. The large urban zones attained 100% compliance with this performance measure whereas zones 1, 3 and 5 ranged from 94.5% to 96.9% by 2010/11.

Source – APSS chart reviews.

APSS
INDICATOR

24

BRAIN IMAGING

Performance Measure:
Percentage of stroke patients
who receive a brain CT/MRI
prior to hospital discharge

FIGURE 4.6

Hemorrhagic Stroke Patients Receiving Brain Imaging Prior to Discharge

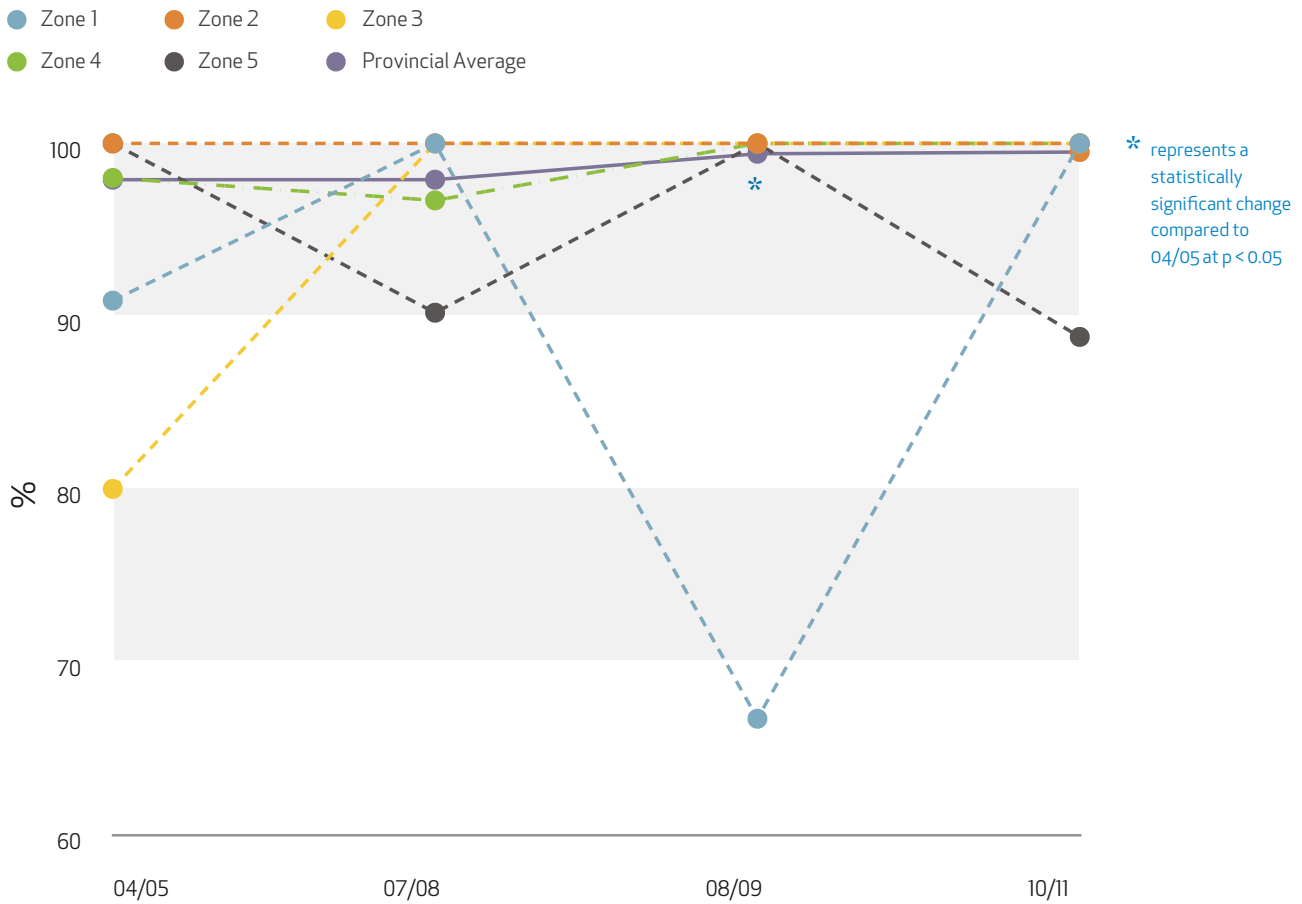


Figure 4.6 By 2010/11, 99.5% of hemorrhagic stroke patients across Alberta received brain imaging prior to discharge. More variability was noted in South Zone and North Zone than the other zones.

Source – APSS chart reviews.

FIGURE 4.7

TIA Patients Receiving Brain Imaging Prior to Discharge

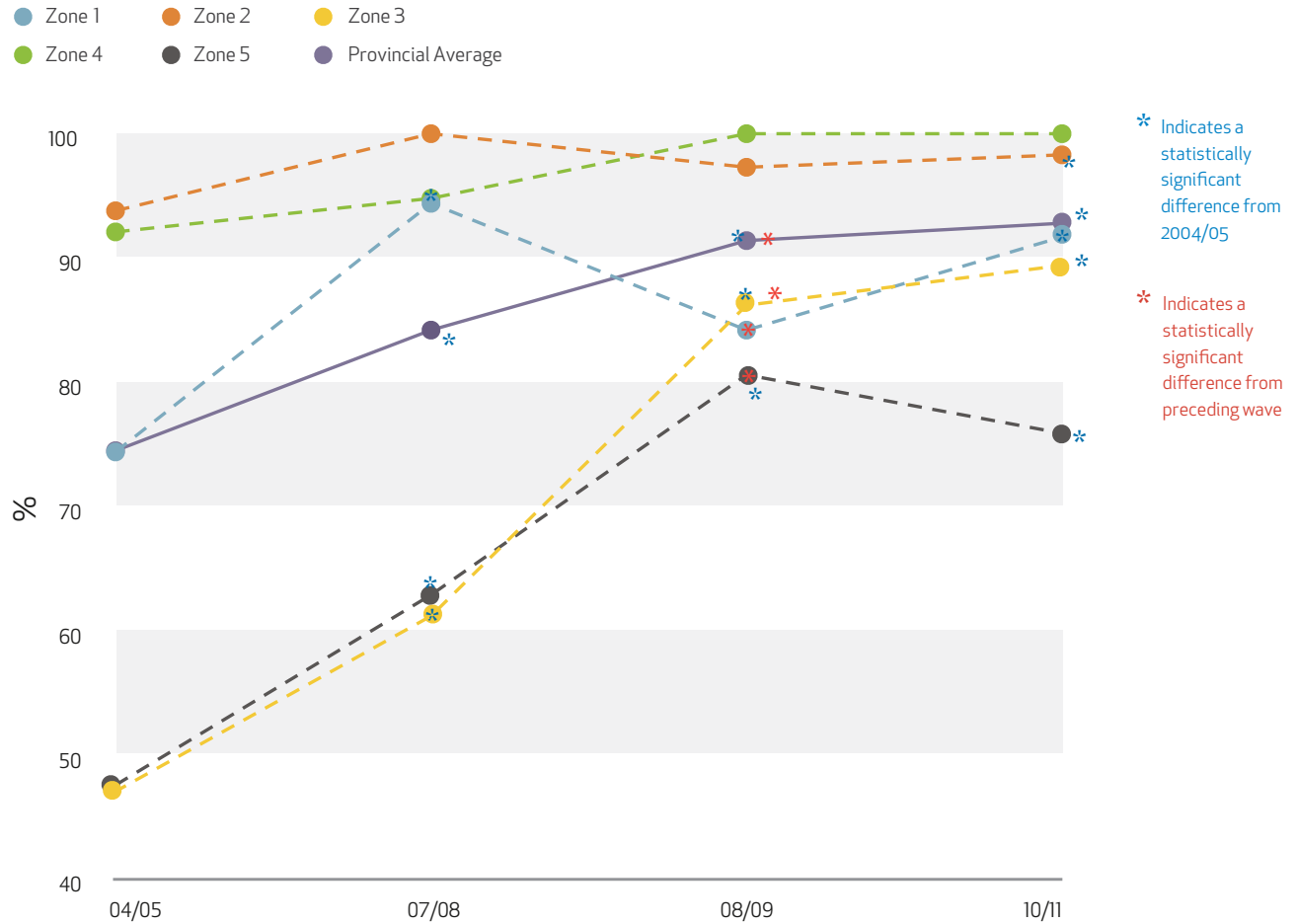


Figure 4.7 All zones improved significantly in the proportion of TIA patients receiving brain imaging prior to discharge with the provincial average increasing from 75% in 2004/05 to 93% in 2010/11. The large urban zones had the highest compliance with this performance measure with Edmonton Zone (Zone 4) attaining 100%

and Calgary (Zone 2) attaining 98.5% compliance. Zones 1 and 3 had lower but still good compliance whereas North Zone patients clearly did not receive the same access with only 76% of TIA patients receiving brain imaging prior to discharge.

Source – APSS chart reviews.

FIGURE 4.8

Ischemic Stroke or TIA Patients Receiving Carotid Imaging Prior to Discharge

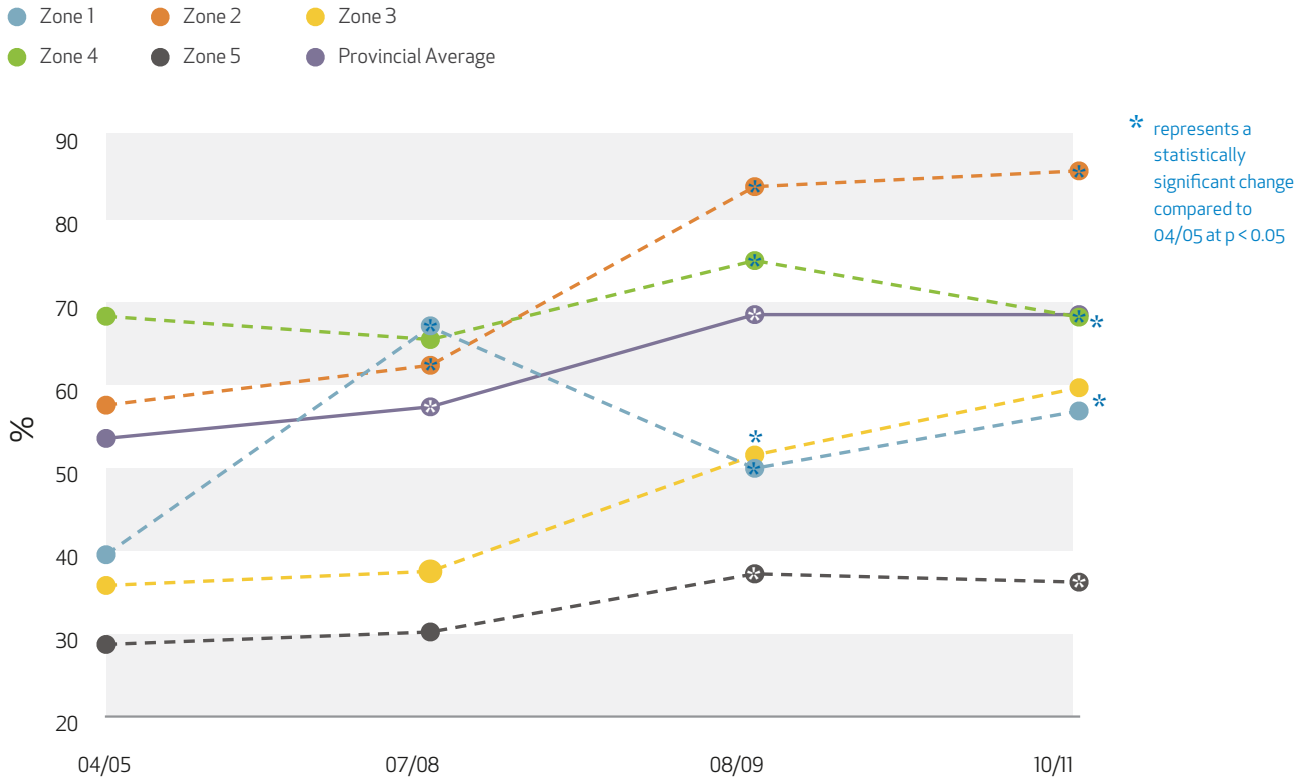


Figure 4.8 The percentage of patients with ischemic stroke or TIA who received imaging of their carotid arteries prior to discharge increased significantly from 54% to 69% between 2004/05 and 2010/11 for the province overall although there was a plateau in 2008/09. However, there was considerable variability between zones with a high level of imaging for Zone 2 (86%), intermediate for Zone 1, 3 and 4 (56%-68%) and low for Zone 5 (36%). Other methods to image the carotids such as urgent outpatient imaging post-discharge were not captured by the inpatient chart reviews but are certainly in use.

Source – APSS chart reviews.

<p>APSS INDICATOR</p> <p style="font-size: 2em; font-weight: bold; margin: 0;">25</p>	<p>CAROTID IMAGING</p> <p>Performance Measure: Percentage of stroke/TIA patients who receive carotid imaging prior to hospital discharge</p>
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FIGURE 4.9

Patients Receiving Care in a Stroke Unit

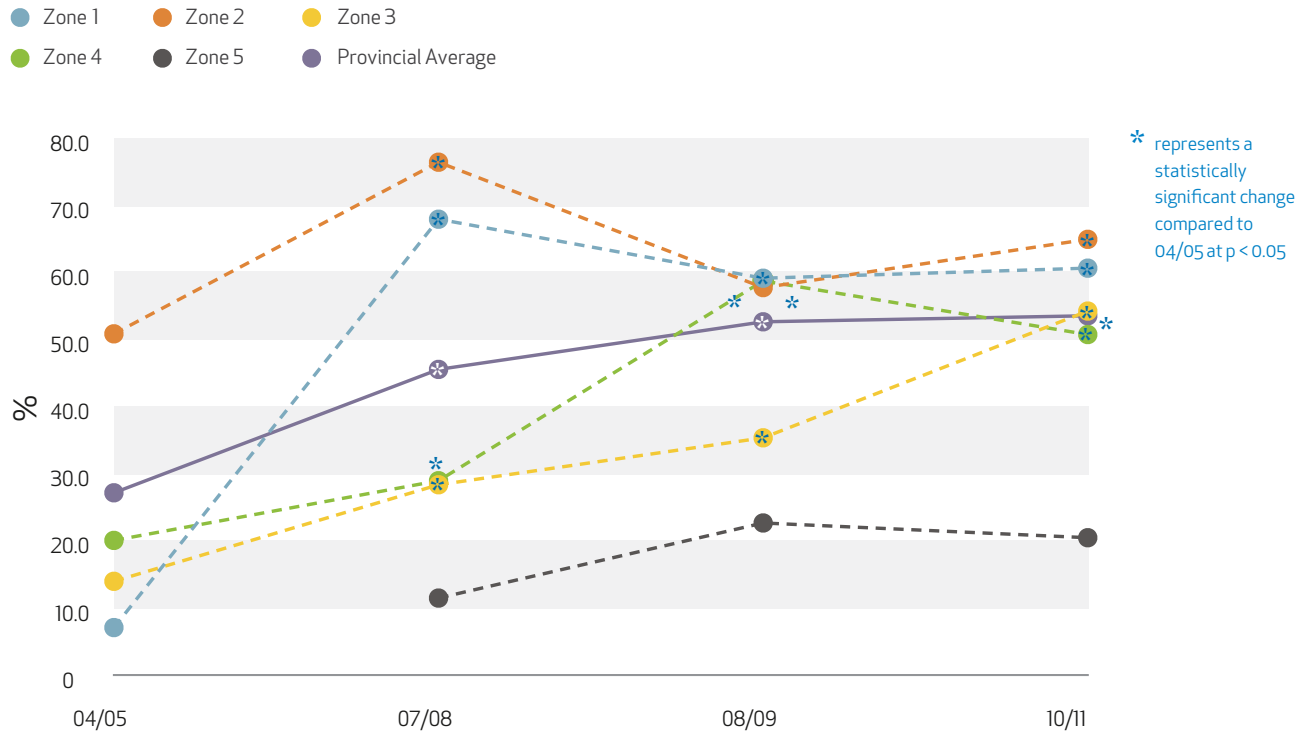


Figure 4.9 The percentage of stroke patients across Alberta who spent some portion of their inpatient stay in a Stroke Unit increased significantly, essentially doubling from 27% to 54%. There was a plateau in 2008/09 and great variability by zone with Zone 5 experiencing the lowest access to stroke unit care at 21%. Very small rural stroke centres such as those in Zone 5 are disadvantaged by being unable to have sufficient annual stroke numbers to create geographically defined stroke units.

Source – APSS chart reviews.

APSS
INDICATOR

31

STROKE UNIT CARE

Performance Measure:
Number of stroke patients treated on a Stroke Unit at any time during their inpatient hospital stay for a stroke event as a percentage of total number of stroke patients admitted to hospital

FIGURE 4.10

Ischemic stroke or TIA Inpatients who Received Antiplatelet Agents Within 48 Hours

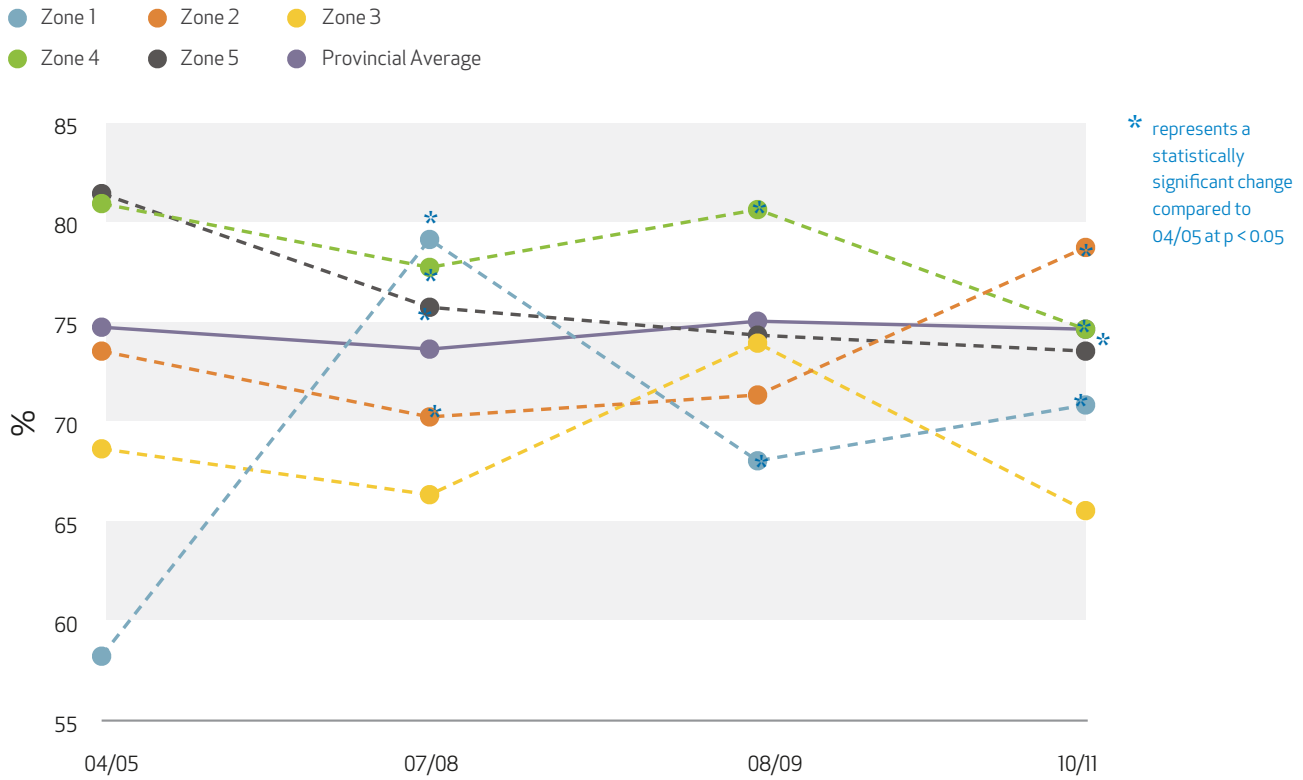


Figure 4.10 Province-wide, the percentage of ischemic stroke or TIA patients who receive antiplatelet therapy within 48 hours of admission did not change significantly between 2004/05 and 2010/11. However, there was some variability between zones with some improving and others performing slightly worse on this performance measure over time.

Source – APSS chart reviews.

<p>APSS INDICATOR</p> <p style="font-size: 2em; font-weight: bold; margin: 10px 0;">30</p>	<p>ACUTE ANTIPLATELET THERAPY</p> <p>Performance Measure: Percentage of ischemic stroke/ TIA patients who receive acute antiplatelet therapy within the first 48 hrs following a stroke event</p>
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FIGURE 4.11

Stroke Patients who Developed a Potentially Preventable Complication

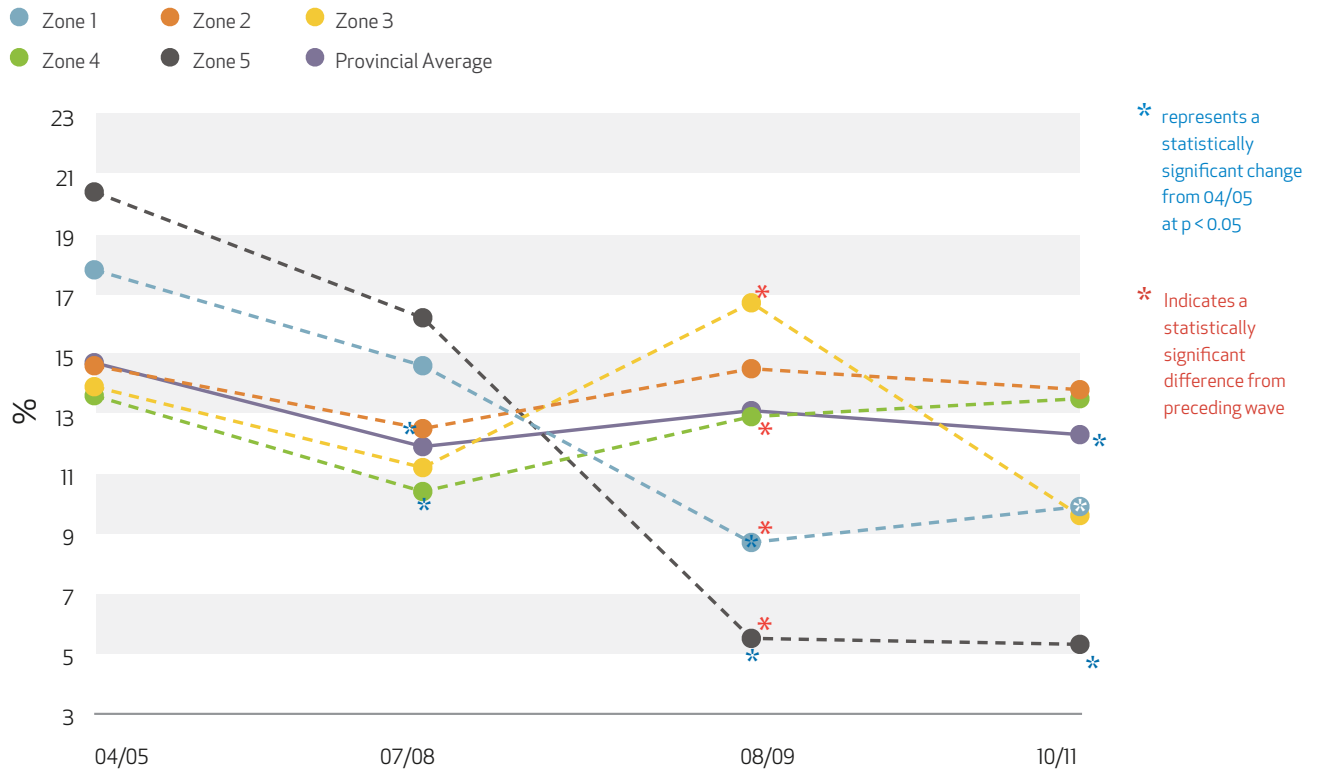


Figure 4.11 The proportion of all stroke patients experiencing a potentially preventable complication dropped significantly province-wide from 14.7% to 12.3% between 2004/05 and 2010/11. This was a 16% drop in relative terms. The potentially preventable complications consisted of: deep venous thrombosis, pulmonary embolism, decubitus ulcer, pneumonia, and urinary tract infection.

Source – APSS chart reviews.

APSS INDICATOR

32

POST-STROKE COMPLICATIONS

Performance Measure: Percentage of stroke patients admitted to hospital who experience any post-stroke complications while in hospital

Margaret S. was recovering in the Foothills Medical Centre in Calgary after experiencing a stroke that left her with difficulty using her right arm and leg. Therapists began working with her within two days of her admission. She was discharged home and received rehabilitation by the Early Supported Discharge Team. With rehabilitation services provided in Margaret's home environment, she did not have to travel back to the Foothills Medical Centre. Rehabilitation professionals were able to individualize Margaret's treatment plan based on her lifestyle needs.



Effective rehabilitation for people affected by stroke represents an important opportunity to reduce the burden of stroke both on the individual and family, and the healthcare system. Properly resourced community-based stroke rehabilitation services that promote Early Supported Discharge (ESD) from acute care

are cost efficient, clinically effective and significantly reduce length of hospital stay. With APSS funding, ESD services are important components of the range of stroke services provided in Edmonton and Calgary. Pilot projects are taking place in other centres.

FIGURE 4.12

Patients Receiving Rehabilitation Assessment Within 48 Hours of Admission to Hospital

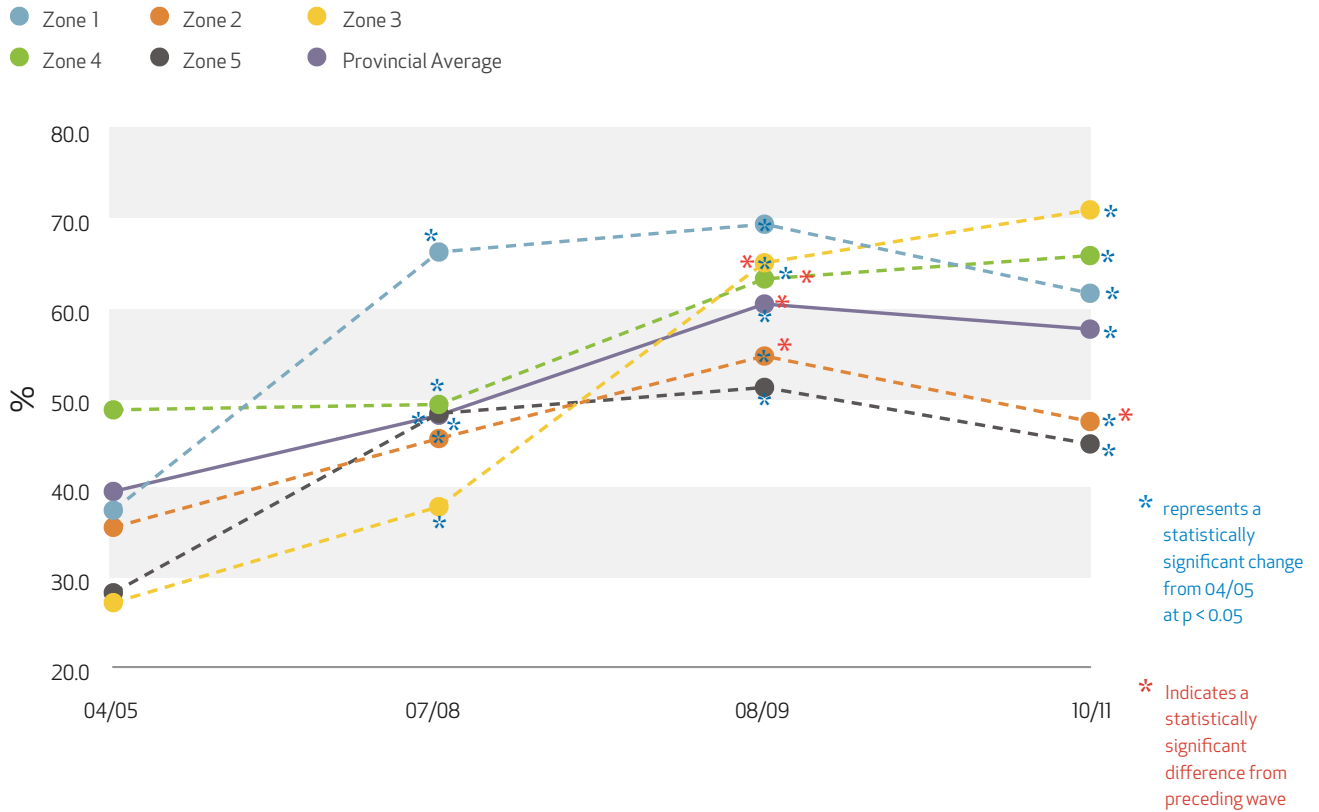


Figure 4.12 The proportion of stroke patients receiving a rehabilitation assessment within 48 hours of hospital arrival increased by 18 % in absolute terms and 32% in relative terms between 2004/05 and 2010/11 with all zones experiencing statistically significant improvements. Although the province experienced a plateau after 2008/09 some zones continued to make modest progress.

Source – APSS chart reviews.

APSS INDICATOR

36

REHABILITATION ASSESSMENT IN THE ACUTE CARE SETTING

Performance Measure: Median/mean time from hospital admission for stroke to initial assessment for rehabilitation potential by any rehabilitation discipline; or percentage of patients receiving rehabilitation assessment within 48 hours

FIGURE 4.13

Stroke/TIA Patients Referred to Outpatient Rehabilitation on Discharge from Acute Care

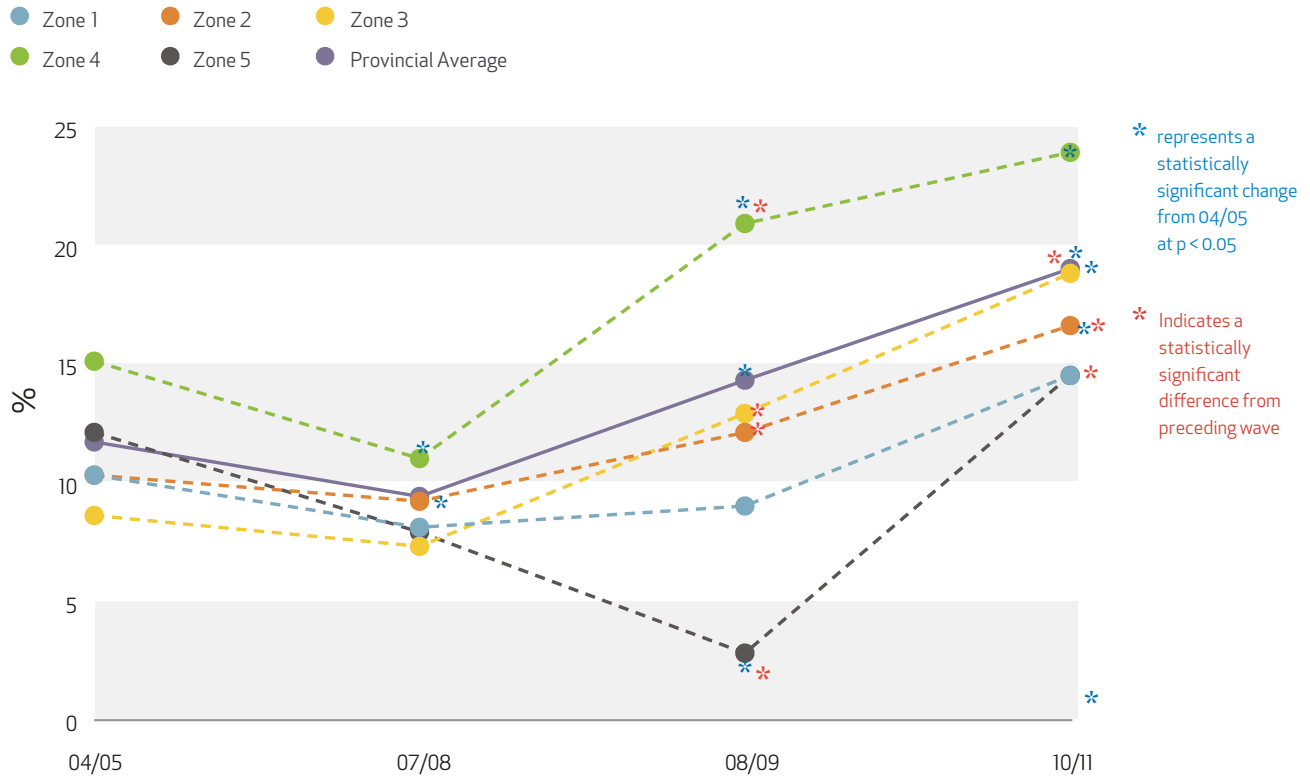


Figure 4.13 Province-wide the proportion of stroke or TIA patients receiving referrals to outpatient rehabilitation on discharge increased significantly from 11.7% to 19% between 2004/05 and 2010/11. All zones improved on this measure by 2010/11 but the difference was statistically significant only for Zones 2, 3 and 4.

Source – APSS chart reviews.

<p>APSS INDICATOR</p> <p style="font-size: 2em; font-weight: bold; margin-top: 20px;">42</p>	<p>OUTPATIENT REHABILITATION</p> <p>Performance Measure: Percentage of stroke patients discharged to the community who receive a referral for outpatient rehabilitation prior to discharge from acute care or inpatient rehabilitation (referrals may include either facility-based or community-based programs)</p>
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FIGURE 4.14

Stroke/TIA Patients Referred to Homecare/Community Services on Discharge from Acute Care

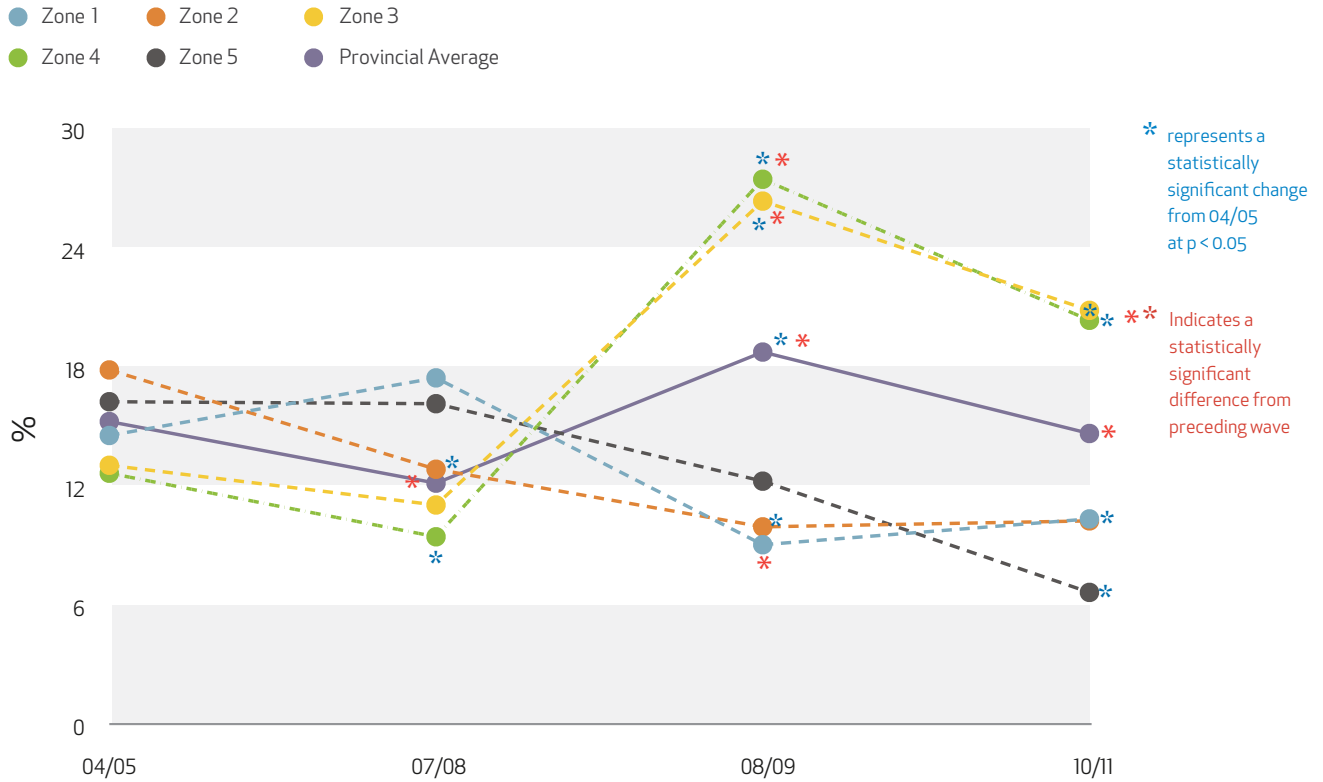


Figure 4.14 The proportion of stroke or TIA patients receiving referrals to home care/community support on discharge improved significantly for the province overall by 2008/09 then declined by 2010/11. Zones 3 and 4 also saw a decline in 2010/11 but they were able to maintain substantial improvements over 2004/05 compared to other zones.

Source – APSS chart reviews.

APSS
INDICATOR

43

REFERRAL FOR COMMUNITY
SERVICE

Performance Measure:
Percentage of patients who are discharged from acute care who receive a referral for home care/ community supportive services

FIGURE 4.15

Stroke Patients Receiving a Swallowing Screen

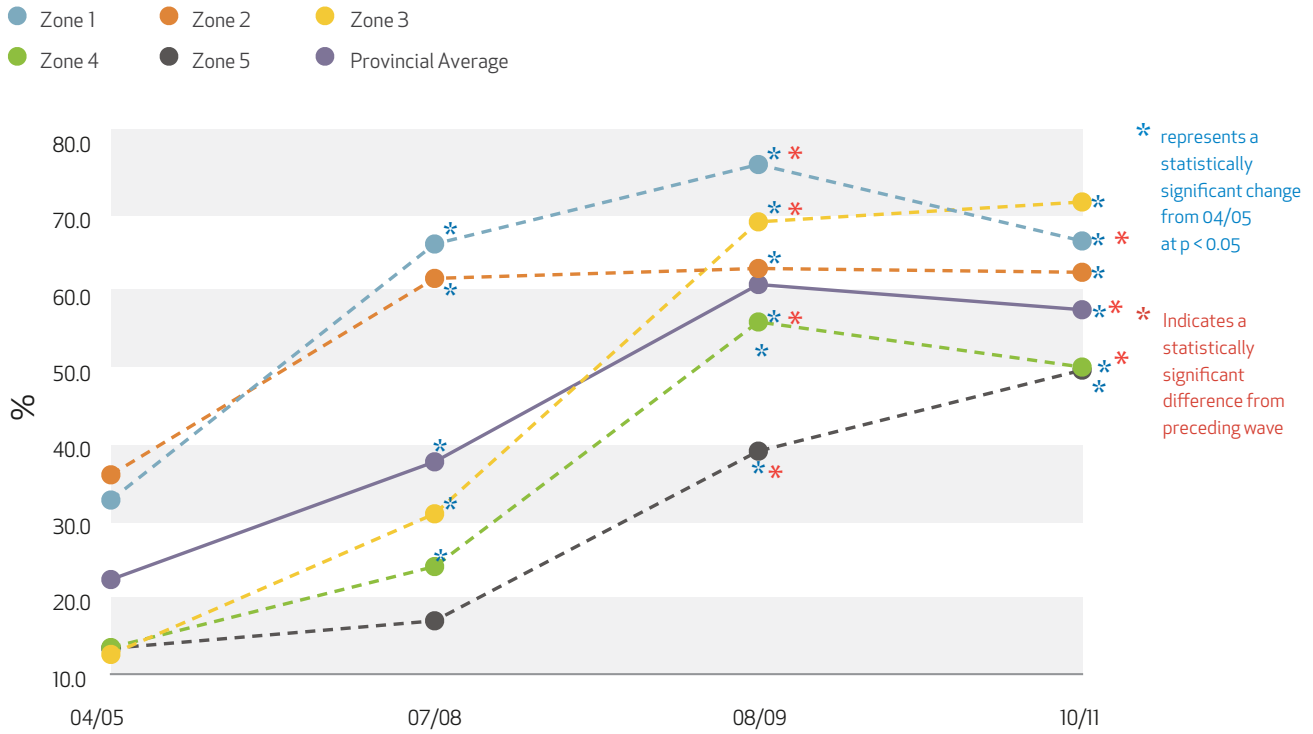


Figure 4.15 The proportion of stroke patients receiving an initial screen or assessment for dysphagia increased significantly for the province overall going from 22% to 58%. There was marked improvement between 2004/05 and 2008/09 followed by a slight decline afterwards. Most zones plateaued after 2008/09 with only Zone 5 continuing with an improving trend. Swallowing screens are important to detect swallowing difficulties that might lead to complications.

Source – APSS chart reviews.

<p>APSS INDICATOR</p> <p style="font-size: 48px; font-weight: bold; margin: 0;">49</p>	<p>DYSPHAGIA</p> <p>Performance Measure: Percentage of stroke patients with documentation that an initial dysphagia screen was performed during an admission to the ED, acute care and/or inpatient rehabilitation</p>
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FIGURE 4.16

Ischemic Stroke Patients Discharged Back To Their Pre-admission Place of Residence

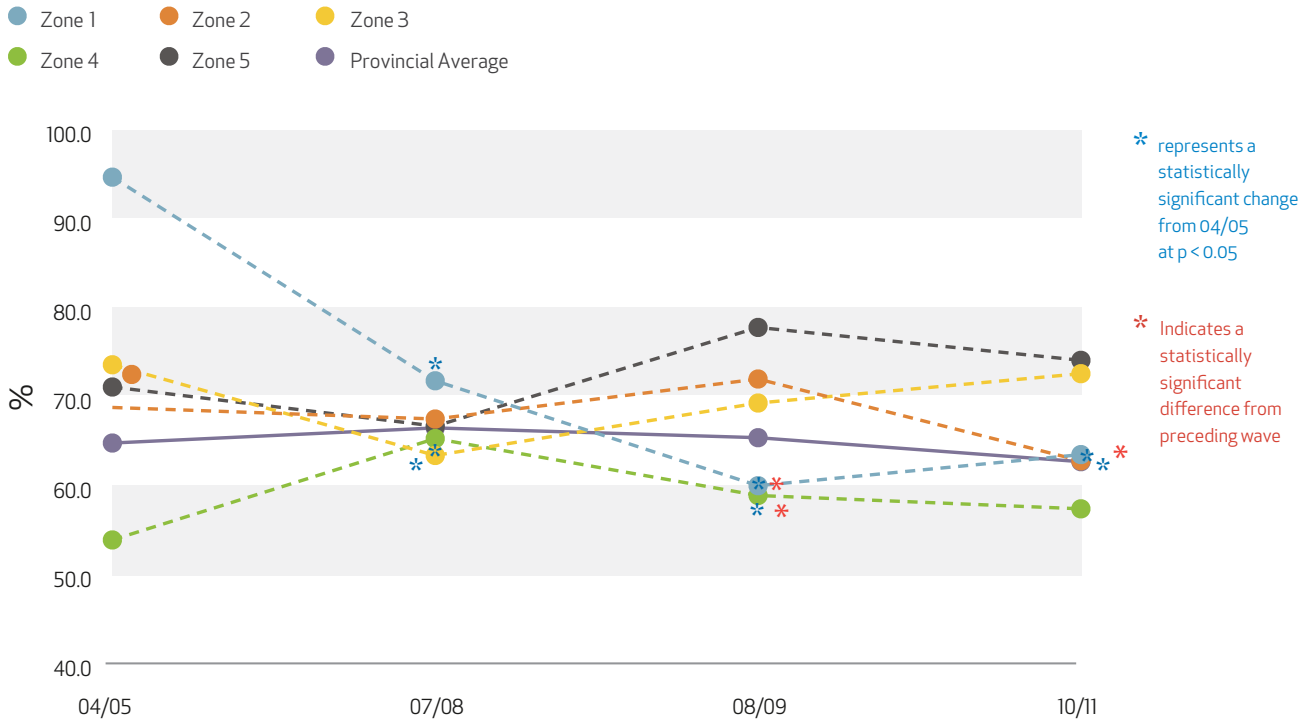


Figure 4.16 The proportion of ischemic stroke survivors discharged back to their pre-admission place of residence did not change significantly for the province overall between 2004/05 and 2010/11.

Source – APSS chart reviews

FIGURE 4.17

Hemorrhagic Stroke Patients Discharged Back To Their Pre-admission Place of Residence

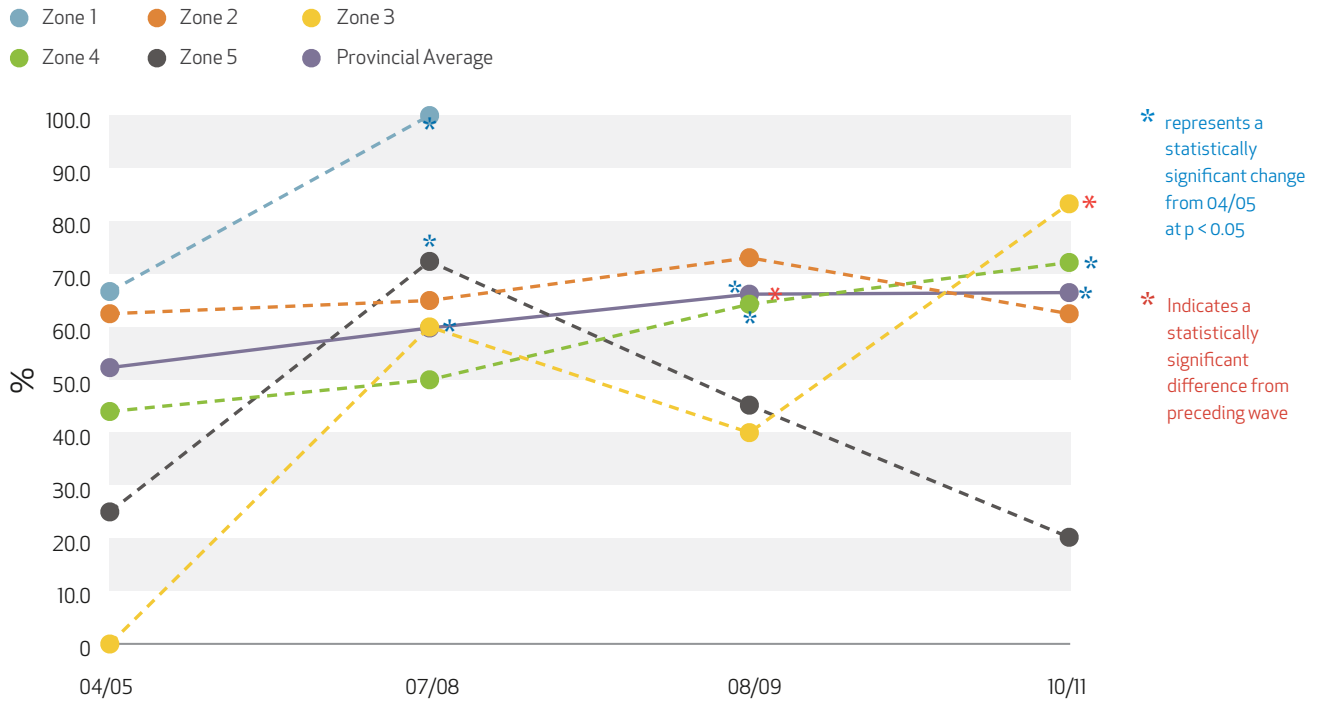


Figure 4.17 The proportion of hemorrhagic stroke patients discharged back to their pre-admission place of residence increased significantly by 2007/08 and continued to rise plateauing after 2008/09. The baseline value was 52% and it increased to 66%.

Source – APSS chart reviews.

FIGURE 4.18

TIA Patients Discharged Back To Their Pre-admission Place of Residence

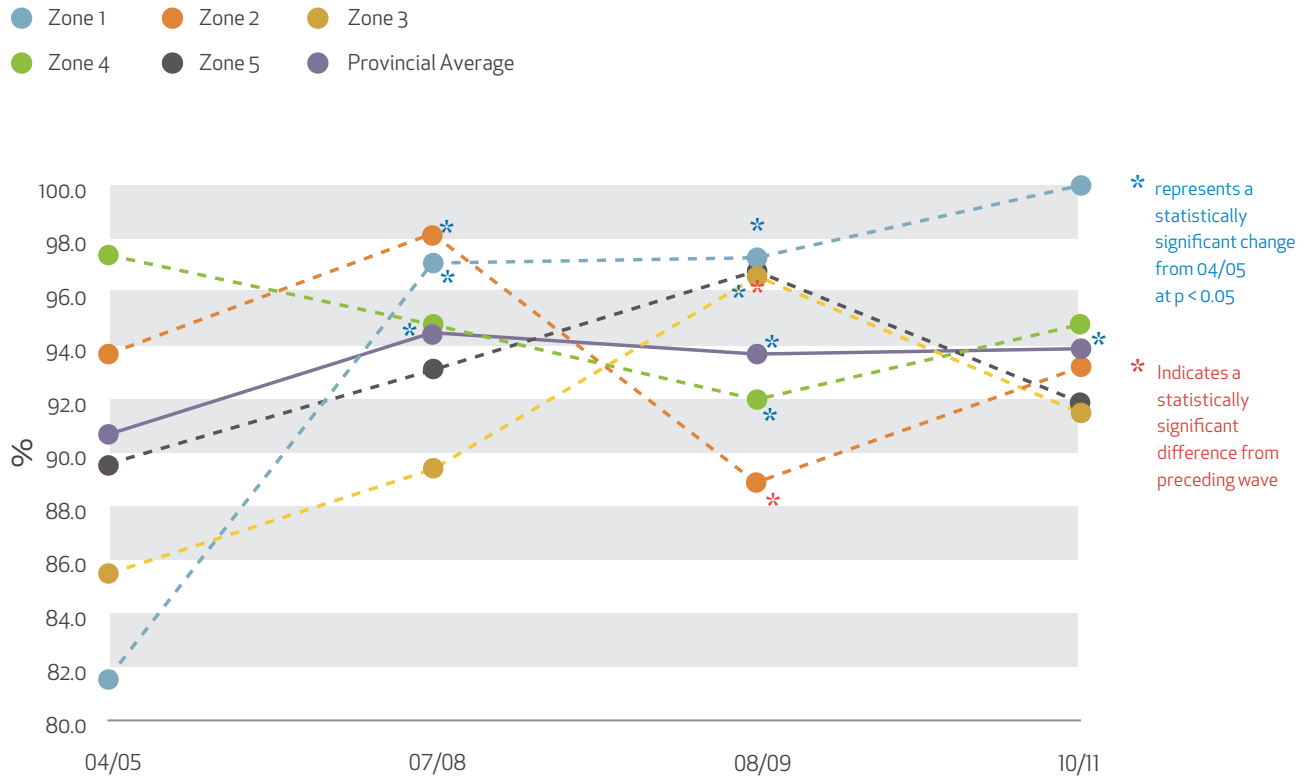


Figure 4.18 The proportion of TIA survivors discharged back to their pre-admission place of residence was already high in 2004/05 as expected. This proportion increased significantly by 2007/08 and maintained a level of approximately 94% until 2010/11.

Source – APSS chart reviews.

Summary of Findings - Quality of inpatient care for stroke

- The proportion of ischemic stroke patients receiving brain imaging before discharge from hospital increased significantly to 98.8% province-wide. For hemorrhagic stroke patients the proportion increased to 99.5%, which represents near-perfect performance.
- 98-100% of TIA patients received brain imaging before discharge in Edmonton and Calgary, which is near-perfect performance. Performance in Zones 1 and 3 was excellent (89% - 92%). However, North Zone (Zone 5) could achieve this near perfect target only 75% of the time although this still represents substantial improvement.
- The proportion of patients with ischemic stroke or TIA who received imaging of their carotid arteries prior to discharge increased significantly from 54% to 69% for the province overall. There was a plateau in improvement in 2008/09 for the province and considerable variability between zones.
- The percentage of stroke patients across Alberta who spent some portion of their inpatient stay in a Stroke Unit increased significantly, essentially doubling from 27% to 54% over the course of the strategy. There was a plateau in 2008/09 and great variability between zones.
- Province-wide, the percentage of ischemic stroke or TIA patients who receive antiplatelet therapy within 48 hours of admission did not change significantly between 2004/05 and 2010/11. The rate remained at approximately 75%. It is understood that another 8-10% of patients receive anticoagulant therapy within 48 hours instead of antiplatelet therapy. However, that information was not captured in the most recent chart review program and so is not reported.
- The proportion of all stroke patients experiencing a potentially preventable complication dropped significantly province-wide from 14.7% to 12.3% between 2004/05 and 2010/11.
- The proportion of stroke patients receiving a rehabilitation assessment within 48 hours of hospital arrival increased by 18 percent in absolute terms and 32% in relative terms between 2004/05 and 2010/11 with all zones experiencing statistically significant improvements.
- Province-wide the proportion of stroke or TIA patients receiving referrals to outpatient rehabilitation on discharge increased significantly from 11.7% to 19% between 2004/05 and 2010/11.
- The proportion of stroke or TIA patients receiving referrals to home care/community support on discharge improved significantly for the province overall by 2008/09 then declined by 2010/11 back to baseline. There was variability between zones as Zones 3 and 4 were able to maintain relative improvements of over 35% in 2010/11 compared to 2004/05.
- The proportion of stroke patients receiving an initial screen or assessment for dysphagia increased significantly for the province overall going from 22% to 58%.
- Although there was no change for ischemic stroke patients, the proportion of hemorrhage patients discharged back to their pre-admission place of residence increased significantly by 2007/08 and continued to rise, plateauing after 2008/09. The baseline value was 52% and it increased to 66%. For TIA patients there was a similar significant trend although it was less dramatic going from 91% in 2004/05 to 94% in 2010/11.
 - Together this represents 109 more Albertans per year who are able to avoid an increase in the level of care they require as a result of their stroke.

More information on these findings can be found in Tables 4.4 to 4.13 (pages 100-105)

Recommendations

- ▶ Access to brain imaging for TIA patients in Zone 5 (North Zone) needs to increase further to reduce a clear discrepancy with the rest of the province. Access to brain imaging for TIA patients in Zones 1 and 3, although very good, could increase further to match access in Calgary and Edmonton.
- ▶ Access to carotid imaging before discharge from hospital should increase for Zones 1, 3, and 4 to allow them to be on par with Zone 2. However, the major priority should be increasing access for Zone 5 which is well below the provincial average.
- ▶ Further increasing the proportion of patients receiving care on a Stroke Unit should remain a major provincial priority. The identification of a model of stroke unit care that would work for rural centres that are too small for geographic clustering of beds is also a priority for Alberta.
- ▶ All patients with ischemic stroke or TIA without contraindications should receive antiplatelet agents as soon as possible after stroke onset and certainly within 48 hours. The minority in which anticoagulation is more appropriate should also have that treatment started at the earliest time point judged to be safe by the treating team.
- ▶ More effort should be expended to reduce complications following stroke especially for the most frequent complications of pneumonia and urinary tract infections. To facilitate this, swallow screens and assessments should be performed on all stroke patients prior to initiation of oral intake. Foley catheters should be removed as soon as possible. All stroke patients should be targeted for a stroke-specific rehabilitation assessment within 48 hours to establish and develop a plan to meet their rehabilitation needs.
- ▶ All stroke patients should receive a swallowing screen or swallowing assessment before first oral intake. Alberta should aim for a target of a 90% screening rate. The value of screening is not clear in patients with TIA who have completely resolved deficits.
- ▶ Management of transitions in care is improving but referrals to homecare from hospital should increase or be better documented. Referrals to outpatient rehabilitation have increased but could still increase further. Early Supported Discharge teams may be an important part of transition planning for many patients.
- ▶ Documentation of many best practices in stroke needs to improve. The APSS is creating a set of minimum documentation standards for patients admitted with stroke.

STROKE PREVENTION

Findings - Access to stroke prevention services

To improve access to expertise in stroke prevention, the APSS established SPCs across the province (see Figure 1.2, APSS Provincial Maps). In these inter-disciplinary clinics, Albertans can receive information on stroke prevention and care from stroke specialists. Prior to APSS implementation, there were 3 SPCs providing these services. Currently there are 12 operating across the province. Since June 2007, there have been over 22000 initial visits and 8800 follow-up visits to SPCs province-wide. Over 2000 of the patient visits occurred in rural regions that might not have been served by a SPC prior to the establishment of the APSS. Since 2007, there have also been over 1000 outpatient Telehealth consultations

between stroke experts in Edmonton and Calgary and patients in rural centers, thus allowing patients to have access to specialist care with less travel and time expenditure.

<p>APSS INDICATOR</p> <p style="font-size: 2em; font-weight: bold; margin: 0;">48</p>	<p>REFERRALS TO SPC AFTER DISCHARGE FROM HOSPITAL</p> <p>Performance Measure: Percentage of stroke patients referred to secondary prevention services after being discharged from acute care or inpatient rehabilitation following a stroke event</p>
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FIGURE 4.19

Ischemic Stroke Patients Referred to Stroke Prevention Clinics on Discharge

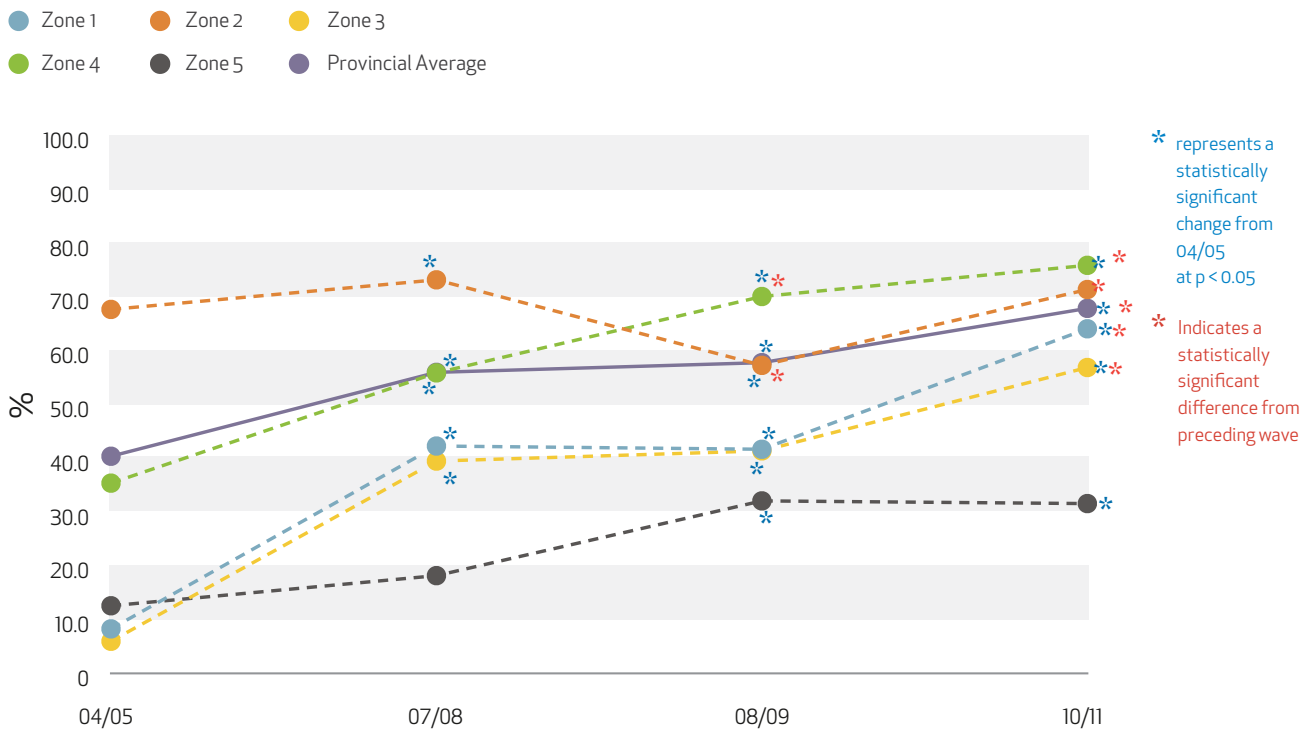


Figure 4.19 The proportion of ischemic stroke survivors referred to SPCs on discharge from hospital increased from 40.4% to 67.9% and the difference was statistically significant. Most zones made progress on this

performance measure or had good performance to start with. However, Zone 5 had a considerably lower rate of referral than other zones by 2010/11.

FIGURE 4.20

TIA Patients Referred to Stroke Prevention Clinics on Discharge

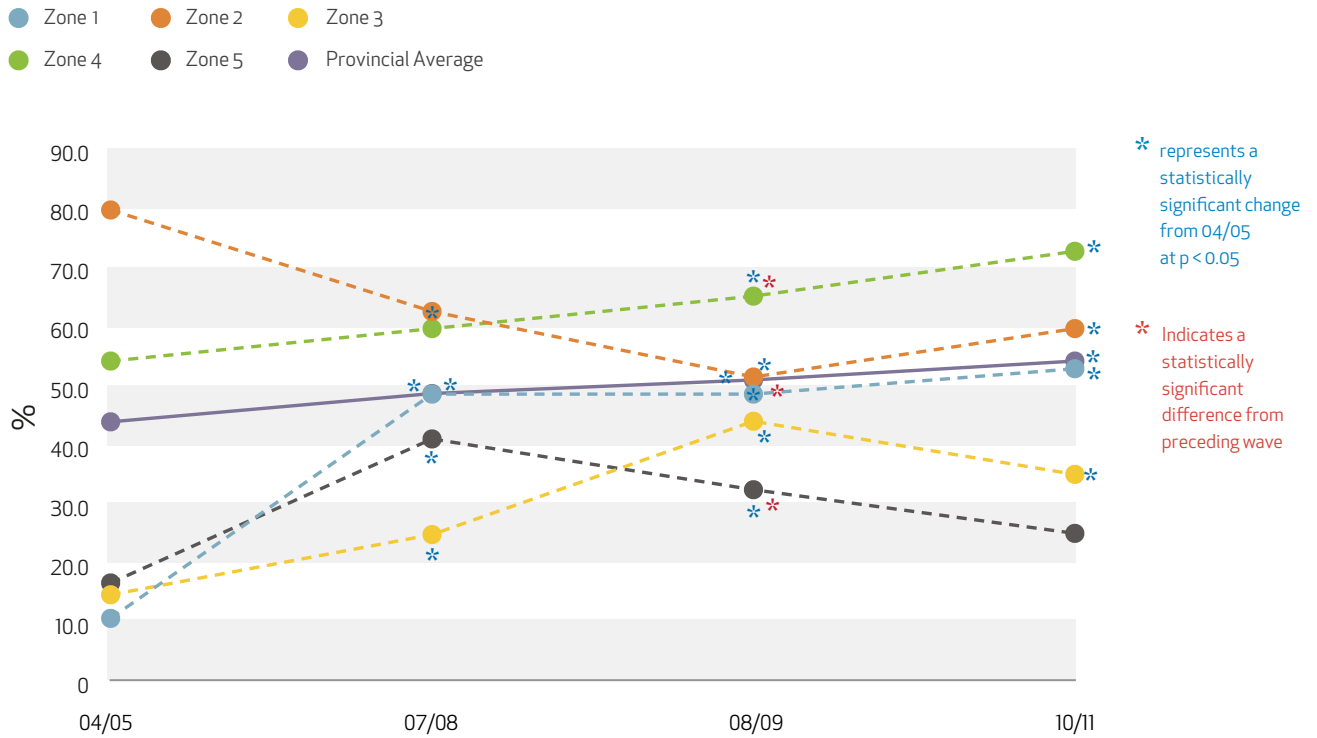


Figure 4.20 The proportion of TIA patients referred to SPCs on discharge from hospital increased significantly from 43.8% to 53.1% province-wide. Referral rates were lower for Zones 3 and 5.

FIGURE 4.21

Hemorrhagic Stroke Patients Referred to Stroke Prevention Clinics on Discharge

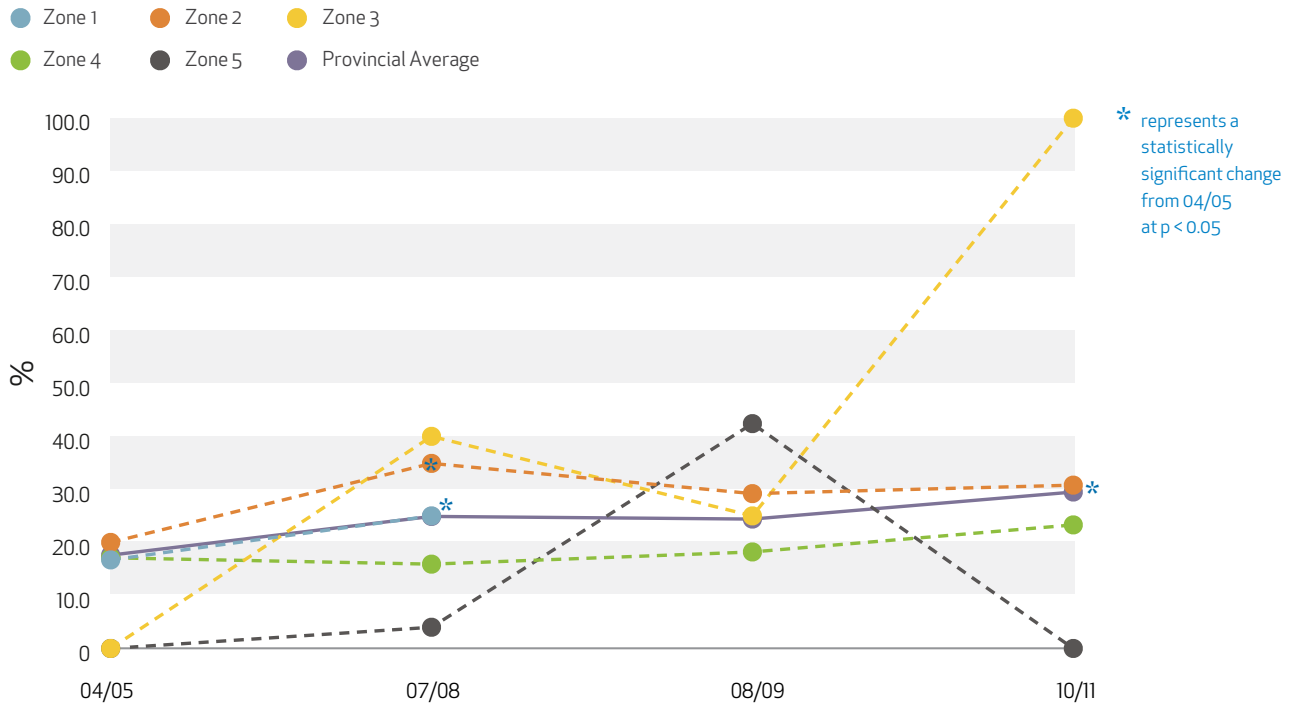


Figure 4.21 The proportion of hemorrhagic stroke patients referred to SPCs on discharge increased significantly considering the province as a whole.

However, the referral rates remained much lower than for ischemic stroke being only 29.5% in 2010/11. Small sample sizes prevented an accurate analysis by zone.

The TIA Hotline

The TIA Hotline is an innovative approach to helping physicians and patients access stroke prevention services in a timely way. This service is the result of a partnership between the APSS, Alberta Health Services, and Alberta Health & Wellness. The **TIA Hotline** provides physicians with immediate consultation and referral to stroke experts in Edmonton and Calgary for patients presenting with warning symptoms of stroke. Calls to the **TIA Hotline** result in advice on TIA triage (high, medium, low risk), treatment, as well as access to timely diagnostics and follow-up. The TIA Hotline's effectiveness will be evaluated by the ASPIRE Project which utilizes funding from the Heart and Stroke Foundation, the Canadian Institute of Health Research and the Canadian Stroke Network. Since implementation March 16, 2009, it is estimated that over 800 high-risk TIA patients have received urgent consultation through this service across the province.

Summary of Findings - Stroke prevention services

- The number of SPCs in Alberta tripled between 2005 and 2012. From June 2007 until December 2012, more than 22,000 patients have been seen in such clinics.
- There were substantial improvements in the proportion of ischemic stroke and TIA patients receiving a documented referral to SPCs before discharge from hospital. However, only 68% of ischemic stroke patients and 54% of TIA patients received such referrals.
- The proportion of hemorrhagic stroke patients referred to SPCs on discharge also increased significantly but was very low at 29% in 2010/11. The reason for the low rate of referral is unclear but one possibility might be that many of these patients are followed up by neurosurgeons in other clinics.
- A physicians' TIA Hotline was implemented in Alberta to facilitate urgent access to specialist consultation, diagnostic imaging, and stroke prevention measures. We estimate that more than 800 high risk TIA patients have received urgent care through this Hotline since its implementation.

More information on these findings can be found in Tables 4.14 (page 106)

Recommendations

- ▶ The proportion of ischemic stroke and TIA patients referred to SPCs on discharge should increase further to allow completion of the management plan, continuity of care, and optimization of stroke prevention strategies. It may be beneficial to increase the proportion of hemorrhagic stroke patients referred to SPCs for follow-up of investigations, transition into the community and risk factor control.
- ▶ Physicians/providers should increase use of the TIA Hotline or other rapid referral systems to maximize the likelihood of urgent access to care for high risk TIA patients. Adequate support should be in place to allow such patients priority access to local brain imaging and vascular imaging, as well as carotid revascularization procedures to reduce the high short-term risk of stroke occurrence after TIA or minor stroke.



Improving Health Care System Efficiency



Bruce T. is 78 years old and lives on a farm near Bowden, Alberta. He collapsed in his home when the left side of his body became paralyzed. Emergency Medical Services (EMS) were called and an initial assessment was conducted that included determining the exact time of onset of the paralysis as well as Bruce's blood sugar level. Suspecting acute stroke, a decision was made by the EMS providers to bypass the Innisfail Health Care Centre in favour of the nearest Primary Stroke Centre in Red Deer. Bruce was treated for acute ischemic stroke at the Red Deer Regional Hospital emergency department. Once stable, he was admitted to the Stroke Unit.



A comprehensive economic analysis of the APSS is underway and being conducted by the Institute for Health Economics in Edmonton, Alberta. This will examine the value created by the APSS for the money invested and

will be the subject of another report to be published in 2013. However, some information on the effects of the strategy on health system efficiency is available.

Findings

In 2004/05 EMS bypass protocols were in effect only for three PSCs and the two CSCs. As of 2012, bypass protocols are now in effect across Alberta diverting patients to 15 PSCs such as Hinton, Peace River, Grande Prairie, High Level, Camrose, Cold Lake, Fort McMurray, Wainwright, Red Deer, Lethbridge, Medicine Hat, Lloydminster, Drumheller, Westlock and Brooks as well as the CSCs in the Foothills Medical Centre in Calgary and the Edmonton Comprehensive Stroke System (Grey Nuns Community Hospital and the University of Alberta Hospital).

APSS
INDICATOR

19

TIME FROM EMS ARRIVAL AT SCENE OF SUSPECTED STROKE TO ARRIVAL IN AN APPROPRIATE EMERGENCY DEPARTMENT

Appropriate ED refers to Primary and Comprehensive Stroke Centres as defined by APSS and involves bypassing of non stroke centres

HOW DOES ALBERTA'S LENGTH OF STAY FOR STROKE COMPARE WITH THE NATIONAL AVERAGE?

FIGURE 5.1

Median Length of Stay by Stroke Diagnosis Type for Alberta

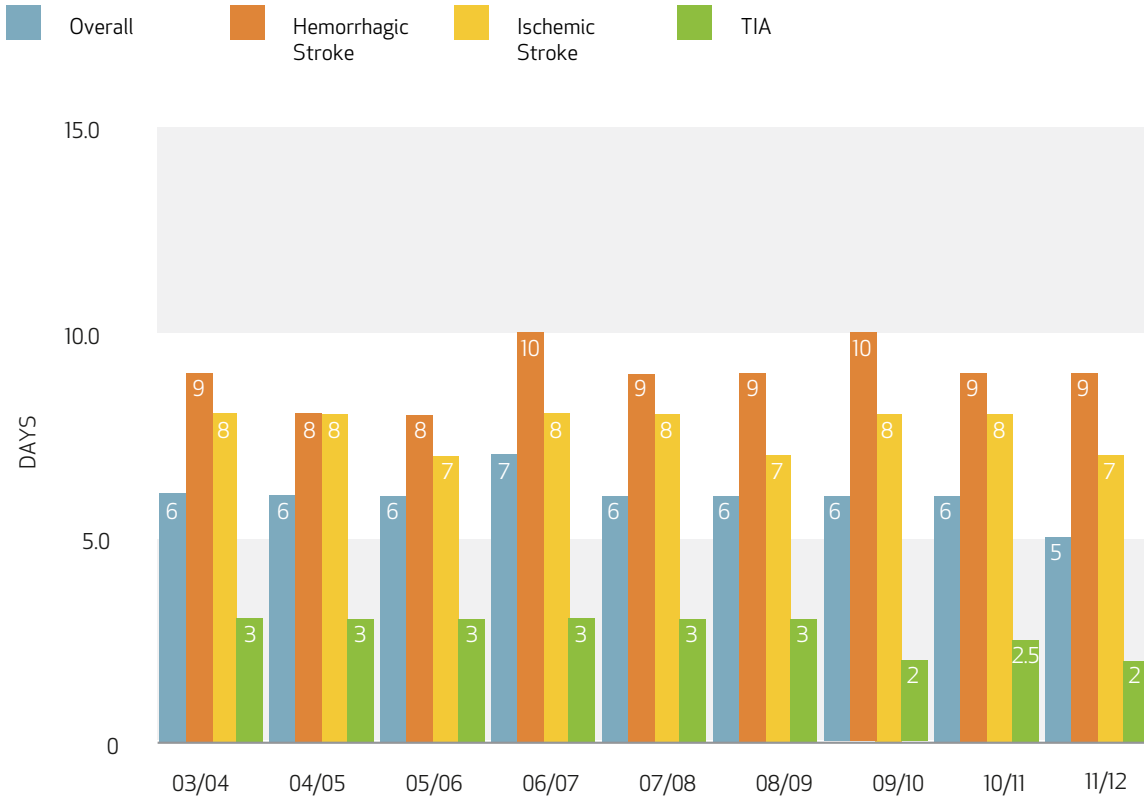


Figure 5.1 The median length of stay for all stroke types across Alberta did not change substantially although there was a slight downward trend in recent years with 2011/12 achieving 5 days. Over time the median length of stay of usually 6 days compares favourably with the national average of 7 days (1).

Source – APSS Hospital discharge abstracts.

<p>APSS INDICATOR</p> <p>34</p>	<p>LENGTH OF STAY</p> <p>Performance Measure: Mean/median time from stroke patient arrival in ED to final discharge from hospital (days)</p>
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FIGURE 5.2

Median Length of Stay for Stroke Patients by Zone

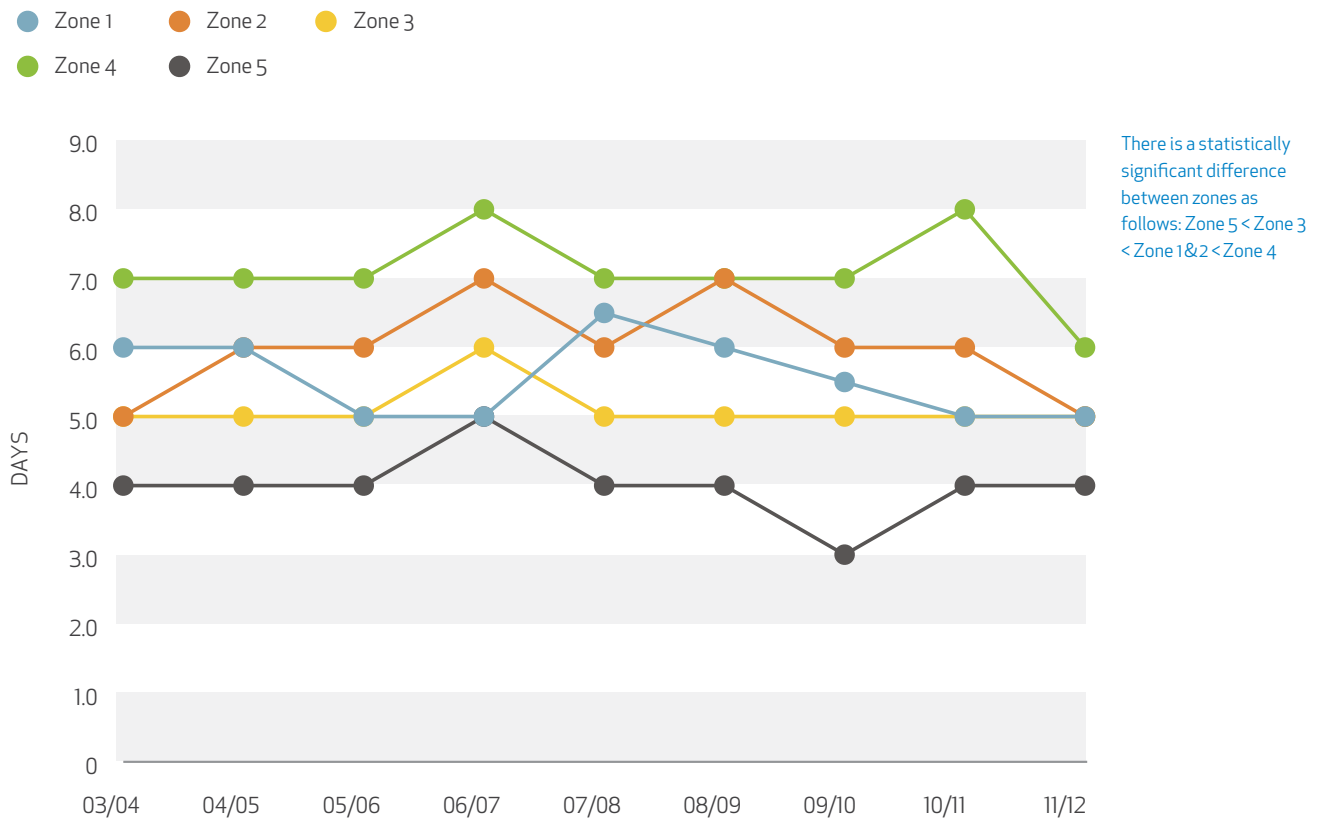


Figure 5.2 In general, all zones had median lengths of stay below or at the national average of 7 days. There was the suggestion of recent downward trends for Zone 2 (Calgary) and Zone 3 (Central) and possibly for Edmonton

in 2011/12. There were statistically significant differences between zones as follows: Zone 5 < Zone 3 < Zones 1 & 2 < Zone 4 in unadjusted analysis.

Source – APSS Hospital discharge abstracts.

The use of tPA for ischemic stroke produces a reduction in disability and an improvement in quality-adjusted-life years while at the same time lowering total direct care costs. In the Canadian healthcare system the use of tPA for ischemic stroke is associated with a \$678 1-year and \$3800 30-year **cost avoidance** per patient treated. (3,4) These numbers are based only on reductions in

direct costs due to shorter length of stay and lower rehabilitation and long-term care costs. From APSS random chart reviews, the proportion of ischemic stroke patients receiving tPA increased from 8.2% to 12.7%. Figure 5.3 and 5.4 demonstrate the total benefits and cost avoidance from tPA use in 2010/11 versus 2004/05.

FIGURE 5.3

Estimated Benefits of tPA in 2010/11 vs 2004/05

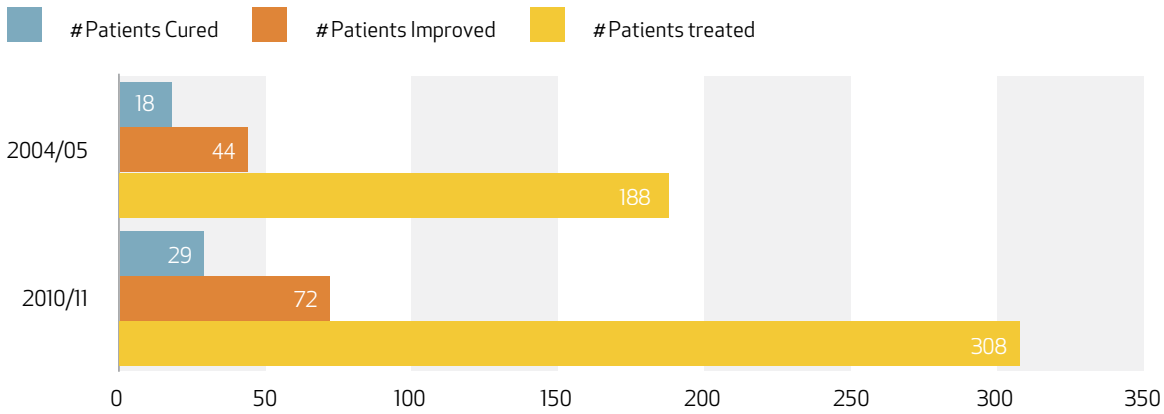


Figure 5.3 Estimated benefit from tPA in 2010/11 vs 2004/05 in regards to patients cured or improved by \geq 1 grade on the Modified Rankin Scale. Assuming a 9.5% improvement in cure with treatment (averaging benefits

across the 3 hour and 4.5 hour time windows) and a 23% increase in improvement with treatment.

Source – APSS chart reviews (5, 6).

FIGURE 5.4

Estimated Cost Avoidance from tPA use in 2010/11 vs 2004/05

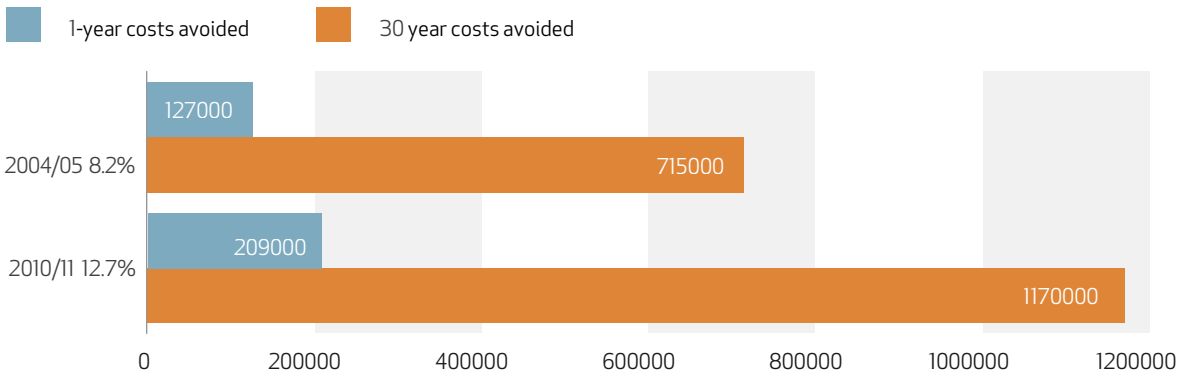


Figure 5.4 Proportions receiving tPA were applied to 2296 ischemic strokes in 2004/05 (with 8.2% treatment rate) and 2424 ischemic strokes in 2010/11 (with 12.7% treatment rate). Baseline cost savings estimates in 2004/05 were a \$127 000 avoidance in 1-year costs and a \$715 000 avoidance in 30-year costs. The increased use

of tPA in 2010/11 produced an additional estimated cost avoidance of \$81 000 at 1 year and \$445 000 at 30 years. If 20% of ischemic stroke patients from the 2010/11 population had received IV tPA, projected direct cost avoidance would be \$329 000 at 1 year and \$1 800 000 at 30 years.

Summary of Findings

- EMS bypass protocols are now in place across Alberta to allow patients to be diverted to PSCs.
- Alberta's median length of stay for stroke remained fairly constant over time and was 6 days in 2008/09 which compares favourably with the national average of 7 days for the same year. It remains to be seen whether a decline to 5 days in 2011/12 will persist.
- Although all zones had a median length of stay that was at or below the national average, there was significant variability between zones. Zone 4's length of stay was longer than the other zones; Zone 1 and 2 had longer length of stay than Zone 3 and Zone 5; Zone 3 had a longer length of stay than Zone 5.
- Intravenous tPA is considered a dominant therapy in terms of cost-effectiveness associated with a cost avoidance while still producing reduced disability. With increased use of IV tPA (from 8.2% of all ischemic stroke patients in 2004/05 to 12.7% in 2010/11) the province avoided an additional \$81,000 in 1-year costs and is projected to avoid an additional \$445,000 in 30-year costs. At the same time the number of patients cured or improved increased by 64% in relative terms.

Recommendations

- ▶ Cross communication between zones is encouraged to determine the factors influencing the variability in length of stay including waits for rehabilitation access and long term care as well as patient complexity.
- ▶ Intravenous tPA is an important treatment in ischemic stroke to reduce disability for patients and to reduce cost to the health care system. To further improve access new rural PSCs should be created. Through quality improvement programs in existing PSCs and CSCs the proportion of patients treated should increase and door to treatment times decrease. The province should strive to increase intravenous tPA use to a target level of 20%.
- ▶ Although intravenous tPA is an important treatment for stroke the province should participate actively in the development and accessibility of catheter-based intra-arterial recanalization strategies. This recommendation recognizes the fact that the most severe ischemic stroke syndromes respond poorly to intravenous tPA and these will become a major burden in personal and financial terms as the population ages.
- ▶ More data on the value for cost of the APSS will become available after the detailed economic report is completed by the Institute for Health Economics.



Improving Satisfaction with Care



VI

Two months after suffering a stroke, Walter L., 80, was discharged home from Chinook Regional Hospital in Lethbridge. The day before leaving, Walter and his son met with a Social Worker and were provided with information on services in his community. In addition, follow-up appointments were made with the Stroke Prevention Clinic. The following week, Walter received a call from the Lethbridge hospital asking about the care they received. Along with information obtained from other clients and families, information from the call was used by an inter-disciplinary team in a review of the services provided.



The APSS commissioned a series of stroke survivor surveys targeting individuals discharged from hospital back to the community. The focus of the phone survey was to determine the patient and/or caregiver's experience with care received in hospital and on return to the community. The survey asked questions about the stroke survivor's ability to participate in everyday

activities and their perception of care during and after their hospital stay. Using the information obtained in a 2008 baseline survey of individuals discharged in 2007, a number of recommendations were made regarding areas of improvement, especially on return to the community. Surveys were again repeated in 2009, 2010 and 2012 of individuals discharged in the previous year.

ARE PATIENTS SATISFIED WITH THE CARE THEY RECEIVE?

Findings

FIGURE 6.1

Changes in Satisfaction with Inpatient Care Received for Stroke Survivors

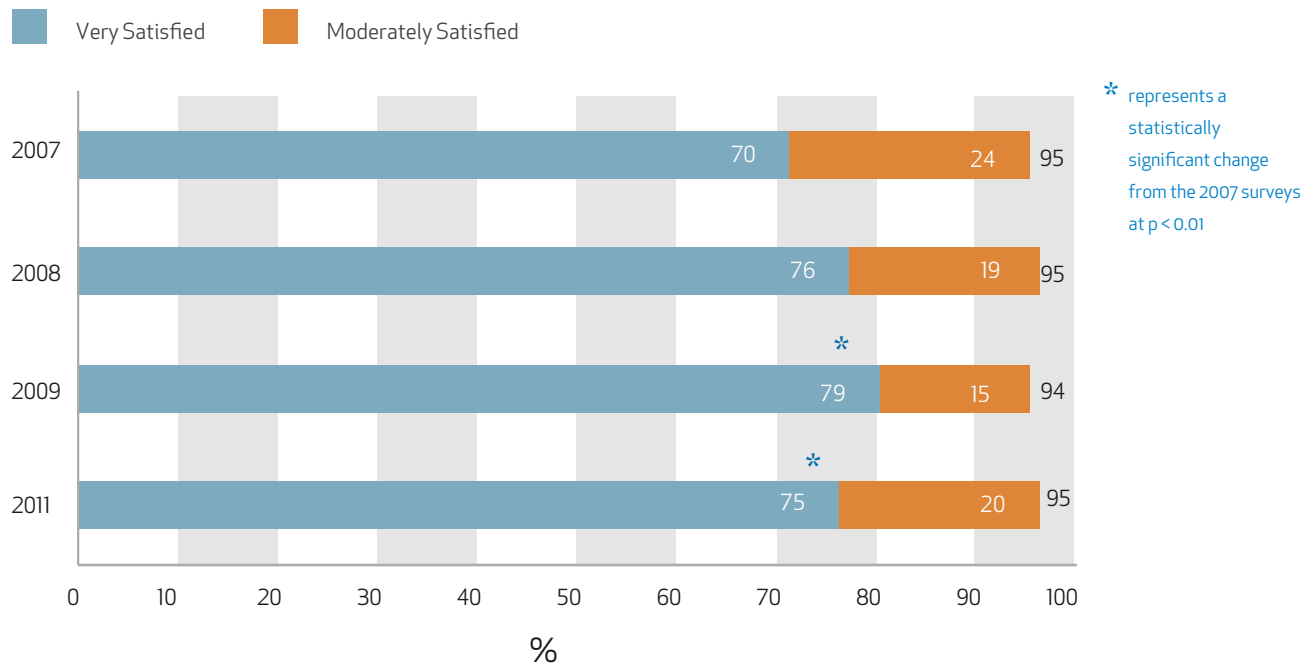


Figure 6.1 For all four discharge years there was a 94-95% rate of patients moderately satisfied or very satisfied with inpatient care. There was a statistically significant increase in the percentage of patients very satisfied with inpatient care for patients discharged in 2009 and 2011 compared to 2007 although the level seemed to peak in 2009.

Source – APSS stroke survivor surveys.

APSS
INDICATOR

44

PATIENT SATISFACTION

Performance measure:
Percentage of patients/
caregivers expressing
satisfaction with content,
frequency etc. of education
in acute care or outpatient/
community setting

FIGURE 6.2

Changes in Satisfaction with Care Received at Home/Community for Stroke Survivors

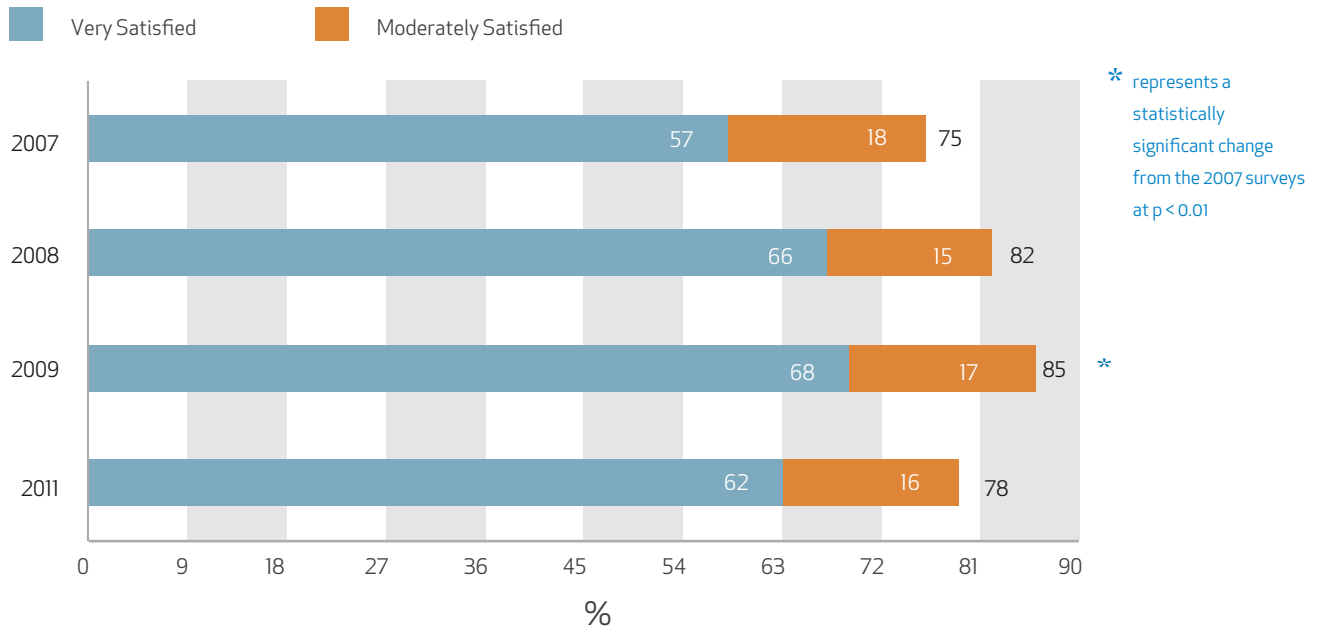


Figure 6.2 The proportion of patients very satisfied or moderately satisfied with care received at home or in the community post discharge was lower than for inpatient care. The APSS increased efforts to provide information on community support services and stroke survivor support organizations. Early Supported Discharge programs were established in some communities. Over two years there was a statistically significant 10% increase in the proportion of patients moderately or very satisfied with care received at home or in the community. However the province was unable to sustain the gains as of 2011 and the level of satisfaction dropped.

Source – APSS stroke survivor surveys.

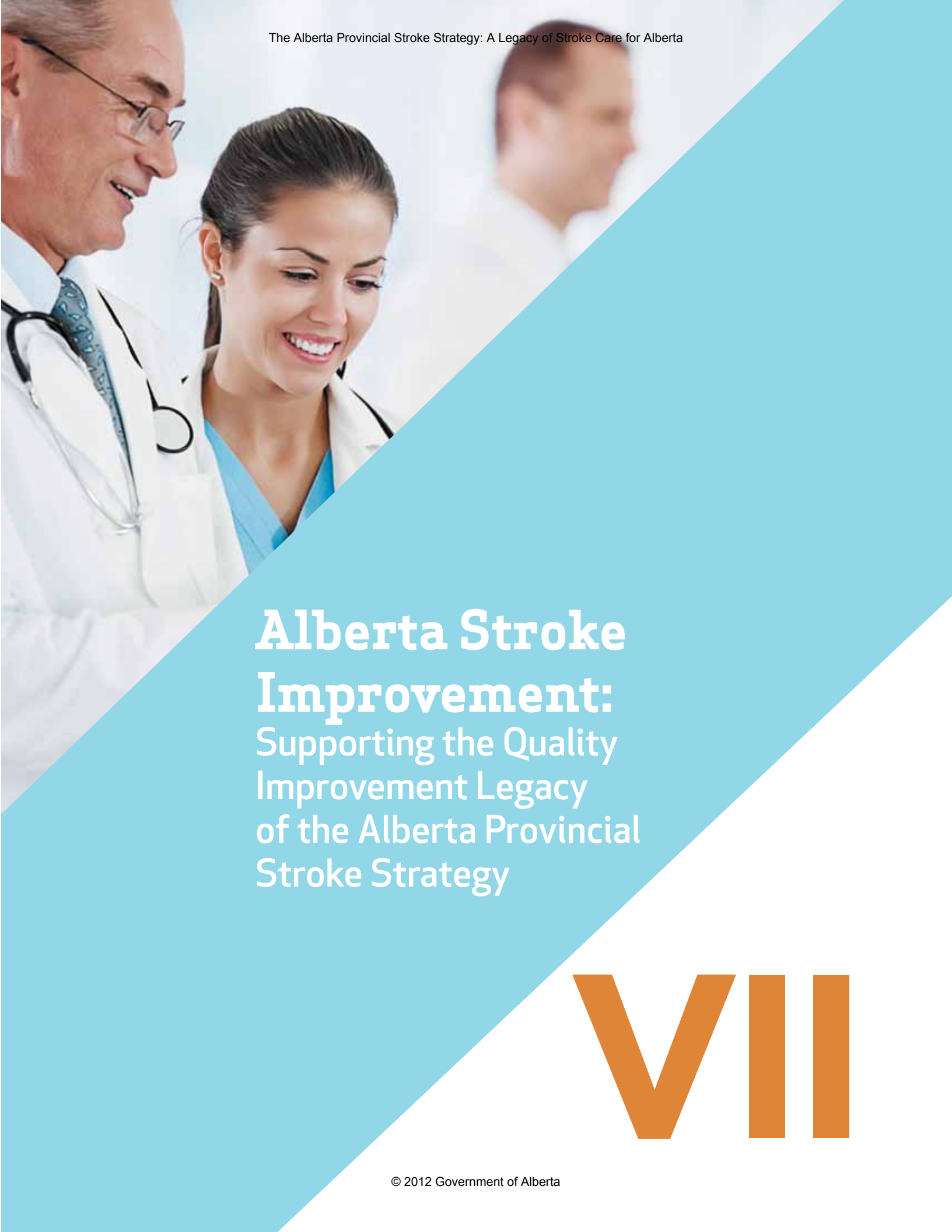
<p>APSS INDICATOR</p> <p style="font-size: 2em; font-weight: bold; margin: 0;">45</p>	<p>COMMUNITY SUPPORT</p> <p>Performance measure: Percent of stroke survivors/caregivers satisfied with support in the community</p>
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Summary of Findings

- Overall 94-95% of patients were moderately or very satisfied with the inpatient care they received in all four years surveyed.
- Satisfaction levels were lower for care received after leaving hospital and a number of community support services were targeted. Between 2007 and 2009, there was a significant improvement in satisfaction with care received after leaving hospital, rising from 75% to 85%. However, the province was unable to sustain the gains as of 2011 and levels of satisfaction dropped to 78%.

Recommendations

- ▶ The high rate of satisfaction with inpatient care should be maintained. The proportion of stroke survivors 'Very satisfied' with their inpatient care should increase further. An increase in stroke unit care province-wide may help patient satisfaction as well.
- ▶ The province should increase its efforts to increase satisfaction with care after discharge into the community. It will be extremely important to continue to build homecare and community support programs such as early supported discharge as well as partnerships with community support organizations.



Alberta Stroke Improvement: Supporting the Quality Improvement Legacy of the Alberta Provincial Stroke Strategy

VIII

What is ASI?

Alberta Stroke Improvement (ASI) is a quality improvement initiative sponsored by the Alberta Stroke Council, representing collaboration between AHS stroke service providers, AHS Quality Health and Information teams, and Pillar IV of the APSS.

The mission of ASI is to support timely access to quality

stroke care through the development and execution of Stroke Centre and provincial improvement plans and the development of sustainable, ongoing quality improvement expertise within these services. The initiative is led by a small ASI Coordination Team made up of representatives from Stroke Centres across the province, Pillar IV team and Alberta Stroke Council.

Why is ASI important now?

Significant improvements in the outcomes from, and processes of, stroke care have been seen as a result of the APSS. Some of our performance measures have plateaued over the last two years of the Strategy. However, there remain important opportunities that require ongoing improvement within centres and zones.

A province-wide consultation was undertaken in 2010 to determine the current state of all Stroke Centres with respect to their capacity for ongoing quality improvement beyond the end of the Strategy. Although teams were rightly proud of the significant achievements they had made at their Centre, there were perceived challenges with respect to timeliness and access to data about local performance. Additional findings included the need for a systematic and shared approach to

quality improvement across the province and having the resources and technical expertise to support this work.

As well as supporting the quality improvement legacy of the APSS, the need to provide an effective transition between the Strategy and the emerging Strategic Clinical Network (SCN) for Cardiac Health and Stroke was identified.

In this way ASI was proposed to provide:

- A proper legacy of improvement for the APSS
- The building blocks of quality improvement capacity within and across centres
- An effective bridge between the APSS and the SCN

How does ASI work?

ASI has three phases.

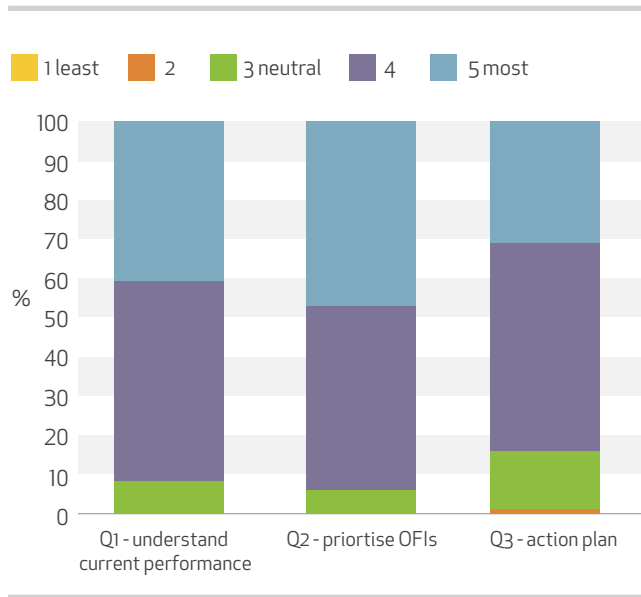
1. Scope

The Scoping phase involved one-day workshops at each PSC and both CSCs. The workshops (or centre-visits) were facilitated by members of the APSS/ Pillar IV Alberta Stroke Improvement Coordination Team and participants from Stroke Centre teams, representing a broad range of stakeholders across the clinical continuum of care and support services.

The stakeholders at each of the centres followed a systematic, team-based process to identify a number of important improvement opportunities. Several opportunities were prioritized in order for initial action planning to start immediately. Scoping visits were positively evaluated by the centres (Figure 7.1). More than 300 people participated in centre visits.

FIGURE 7.1

Participant experience of scoping visits



Participants were asked to rate their satisfaction on a scale of 1 to 5 (1 = lowest, 3 = neutral, 5 = highest) with how the Scoping visit had enabled them to:

One – Understand their Centre’s current level of performance

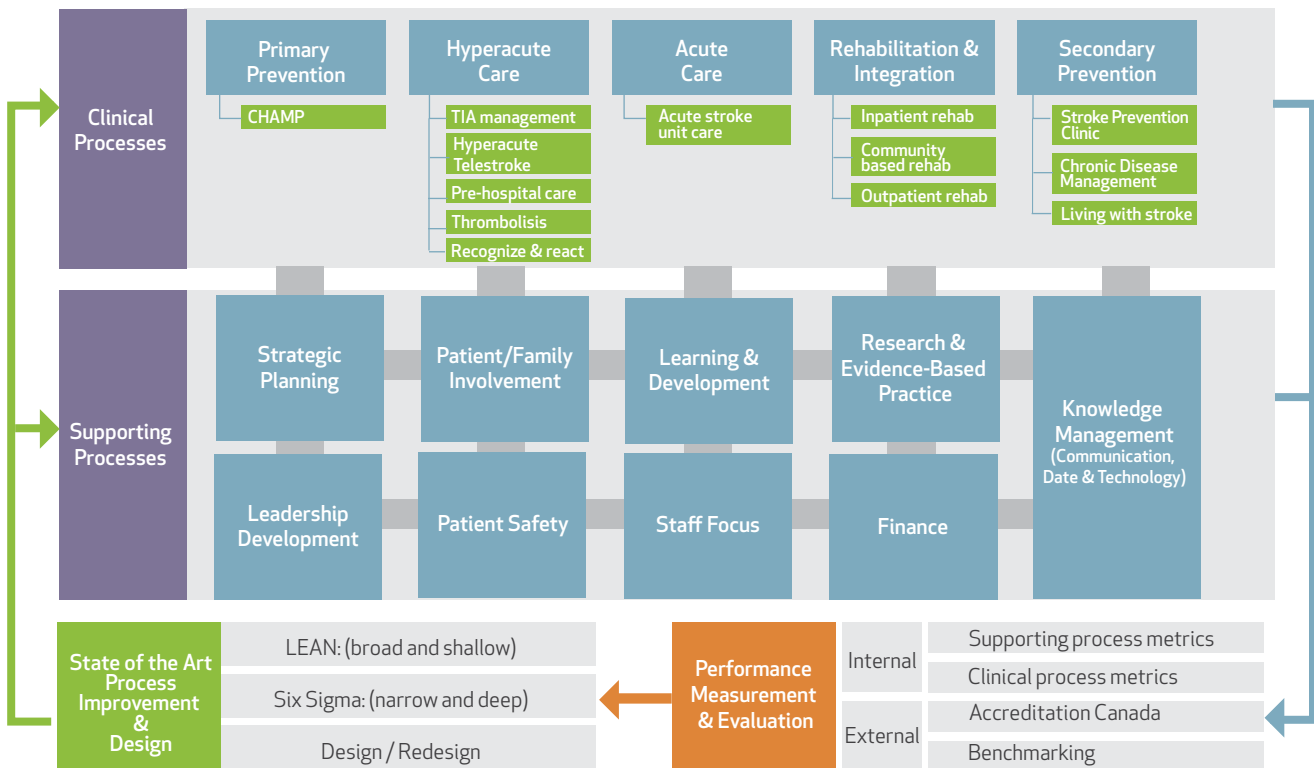
Two – Identify their most important opportunities for improvement (OFIs)

Three – Begin to action plan around these OFIs

The educational component of the centre visits covered material aligned both within the Alberta Improvement Way (AIW) and the Stroke Quality Management Framework adopted by the ASC (Figure 7.2)

FIGURE 7.2

Alberta Stroke Quality Management Framework



2. Improve

The prioritised improvement opportunities from the Scoping phase were sorted into themes in order to identify a provincial level improvement plan. Seven key improvement themes were identified. These represent a combination of four cross-continuum clinical process (numbers 4 to 7) and three supporting process (numbers 1 to 3) themes. They are:

1. Governance and Leadership
2. Data and Performance Measurement
3. Staff Education
4. Door to Needle time and Hyper-acute Care
5. Transition Planning and Patient Education
6. Rehab Access and Intensity

7. Ambulatory Care and Follow-up

The Improvement phase of ASI involves individual centres working on their own improvement plan with the support of Pillar IV and the ASI coordination team through a variety of improvement approaches aligned with the AHS Alberta Improvement Way and coordinated using the Institute for Health Improvement (IHI) Collaborative model (3 learning sessions separated with action and improvement cycles involving within and across centre improvement projects). Each centre was asked to choose one or two themes. The selection of improvement themes by centre is summarized in Figure 7.3.

FIGURE 7.3

Clinical Improvement Themes

	Red Deer	Camrose	Edmonton	Westlock	Hinton	High Level	Grande Prairie	Fort McMurray	Cold Lake	Calgary
Door to Needle Time	●	●		●	●	●	●	●		
Transition Plan & Pt Education	●		● Grey Nuns		●					
Rehab Access & Intensity		●	● SESD CRIS	●				●	●	● Prov Primp
Ambulatory Care & Follow-Up			● Grey Nuns				●			●

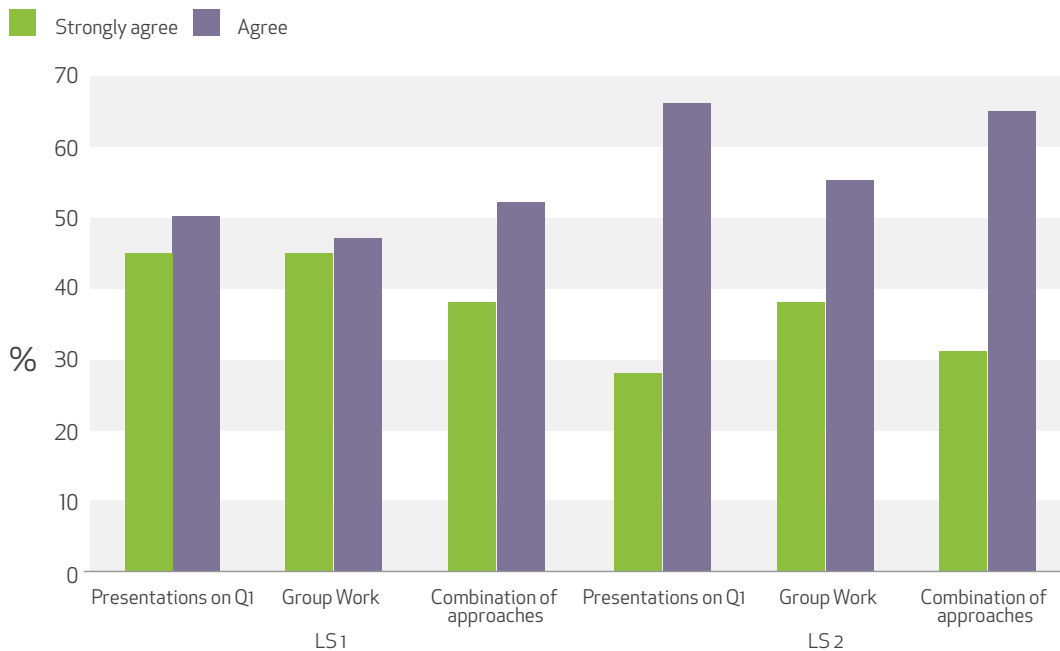
Clinical Improvement Themes by centre. At the time of writing, two learning sessions have been held with over 140 stroke care providers in attendance. Teams have been able to successfully scope out their specific improvement opportunities and are now moving forward with their individual and/or cross-centre projects. Some centres are already testing their improvement ideas using a PDSA (Plan Do Study Act) approach.

To date, teams have positively evaluated their experience of the ASI learning sessions. This includes the opportunity for participants to benefit from teaching around quality improvement (QI) approaches and methods as well as their ability to work together within their own teams Figure 7.4.

FIGURE 7.4

Participant evaluation – learning sessions (LS) one and two

Understanding of QI and ability to move projects toward due to key elements of the LS



The three supporting process themes of Governance and Leadership, Data and Performance Measurement, and Staff Education are also being addressed within specific working groups. With respect to Governance and Leadership, individual centres have defined their own governance and leadership teams. Key clinical leaders for stroke care across the province will be supported with formal leadership development opportunities. Led by representatives from Pillar IV, the Performance

Measurement working group is moving towards a standardized dashboard for performance reporting and improving the timeliness of data reporting. Finally the Staff Education working group is developing core competencies for nursing and allied health professionals, conducting a gap analysis of our current state of being able to meet these competencies, and finally preparing recommendations to the SCN about a provincial education plan for stroke care providers.

3. Sustain

The third phase of ASI will involve the dissemination of the successful improvement gains made for the clinical process themes to Centres who did not participate in the first set of projects alongside a significant development of QI understanding and capacity in each participating centre. This phase will also see the provincial improvement plan for stroke

consolidated within the SCN for Cardiac Health and Stroke, both in terms of the network infrastructure as well as network-sponsored improvement projects. This phase will also focus on a provincial level accreditation submission for the Accreditation Canada Stroke Services of Distinction Award.

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LIST OF EXHIBITS

FIGURES

Momentum and Milestones-the APSS Story

FIGURE 1.1

The APSS Milestones

FIGURE 1.2

Provincial Maps 2005 and 2012

FIGURE 1.3

Stroke Services in 2005 and 2012 for North Zone

FIGURE 1.4

Stroke Services in 2005 and 2012 for Edmonton Zone

FIGURE 1.5

Stroke Services in 2005 and 2012 for Central Zone

FIGURE 1.6

Stroke Services in 2005 and 2012 for Calgary Zone

FIGURE 1.7

Stroke Services in 2005 and 2012 for South Zone

Educating Albertans About Stroke

FIGURE 2.1

Blood Pressure Awareness Campaigns 2010-11

FIGURE 2.2

The Recognize and React Public Awareness Campaigns

FIGURE 2.3

The median time from last seen well to ED arrival

FIGURE 2.4

The percentage of TIA and stroke patients arriving at hospital within 2.5, 3.5 and 4.0 hour windows

Reducing Stroke Occurrence and Mortality

FIGURE 3.1

The percentage of ischemic stroke and TIA patients prescribed antihypertensive medications on discharge

FIGURE 3.2

The percentage of hemorrhagic stroke patients prescribed antihypertensive medications on discharge

FIGURE 3.3

The percentage of ischemic stroke and TIA patients prescribed lipid-lowering agents on discharge

FIGURE 3.4

The percentage of ischemic stroke and TIA patients without atrial fibrillation prescribed antiplatelet agents or anticoagulants on discharge

FIGURE 3.5

The percentage of ischemic stroke or TIA patients with atrial fibrillation prescribed anticoagulant medications on discharge

FIGURE 3.6

The percentage of patients with atrial fibrillation prescribed anticoagulants or antiplatelet medications on discharge

FIGURE 3.7

The median time from onset of stroke and TIA symptoms to carotid intervention

FIGURE 3.8

The percentage of patients receiving carotid intervention within two weeks of their index TIA or stroke event

FIGURE 3.9

The number of inpatient and ED stroke events requiring hospitalization in Alberta

FIGURE 3.10

Stroke hospitalizations and ED visits using the APSS definition for stroke standardized by age and gender

FIGURE 3.11

Stroke hospitalizations and ED visits by stroke subtype

FIGURE 3.12

Stroke hospitalizations and ED events using the CIHI definition for stroke

FIGURE 3.13

Age and sex adjusted 30-day in-hospital case fatality for stroke hospitalizations by stroke subtype

FIGURE 3.14

Age and sex adjusted 30-day case fatality for stroke hospitalizations by stroke subtype by zone

FIGURE 3.15

Adjusted 30-day mortality by zone

Improving Access to Best Care

FIGURE 4.1

Comprehensive and primary stroke centres in Alberta in 2005 and 2012

FIGURE 4.2

The percentage of all ischemic stroke patients receiving tPA

FIGURE 4.3

The median door to treatment time for patients receiving tPA

FIGURE 4.4

The proportion of patients receiving tPA who were treated within 1 hour of arrival in the ED

FIGURE 4.5

The percentage of ischemic stroke patients receiving brain imaging prior to discharge

FIGURE 4.6

The percentage of hemorrhagic stroke patients receiving brain imaging prior to discharge

FIGURE 4.7

The percentage of TIA patients receiving brain imaging prior to discharge

FIGURE 4.8

The percentage of ischemic stroke or TIA patients who received carotid imaging prior to discharge

FIGURE 4.9

The percentage of stroke patients who spent some portion of their inpatient stay in a stroke unit

FIGURE 4.10

The percentage of ischemic stroke or TIA patients who received antiplatelet therapy within 48 hours of admission

FIGURE 4.11

The percentage of stroke patients experiencing a potentially preventable complication

FIGURE 4.12

The percentage of stroke patients receiving a rehabilitation assessment within 48 hours of hospital arrival

FIGURE 4.13

The percentage of stroke or TIA patients receiving referrals to outpatient rehabilitation on discharge

FIGURE 4.14

The percentage of stroke patients who receive a referral to homecare or community support service prior to discharge

FIGURE 4.15

The percentage of stroke patients receiving an initial dysphagia screen or assessment

FIGURE 4.16

The percentage of ischemic stroke patients discharged back to their pre-admission place of residence

FIGURE 4.17

The percentage of hemorrhagic stroke patients discharged back to their pre-admission place of residence

FIGURE 4.18

The percentage of TIA patients discharged back to their pre-admission place of residence

FIGURE 4.19

The percentage of ischemic stroke patients referred to SPS on discharge

FIGURE 4.20

The percentage of TIA patients referred to SPCs on discharge

FIGURE 4.21

The percentage of hemorrhagic stroke patients referred to SPCs on discharge

Improving Health Care System Efficiency

FIGURE 5.1

The median length of stay by stroke type

FIGURE 5.2

Median length of stay for stroke patients by zone

FIGURE 5.3

The estimated benefits of tPA in 2010/11 versus 2004/05

FIGURE 5.4

The estimated cost avoidance from increased use of intravenous tPA

Improving Satisfaction with Care

FIGURE 6.1

Changes in satisfaction with inpatient care received by stroke survivors

FIGURE 6.2

Changes in satisfaction with care received at home or in the community by stroke survivors

Alberta Stroke Improvement

FIGURE 7.1

Participant experience of scoping visits

FIGURE 7.3

Clinical Improvement Themes

FIGURE 7.2

Alberta Stroke Quality Management Framework

FIGURE 7.4

Participant evaluation – learning sessions (LS) one and two

TABLES

Educating Albertans About Stroke

TABLE 2.1

The median time from stroke or TIA symptom onset to presentation in an ED

TABLE 2.3

The percentage of stroke and TIA patients who seek medical attention in less than 3.5 hours

TABLE 2.2

The percentage of stroke and TIA patients who seek medical attention in less than 2.5 hours

TABLE 2.4

The percentage of stroke and TIA patients who seek medical attention in less than 4 hours

Reducing Stroke Occurrence and Mortality

TABLE 3.1

Estimated proportion (%) of inpatients prescribed blood pressure lowering agents on discharge

TABLE 3.3

Proportion (%) of TIA and ischemic stroke patients without atrial fibrillation discharged on antithrombotic agents

TABLE 3.2

Proportion (%) of inpatients prescribed lipid lowering agents on discharge

TABLE 3.4

Proportion (%) of TIA and ischemic stroke patients with atrial fibrillation discharged on anticoagulants or any antithrombotic agents

TABLE 3.5

Age-Sex standardized incidence rate (per 100,000). Most responsible and type 1, 2, 6, W, X, Y diagnosis (APSS Definition)

TABLE 3.6

Age-Sex standardized incidence rate (per 100,000). Most responsible and type 1, 2, 6, W, X, Y diagnosis. (APSS Definition)

TABLE 3.7

Inpatient Age-Sex standardized incidence rate (per

100,000). CIHI (ICD-10: I60 – I64) Most responsible and type 1, W, X, Y diagnosis. (CIHI compatible definition)

TABLE 3.8

30-day crude hospital fatality rates. Most responsible diagnosis type only

TABLE 3.9

30-day crude hospital fatality rates. Most response diagnosis and 1, 2, 6, W, X, Y diagnosis types

Improving Access to Best Care for Stroke

TABLE 4.1

Proportion (%) of stroke/TIA patients who received tPA (intravenous, combination of intravenous & intra-arterial or intra-arterial alone)

TABLE 4.2

Median and first (Q1) and third (Q3) quartiles of door-to-needle time (time in minutes from ED arrival to initiation of tPA)

TABLE 4.3

Proportion (%) of stroke and TIA patients receiving tPA within 1 hour from arrival in ED (includes intravenous and a combination of intravenous and intra-arterial tPA)

TABLE 4.4

Proportion (%) of stroke/TIA patients receiving a brain CT or MRI prior to discharge

TABLE 4.5

Proportion (%) of ischemic stroke or TIA patients receiving carotid imaging prior to discharge

TABLE 4.6

Proportion (%) of stroke patients who received treatment on a stroke unit

TABLE 4.7

Proportion (%) of Ischemic stroke or TIA patients who received antiplatelet within 48 hrs of arrival at the hospital

TABLE 4.8

Proportion (%) of Stroke/TIA patients experiencing potentially preventable complications during their inpatient stay (including deep vein thrombosis, pulmonary embolism, pneumonia, decubitus ulcer, and urinary tract infection)

TABLE 4.9

Proportion (%) of Stroke/TIA patients who received rehabilitation assessment within 48 hours of hospital arrival

TABLE 4.10

Proportion (%) of Stroke or TIA patients who received a referral to outpatient rehabilitation on discharge

TABLE 4.11

Proportion (%) of Stroke or TIA patients receiving a referral to home care/ community supportive services on discharge. Charts with patients discharged to home were selected for analysis

TABLE 4.12

Proportion (%) of Stroke patients receiving an initial dysphagia screen within 72 hours after admission

TABLE 4.13

Proportion (%) of Stroke patients discharged back to their pre-admission place of residence

TABLE 4.14

Proportion (%) of Stroke and TIA patients referred to stroke prevention clinics on discharge

TABLES

Table legend	
* , **	Bolded single or double asterisks signify statistical significance at $p < 0.05$ usually in relation to a baseline year or wave.
--	Double dashed line indicates that results cannot be reported usually due to lack of 'pre-APSS' comparison group.
-	Single dash indicates that results are not reported due to small block size.
UTD	When there was insufficient information in a patient chart to answer a performance measure the chart was labelled UTD. Depending on the measure of interest UTDs might be included in a denominator or excluded from analysis.
†	Represents a statistically significant change from an immediately preceding year or wave.
~	Data not available or no occurrence.

EDUCATING ALBERTANS ABOUT STROKE

TABLE 2.1

The median time from stroke or TIA symptom onset to presentation in an ED.

Stroke Type	Zone Code	Wave 1			Wave 2			Wave 3			Wave 4		
		Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
STROKE	1	0.67	2.40	10.72	0.90	1.37	7.42	0.97	1.93	4.53	0.88	1.90	3.70
	2	1.32	3.88	12.35	1.35	2.86	12.27	1.20	2.70*	9.68	1.28	2.93*	8.93
	3	1.50	3.18	10.48	1.00	2.35	6.25	0.98	1.97*	6.47	0.92	1.98*	6.52
	4	1.00	2.02	6.48	1.08	3.28*	10.68	1.08	1.67	5.17	1.26	2.30	6.33
	5	1.53	2.03	4.08	1.77	5.30*	11.02	2.10	4.31*	7.18	1.60	2.80	8.95
	Province	1.07	2.43	9.07	1.15	2.77	9.92	1.10	2.12	6.08	1.19	2.43	7.02
TIA	1	1.58	5.67	10.30	0.43	0.62*	1.25	0.93	1.20*	1.98	0.87	1.37*	4.78
	2	1.33	3.25	6.92	1.08	3.03	3.58	1.32	1.68*	4.23	1.45	3.10	5.03
	3	0.98	2.87	8.83	0.73	2.08	4.00	0.67	1.37*	2.25	1.00	1.38	3.23
	4	2.63	4.18	5.35	0.95	2.13*	4.00	1.30	2.10*	3.70	2.38	3.68	6.53
	5	1.40	3.26	7.07	0.43	1.09*	3.20	0.88	2.15	3.50	1.43	2.35	6.43
	Province	1.37	3.40	7.57	0.72	1.58*	3.60	0.98	1.68*	2.80	1.22	2.57*	5.77

Chart review data. Only charts with an exact onset date and time were included.

TABLE 2.2

The percentage of stroke and TIA patients who seek medical attention in less than 2.5 hours.

Stroke Type	Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
HEMORRHAGIC AND ISCHEMIC	1	52.2	62.5	59.5	65.5
	2	43.2	45.8	49.1	45.0
	3	41.4	54.5*	51.0	57.1*
	4	60.3	46.7*	65.6	58.0
	5	66.1	41.7*	26.9*	45.0*
	Province	50.9	48.2	54.5	51.6
TIA	1	33.3	76.5*	81.8*	66.7*
	2	44.1	45.0	64.0*	39.5
	3	44.0	56.5	85.2*	69.2*
	4	20.0	52.2*	61.9*	25.0
	5	45.3	72.1*	49.7	55.7
	Province	40.1	56.7*	67.7*	45.2

TABLE 2.3

The percentage of stroke and TIA patients who seek medical attention in less than 3.5 hours.

Stroke Type	Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
HEMORRHAGIC AND ISCHEMIC	1	56.5	70.8*	67.6	72.4*
	2	48.6	52.1	58.0*	54.1
	3	51.7	57.6	60.8	65.7
	4	63.5	50.7*	68.9	63.6
	5	73.2	48.7*	33.1*	60.4
	Province	56.0	53.3	61.5*	60.0
TIA	1	44.4	76.5*	86.4*	66.7*
	2	50.0	70.0*	66.7*	57.9
	3	52.0	73.9*	88.9*	84.6*
	4	50.0	65.2*	71.4*	41.7
	5	54.7	80.3*	74.9*	60.7
	Province	50.5	71.4*	76.1*	57.8*

TABLE 2.4

The percentage of stroke and TIA patients who seek medical attention in less than 4 hours.

Stroke Type	Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
HEMORRHAGIC AND ISCHEMIC	1	56.5	70.8*	67.6	79.3*
	2	50.0	52.1	65.2*	60.4*
	3	55.2	60.6	62.7	65.7
	4	65.1	53.3*	72.2*	64.8
	5	80.4	48.7*	43.5*	60.4*
	Province	57.8	54.8	66.3*	63.5*
TIA	1	44.4	76.5*	90.9*	71.4*
	2	61.8	80.0*	72.0	63.2
	3	52.0	78.3*	88.9*	92.3*
	4	50.0	78.3*	81.0*	54.2
	5	54.7	80.3*	79.1*	64.4
	Province	56.0	78.7*	81.0*	64.5*

REDUCING STROKE OCCURRENCE AND MORTALITY

1) Reducing Stroke Occurrence

TABLE 3.1

Estimated proportion (%) of inpatients prescribed blood pressure lowering agents on discharge.

Stroke Type	Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
ISCHEMIC AND TIA	1	64.8	89.8*	88.8*	67.0
	2	74.1	65.8*	65.9*	68.7*
	3	72.1	77.6*	79.2*	61.4*
	4	69.7	70.7	78.9*	79.1*
	5	70.6	72.6	74.9	67.0
	Province	71.3	72.1	76.1*	71.4
HEMORRHAGIC	1	66.7	100	~	~
	2	32.1	40.5	57.1*	41.7
	3	~	60.0	66.7	66.7
	4	48.6	38.1*	31.6*	28.2*
	5	25.0	31.0	100	50.8
	Province	42.0	41.1	46.7*	36.5

Chart review data

TABLE 3.2

Proportion (%) of inpatients prescribed lipid lowering agents on discharge.

Stroke Type	Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
ISCHEMIC AND TIA	1	37.3	66.3*	61.1*	54.4*
	2	48.6	57.2*	52.4	63.1*
	3	20.6	44.2*	49.7*	46.5*
	4	60.9	70.0*	73.2*	74.4*
	5	28.9	49.6*	61.6*	71.1*
	Province	45.9	60.2*	61.9*	65.4*
HEMORRHAGIC	1	~	25.0	~	~
	2	6.9	7.1	24.1*	16.2*
	3	~	20.0	33.3	50.0
	4	25.0	13.6*	13.5*	12.8*
	5	25.0	13.5	42.4	25.4
	Province	16.3	11.3*	19.7	16.3

Chart review data

TABLE 3.3

Proportion (%) of TIA and ischemic stroke patients without atrial fibrillation discharged on antithrombotic agents.

Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
1	84.5	93.8*	90.8	92.8*
2	95.5	98.1*	94.9	94.8
3	88.2	90.4	94.0*	89.7
4	96.3	96.4	96.8	96.3
5	90.0	96.9*	93.3	90.1
Province	93.4	95.9*	95.0*	94.1

TABLE 3.4

Proportion (%) of TIA and ischemic stroke patients with atrial fibrillation discharged on anticoagulants or any antithrombotic agents.

Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
1	90.0	94.7	87.1	84.6
2	97.1	96.2	89.5*	90.2*
3	100.0	88.9	86.2	90.5
4	95.0	98.0*	95.9	96.4
5	93.2	100.0	100.0	100.0
Province	96.0	95.8	91.7*	92.6*

TABLE 3.5

Age-Sex standardized incidence rate (per 100,000). Most responsible and type 1, 2, 6, W, X, Y diagnosis. (APSS Definition)

Fiscal Year	ER			Inpatient			Total		
	Lower	Rate	Upper	Lower	Rate	Upper	Lower	Rate	Upper
2003/04	158.475	162.859	167.243	137.601	141.676	145.750	298.581	304.535	310.489
2004/05	161.135	165.497	169.859	141.207	145.276	149.345	304.837	310.773	316.710
2005/06	154.592	158.800	163.008	133.864	137.762	141.661	290.852	296.562	302.272
2006/07	146.868	150.901	154.935	126.271	129.993	133.716	275.429	280.895	286.360
2007/08	148.327	152.310	156.293	118.780	122.332	125.884	269.326	274.642	279.957
2008/09	138.204	141.998	145.792	115.265	118.703	122.140	255.600	260.701	265.802
2009/10	136.02	139.718	143.417	119.763	123.210	126.657	257.891	262.928	267.966
2010/11	123.047	126.516	129.984	112.595	115.884	119.173	237.636	242.400	247.163
2011/12	131.085	134.604	138.123	116.342	119.626	122.911	249.463	254.260	259.058

TABLE 3.6

Age-Sex standardized incidence rate (per 100,000). Most responsible and type 1, 2, 6, W, X, Y diagnosis. (APSS Definition)

Fiscal Year	Hemorrhage			Ischemic			TIA		
	Lower	Rate	Upper	Lower	Rate	Upper	Lower	Rate	Upper
2003/04	31.911	33.929	35.946	140.125	144.239	148.354	122.511	126.367	130.222
2004/05	32.899	34.919	36.939	140.680	144.747	148.814	127.233	131.108	134.982
2005/06	31.836	33.804	35.772	139.777	143.766	147.754	115.364	118.992	122.621
2006/07	32.011	33.957	35.904	129.654	133.430	137.207	110.027	113.507	116.986
2007/08	28.146	29.943	31.741	125.818	129.475	133.132	111.774	115.223	118.673
2008/09	29.150	30.944	32.739	124.398	127.977	131.555	98.584	101.780	104.975
2009/10	27.784	29.509	31.234	122.036	125.519	129.003	104.664	107.900	111.137
2010/11	24.604	26.213	27.822	118.361	121.735	125.110	91.470	94.451	97.433
2011/12	28.423	30.118	31.813	120.712	124.061	127.410	97.063	100.082	103.101

TABLE 3.7

Inpatient Age-Sex standardized incidence rate (per 100,000). CIHI (ICD-10: I60 – I64) Most responsible and type 1, W, X, Y diagnosis. (CIHI compatible definition)

Fiscal Year	Hemorrhage			Ischemic			Total		
	Lower	Rate	Upper	Lower	Rate	Upper	Lower	Rate	Upper
2003/04	15.215	16.622	18.029	84.371	87.581	90.791	100.699	104.203	107.708
2004/05	16.727	18.172	19.618	85.157	88.336	91.515	103.016	106.509	110.001
2005/06	16.274	17.689	19.104	84.154	87.258	90.363	101.535	104.947	108.359
2006/07	16.179	17.562	18.946	79.438	82.400	85.363	96.693	99.962	103.232
2007/08	13.705	14.966	16.228	75.914	78.763	81.611	90.613	93.729	96.844
2008/09	15.328	16.624	17.919	73.749	76.508	79.268	90.083	93.132	96.180
2009/10	14.464	15.708	16.953	75.372	78.113	80.854	90.811	93.821	96.832
2010/11	13.374	14.554	15.734	73.375	76.035	78.695	87.679	90.589	93.499
2011/12	14.726	15.940	17.153	74.256	76.883	79.509	89.929	92.822	95.716

2) Reducing Stroke Mortality

TABLE 3.8

30-day crude hospital fatality rates. Most responsible diagnosis type only.

Fiscal Year	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
2003/04	15.03%	10.40%	9.73%	12.05%	9.97%
2004/05	12.69%	11.42%	12.69%	12.86%	6.82%
2005/06	12.81%	10.63%	14.34%	11.11%	11.64%*
2006/07	10.14%	11.38%	12.48%	12.52%	10.56%*
2007/08	10.23%	9.57%	13.35%	10.63%	8.96%*
2008/09	10.00%	9.75%	12.67%	10.28%*	7.33%*
2009/10	9.84%	8.57%*	7.93%*	8.77%*	8.40%*
2010/11	11.27%	8.81%*	11.69%	10.04%*	7.57%*
2011/12	8.23%	6.89%*	10.92%	10.06%*	6.45%

TABLE 3.9

30-day crude hospital fatality rates. Most response diagnosis and 1, 2, 6, W, X, Y diagnosis types.

Fiscal Year	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
2003/04	18.27%	12.21%	10.02%	13.51%	9.76%
2004/05	13.29%	12.61%	12.88%	13.43%	9.23%
2005/06	13.26%	11.64%	15.35%	12.67%	12.26%*
2006/07	9.72%	12.80%	13.33%	13.44%	12.37%*
2007/08	13.12%	11.49%	13.90%	12.58%	11.93%*
2008/09	12.60%	12.00%	13.59%	12.21%	10.05%*
2009/10	12.50%	10.30%*	10.16%	11.15%*	10.20%*
2010/11	16.14%	10.04%*	12.35%	12.03%	9.87%*
2011/12	9.63%	7.84%*	14.80%	11.14%*	8.96%

IMPROVING ACCESS TO BEST CARE

1) Treatment of Patients with Acute Stroke

A. Access to Thrombolytic Therapy

TABLE 4.1

Proportion (%) of stroke/TIA patients who received tPA (intravenous, combination of intravenous & intra-arterial or intra-arterial alone).

Stroke Type	Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
ISCHEMIC	1	~	10.1	2.3 [†]	8.2 [†]
	2	10.3	15.1*	13.0*	14.7*
	3	1.1	5.8*	8.9*	12.4*
	4	10.9	10.6	14.6**	11.8
	5	2.4	7.7*	7.5*	13.8*
	Province	8.2	11.2*	11.7*	12.7*
ISCHEMIC AND TIA	1	~	7.0	1.6 [†]	5.5 [†]
	2	6.8	11.4*	10.6*	11.6*
	3	0.6	3.2*	5.7*	8.3*
	4	9.0	8.4	12.1**	9.3 [†]
	5	1.1	4.6*	3.8*	7.9*
	Province	5.5	8.0*	8.9*	9.5*

Source – APSS chart reviews

Median ED arrival to treatment time for patients receiving intravenous or a combination of intravenous & intra-arterial tPA.

TABLE 4.2

Median and first (Q1) and third (Q3) quartiles of door-to-needle time (time in minutes from ED arrival to initiation of tPA).

Zone Code	Wave 1			Wave 2			Wave 3			Wave 4		
	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3	Q1	Median	Q3
1	~	~	~	70.0	96.5	112.5	50.0	108.5	167.0	59.0	71.5	83.0
2	46.0	75.0	97.0	51.5	64.0	81	47	60.0	76	46.0	55.5*	73.0
3	91.0	91.0	91.0	74.0	83.5	93	62	73.0	100	64.5	77.5	85.5
4	53.5	81.5	91.5	59.0	71.0	99	58	67.5	99	62.0	70.0	84.0
5	240.0	240.0	240.0	42.0	44.0	54.0	31.0	40.0	98.0	80.0	101.0	138.0
Province	50.0	81.0	97.0	54.0	70.0	97.0	54.0	64.0*	94.0	55.0	67.0*	84.0

TABLE 4.3

Proportion (%) of stroke and TIA patients receiving tPA within 1 hour from arrival in ED (includes intravenous and a combination of intravenous and intra-arterial tPA).

Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
1	~	12.5	50.0	33.3
2	46.2	45.8	50.0	60.7*
3	~	16.7	11.1	16.7
4	30.0	27.3	33.3	24.0
5	~	80.0	57.6	~
Province	34.9	35.9	38.2	36.0

B. Quality of Inpatient Care for Stroke

TABLE 4.4

Proportion (%) of stroke/TIA patients receiving a brain CT or MRI prior to discharge.

Stroke Type	Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
ALL	1	84.8	96.8*	90.0**†	92.3*
	2	96.8	98.9*	99.2*	98.4*
	3	65.3	75.6*	93.8**†	92.0*
	4	98.2	97.6	99.7**†	100.0
	5	65.0	80.6*	85.3*	86.9*
	Province	89.0	93.5*	96.7**	96.6*
TIA	1	74.4	94.4*	84.2†	91.7*
	2	93.8	100.0	97.3	98.3*
	3	47.4	61.2*	86.2**†	89.4*
	4	92.1	94.8	100.0	100.0
	5	47.6	62.9*	80.6**†	75.9*
	Province	74.5	84.2*	91.4**	92.8*
HEMORRHAGE	1	90.9	100.0	66.7	100.0
	2	100.0	100.0	100.0	100.0
	3	80.0	100.0	100.0	100.0
	4	98.0	96.7	100.0	100.0
	5	100.0	90.2	100.0	88.8
	Province	97.9	97.9	99.4*	99.5
ISCHEMIC	1	100.0	98.7	94.3†	94.5
	2	97.4	99.4*	100.0	100.0
	3	90.2	87.5	100.0	96.9*
	4	99.5	98.6*	100.0	100.0
	5	84.5	96.9*	91.3†	94.7*
	Province	96.7	97.5	98.9**	98.8*

TABLE 4.5

Proportion (%) of Ischemic stroke or TIA patients receiving carotid imaging prior to discharge.

Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
1	39.6	67.0*	50.0*	56.9
2	57.6	62.4*	83.9*	85.8
3	35.9	37.6	51.6*	59.7
4	68.3	65.5	75.0*	68.2
5	28.8	30.3	37.3*	36.3
Province	53.6	57.4*	68.5*	68.5

TABLE 4.6

Proportion (%) of stroke patients who received treatment on a stroke unit.

Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
1	7.1	68.0*	59.2*	60.7*
2	50.9	76.5*	57.8*	65.0*
3	14.0	28.4*	35.4*	54.3*
4	20.1	29.0*	58.8*	50.8*
5	~	11.5	22.7	20.5
Province	27.2	45.6*	52.7*	53.6*

TABLE 4.7

Proportion (%) of Ischemic stroke or TIA patients who received antiplatelet within 48hrs of arrival at the hospital.

Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
1	58.2	79.1*	68.0*	70.8*
2	73.5	70.2*	71.3	78.7*
3	68.6	66.3	73.9	65.5
4	80.9	77.7*	80.6	74.6*
5	81.4	75.7*	74.3*	73.5*
Province	74.7	73.6	75.0	74.6

*We could not determine the timing of anticoagulant therapy so total antithrombotic use will be more than indicated by just examining antiplatelet agent use.

TABLE 4.8

Proportion (%) of Stroke/TIA patients experiencing potentially preventable complications during their inpatient stay (including deep vein thrombosis, pulmonary embolism, pneumonia, decubitus ulcer, and urinary tract infection).

Stroke Type	Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
STROKE AND TIA	1	12.5	11.2	7.7*	7.7
	2	11.2	11.7	13.5	12.7
	3	9.3	7.0	13.5**	8.0†
	4	11.7	8.6*	11.2†	12.0
	5	11.5	12.3	4.0**	5.1*
	Province	11.2	9.9*	11.3†	10.8
STROKE	1	17.8	14.6	8.7**	9.9*
	2	14.6	12.5	14.5	13.8
	3	13.9	11.2	16.7†	9.6†
	4	13.6	10.4*	12.9†	13.5
	5	20.4	16.2	5.5**	5.3*
	Province	14.7	11.9*	13.1	12.3*

TABLE 4.9

Proportion (%) of Stroke/TIA patients who received rehabilitation assessment within 48 hours of hospital arrival.

Stroke Type	Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
STROKE AND TIA	1	30.6	57.6*	62.5*	56.9*
	2	31.2	41.3*	50.7**	44.4**
	3	20.3	27.9*	58.8**	62.6*
	4	46.0	46.4	63.7**	61.9*
	5	22.5	34.6*	37.9*	34.9*
	Province	33.9	42.2*	56.7**	52.6**
STROKE	1	37.5	66.3*	69.4*	61.7*
	2	35.6	45.5*	54.7**	47.4**
	3	27.2	37.9*	65.1**	71.0*
	4	48.7	49.3	63.3**	65.9*
	5	28.3	48.3*	51.2*	44.9*
	Province	39.6	48.1*	60.5**	57.7*

TABLE 4.10

Proportion (%) of Stroke or TIA patients who received a referral to outpatient rehabilitation on discharge.

Residence	Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
HOME	1	10.3	8.1	9.0	14.5
	2	10.3	9.2	12.1	16.6**†
	3	8.6	7.3	12.9†	18.8*
	4	15.1	11.0*	20.9**	23.9*
	5	12.1	7.9	2.8**	14.5†
	Province	11.7	9.4*	14.3**	19.0**†
HOME AND RETIREMENT HOME	1	9.7	7.8	7.9	13.2
	2	10.0	9.2	11.8	15.2*
	3	8.0	6.6	11.1†	17.1*
	4	14.8	10.6*	19.8**	22.8*
	5	11.8	7.5	2.5**	13.3†
	Province	11.3	9.1*	13.3**	17.7**†

TABLE 4.11

Proportion (%) of Stroke or TIA patients receiving a referral to home care/ community supportive services on discharge. Charts with patients discharged to home were selected for analysis.

Residence	Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
HOME	1	14.5	17.4	9.0†	10.3
	2	17.8	12.8*	9.9*	10.2*
	3	13.0	11.0	26.3**	20.8*
	4	12.6	9.4*	27.4**	20.3**†
	5	16.2	16.1	12.2	6.6*
	Province	15.2	12.1*	18.7**	14.6†
HOME AND RETIREMENT HOME	1	13.6	16.7	7.9†	9.3
	2	17.2	12.8*	9.6*	9.4*
	3	12.1	9.9	22.6**	19.0*
	4	12.4	9.0*	26.0**	19.5**†
	5	15.8	15.3	10.7	6.0*
	Province	14.7	11.7*	17.4**	13.6†

TABLE 4.12

Proportion (%) of Stroke patients receiving an initial dysphagia screen within 72 hours after admission.

Stroke Type	Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
STROKE AND TIA	1	23.5	58.2*	69.2**†	61.7*
	2	33.6	59.1*	60.8*	61.2*
	3	9.9	21.2*	66.4**†	63.8*
	4	11.5	20.5*	53.5**†	46.5**†
	5	10.3	11.1	31.4**†	33.1*
	Province	19.7	32.7*	57.4**†	53.0**†
STROKE	1	32.8	66.3*	76.7**†	66.7**†
	2	36.1	61.8*	63.1*	62.6*
	3	12.6	31.0*	69.2**†	71.8*
	4	13.5	24.1*	56.1**†	50.2**†
	5	13.4	17.0	39.2**†	49.8*
	Province	22.4	37.8*	61.0*	57.7**†
ISCHEMIC STROKE	1	38.8	72.4*	76.8*	72.6*
	2	40.3	69.0	66.7*	70.5*
	3	14.5	31.4*	67.7**†	75.6*
	4	14.9	26.9*	61.8**†	57.7*
	5	13.1	22.8*	44.3**†	52.7*
	Province	24.9	42.5*	64.7**†	64.6*
TIA	1	3.2	38.9*	50.0*	50.0*
	2	27.4	47.2*	50.0*	55.9*
	3	5.8	6.6	59.0**†	42.1**†
	4	~	3.4	29.2†	26.1
	5	7.0	~	22.3*	8.0†
	Province	12.4	16.3*	42.3**†	36.6*

TABLE 4.13

Proportion (%) of Stroke patients discharged back to their pre-admission place of residence.

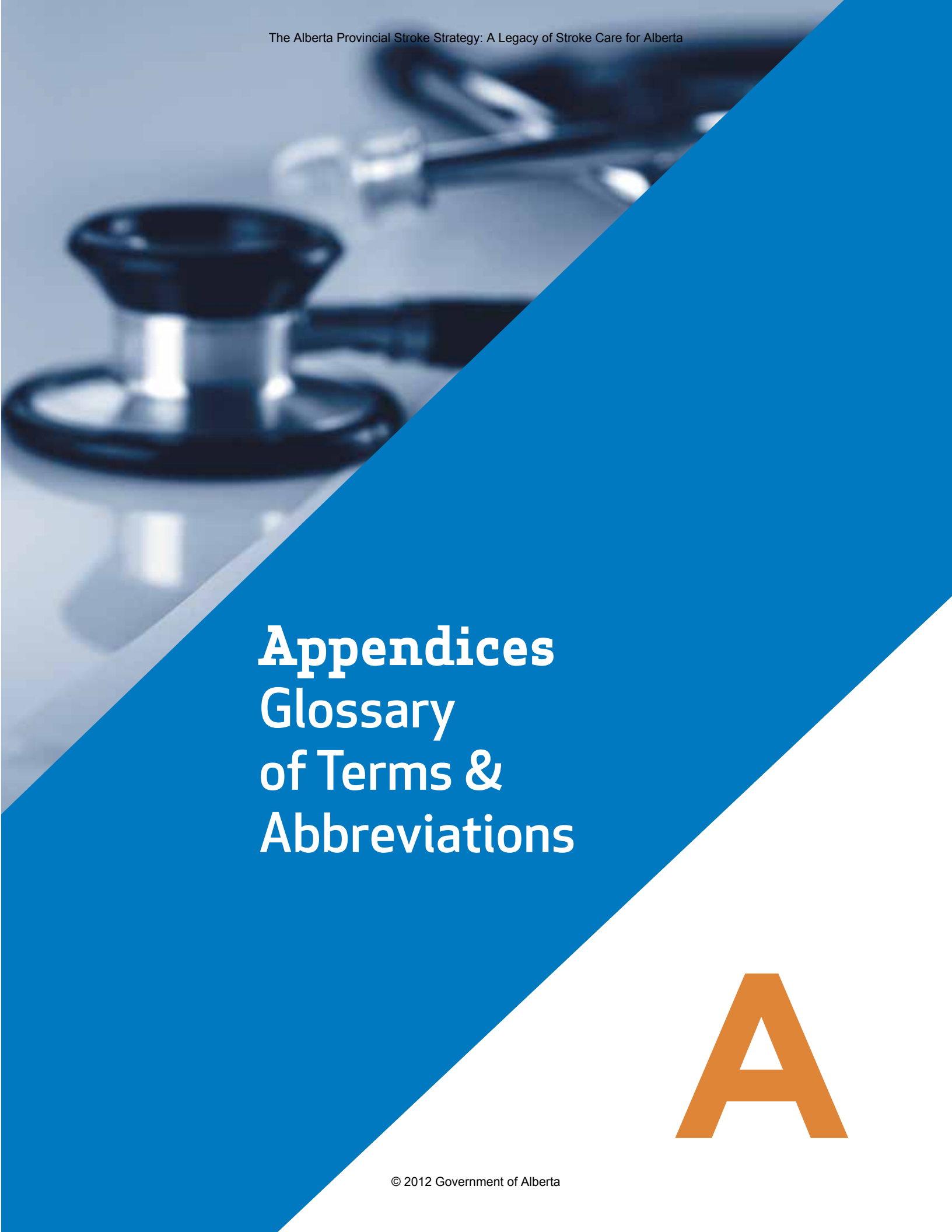
Stroke Type	Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
STROKE AND TIA	1	87.3	89.1	77.2**†	78.9*
	2	77.8	76.1	78.9	73.5**†
	3	80.4	79.2	80.6	82.7
	4	66.7	77.3*	76.1*	73.6*
	5	83.7	82.1	88.9†	81.1†
	Province	75.7	78.5*	78.8*	75.8*
ISCHEMIC AND TIA	1	92.1	88.8	76.8**†	78.7*
	2	79.5	78.2	79.8	75.0**†
	3	82.4	80.3	81.9	82.9
	4	69.5	81.5*	77.9*	73.9*
	5	87.1	84.8	91.5†	83.3†
	Province	78.3	81.2*	80.2	76.8*
HEMORRHAGE	1	66.7	100.0	~	~
	2	62.5	65.0	73.1	62.5
	3	~	60.0	40.0	83.3†
	4	44.0	50.0	64.3**†	72.2*
	5	25.0	72.4*	45.2	20.2
	Province	52.3	59.8*	66.2*	66.5*

2) Access to Stroke Prevention Services

TABLE 4.14

Proportion (%) of Stroke and TIA referred to stroke prevention clinics on discharge.

Stroke Type	Zone Code	Wave 1	Wave 2	Wave 3	Wave 4
STROKE AND TIA	1	9.3	43.5*	43.9*	59.2**†
	2	65.4	63.8	52.1**†	62.9†
	3	10.7	31.6*	42.0**†	48.1*
	4	35.7	50.7*	63.3**†	67.9*
	5	14.1	24.2*	32.0*	28.1*
	Province	38.7	49.6*	52.6**†	59.5**
ISCHEMIC AND TIA	1	9.5	44.2*	44.4*	58.7**†
	2	72.0	70.3	55.9**†	68.1†
	3	10.5	31.9*	42.5**†	47.5*
	4	38.9	56.7*	68.9**†	75.0**†
	5	14.7	27.9*	32.2*	28.4*
	Province	41.6	53.7*	55.7*	63.2**
ISCHEMIC	1	8.3	42.3*	41.7*	64.1**†
	2	67.7	73.2*	57.3**†	71.4†
	3	6.0	39.5*	41.4*	56.9**†
	4	35.4	55.9*	70.1**†	75.9**†
	5	12.6	18.2	32.1*	31.6*
	Province	40.4	56.0*	57.8**†	67.9**
TIA	1	10.5	48.5*	48.5**†	52.8*
	2	79.7	62.5*	51.4*	59.6*
	3	14.5	24.7*	43.9*	34.9*
	4	54.1	59.6	65.1**†	72.7*
	5	16.5	40.9*	32.3**†	24.9
	Province	43.8	48.6*	50.9*	54.1*
HEMORRHAGE	1	16.7	25.0	~	~
	2	20.0	34.9*	29.2	30.8
	3	~	40.0	25.0	100.0
	4	17.1	15.9	18.2	23.3
	5	~	4.0	42.4†	~
	Province	17.6	24.9*	24.4	29.5*



Appendices Glossary of Terms & Abbreviations

A

APPENDIX A

GLOSSARY OF TERMS AND ABBREVIATIONS

APSS	<p>Alberta Provincial Stroke Strategy</p> <p>The APSS is a collaborative partnership between Alberta Health and Wellness, Alberta Health Services, and the Heart & Stroke Foundation of Alberta, NWT & Nunavut. The goal is enhance stroke prevention services and provide a coordinated and integrated approach to care across the province.</p>
ASC	<p>Alberta Stroke Council</p> <p>The ASC oversees and provides direction to the APSS. Its membership is comprised of representatives from Alberta Health Services, Alberta Health and Wellness, the Heart & Stroke Foundation of Alberta, NWT & Nunavut, as well as health care professionals.</p>
ALC	<p>Alternate Level of Care</p>
CSC	<p>Comprehensive Stroke Centre</p> <p>A CSC is a tertiary hospital that provides a full range of stroke services, including:</p> <ul style="list-style-type: none"> • CT scan availability • Door to CT time less than 20 minutes with pre-alert • Stroke team on-site • Neurosurgical expertise on-site • Neuro-interventionist expertise on-site • Central hub of stroke neurologist expertise in a telestroke network <p>www.strokestrategy.ab.ca/Prehospital%20Nov2409%20Final.pdf</p>
CT	<p>Computerized Tomography</p> <p>“CT is a form of medical imaging that combines a series of X-ray views taken from many different angles to produce cross-sectional images of the bones and soft tissues inside your body”. www.mayoclinic.com</p>
DAD	<p>Discharge Abstract Database</p> <p>The DAD contains demographic, administrative and clinical data on hospital discharges across Canada. It pertains to hospital discharges (inpatient acute, chronic, rehabilitation) and day surgeries. www.cihi.ca</p>
ED	<p>Emergency Department</p>
EMS	<p>Emergency Medical Services</p> <p>EMS are health care professionals who provide pre-hospital assessment, treatment, and transport of patients.</p>
Hemorrhagic Stroke	<p>A stroke caused by uncontrolled bleeding in the brain. This bleeding interrupts normal blood flow in the brain and causes brain cell death.</p> <p>www.heartandstroke.ab.ca/site/c.lqIRLIPJtH/b.3651035/k.7685/Stroke_Hemorrhagic_stroke.htm</p>
Ischemic Stroke	<p>A stroke caused by the interruption of blood flow to the brain due to a blood clot. The buildup of plaque (fatty materials, calcium and scar tissue) is involved in most ischemic strokes narrowing the arteries that supply blood to the brain, interfering with, or blocking the flow of blood.</p> <p>www.heartandstroke.com/atf/cf/%7b99452D8B-E7F1-4BD6-A57D-B136CE6C95BF%7d/stroke_isc_web.jpg</p>

MRI	<p>Magnetic Resonance Imaging</p> <p>“MRI is primarily a medical imaging technique most commonly used in radiology to visualize detailed internal structure and limited function of the body. MRI provides much greater contrast between the different soft tissues of the body than computed tomography”. www.en.wikipedia.org</p>
PIA	<p>Privacy Impact Assessment</p> <p>A privacy impact assessment is a due diligence exercise, in which an organization identifies and addresses potential privacy risks that may occur in the course of its operations. www.oipc.ab.ca</p>
PSC	<p>Primary Stroke Centre</p> <ul style="list-style-type: none"> • A PSC is a hospital that provides the following stroke services: • CT scan availability • Door to CT time less than 20 minutes with pre-alert • Stroke expertise on-site or available by telestroke link to a CSC • t-PA treatment availability • Serves communities in closest proximity <p>www.strokestrategy.ab.ca/Prehospital%20Nov2409%20Final.pdf</p>
RNLI	<p>Reintegration to Normal Living Index</p> <p>The Reintegration to Normal Living Index (RNLI) was developed to assess, quantitatively, the degree to which individuals who have experienced traumatic or incapacitating illness achieve reintegration into normal social activities (e.g. recreation, movement in the community, and interaction in family or other relationships). www.strokengine.ca/assess/index.html</p>
SPA	<p>Stroke Prevention Alberta Database</p> <p>SPA is a database developed by APSS to collect demographic and clinical information about visits to secondary prevention clinics for stroke or TIA across Alberta.</p>
Telehealth	<p>Telehealth is the delivery of health-related services and information via telecommunications technologies. “Telestroke” refers to the use of Telehealth technology to convey information related to stroke care.</p>
TIA	<p>Transient Ischemic Attack</p> <p>A TIA is also known as a “mini-stroke”. A TIA occurs when a clot stops blood flow in the brain for a short time. The symptoms of a TIA are similar to a stroke except they resolve within a few minutes or hours. A TIA is an important warning sign and indicates high risk for stroke. www.heartandstroke.ab.ca</p>
tPA	<p>Tissue Plasminogen Activator (alteplase)</p> <p>tPA is a thrombolytic agent (clot busting drug) that breaks up or dissolves blood clots.</p>
UTD	<p>Unable to Determine</p> <p>UTD is a field in several of the APSS datasets used to indicate that information was not available.</p>



Appendices

Summary of Evaluation Plan

B

APPENDIX B

SUMMARY OF EVALUATION PLAN

Background

The development and implementation of a province-wide stroke strategy should be evaluated using the Canadian Best Practice Recommendations for Stroke Care as a baseline. Core indicators, identified by the three APSS Clinical Pillars, provided the basis for the evaluation plan. A diverse group of datasets were needed, some were

already in existence (i.e. abstract data from discharge abstract database) while others were developed specifically for the strategy (i.e. SPA in secondary prevention clinics). All Alberta acute care institutions participated in the evaluation except children's and mental health care facilities.

Methodology

Data was collected on most aspects of stroke care in the acute care facility. Stroke and TIA patients were identified using administrative data from the discharge abstract database and from the ambulatory abstract for emergency department visits. A standard set of ICD10CA codes for stroke were used to calculate stroke occurrence and mortality rates prior to and during APSS. Administrative data was also used to sample for chart reviews and stroke survivor surveys. Linkages were made between datasets using the patient's unique lifetime identifier (ULI).

Four waves of inpatient charts were reviewed at varying stages over the strategy. Wave one (2004/05) was the baseline for stroke care prior to the implementation of APSS. Waves two, three and four were 2007/08, 2008/09 and 2010/11, respectively. Chart reviews were done using data from the inpatient discharge abstract with a minimum 25% sample from rural regions and 15% from urban regions. Over-sampling was done in the rural regions to ensure an adequate representation in the chart review data. All chart review data was entered directly into a stroke audit software program, developed by the Registry of the Canadian Stroke Network (RCSN). Approximately 1300 charts were reviewed with each wave. Chart review data captured patient information and care practices that would not otherwise be available from existing data sources or consistently collected province-wide. Results were weighted based on the sampling scheme.

A chart was excluded if it did not present a suspected acute stroke/TIA scenario or if was miscoded. The stroke audit program's primary focus was to capture information about the acute stroke/TIA event, timely management based on best practice guidelines and implementation of appropriate protocols. Complications were only tracked for the first 30 days post-event.

SPA (Stroke Prevention Alberta) was a web-based data collection program developed specifically to capture information about patients assessed in secondary prevention clinics. Initial and relevant follow-up visits were entered directly into the database at a clinic level. It provides data on the timeframe from stroke event to clinic visit, risk factor management, carotid imaging done and baseline bloodwork.

Prospective tPA data was collected by both PSCs and CSCs. Sites faxed in a worksheet or provided an electronic file identifying each patient who received tPA. Key time stamps such as symptom onset to arrival in the emergency department, time to brain imaging, time to administration of drug and any tPA-related complications within the first 36 hours were tracked. Data from PSCs using Telestroke were also tracked if patients were admitted onsite or transferred to another centre with greater resources.

Quality of life for stroke survivors is a difficult but important outcome to track. Similarly, the stroke survivor's experience post-discharge from acute care in terms of access to community rehabilitation services,

satisfaction with the healthcare system and success with community reintegration are also important areas to consider.

APSS completed four province-wide waves of random telephone surveys of stroke survivors/caregivers approximately 6-12 months post-event. The first survey was considered baseline while the next three waves assessed changes in perception of care over the course of the strategy. Stroke patients were identified from the administrative data based on a final diagnosis of stroke as well as discharge back to the community (with or without support services). A letter outlining the intent of APSS and the survey was sent to all potential respondents prior to any calls being made. Leger Marketing completed the telephone surveys using their call centre and a standardized questionnaire. The survey is composed of the Reintegration to Normal Living Index (RNLI) to measure quality of life and questions about the

patient's experience while in hospital and following return to the community. The survey also contains a couple of questions specific to the caregiver experience.

Public awareness of the signs and symptoms of stroke and the appropriate response in calling 911 was the message of the "Recognize and React" campaign. This was done in partnership with the HSFA. The campaign ran in June of 2007 and 2009. Leger Marketing conducted pre- and post-campaign telephone surveys assessing the knowledge and awareness of stroke symptoms and care. A second public awareness campaign highlighting high blood pressure as a risk factor for stroke was run in May 2010 and 2011. Leger Marketing was contracted by the HSFA to perform the pre- and post-campaign surveys and also included questions to determine the degree of recall for stroke signs and symptoms from the earlier campaign.

