Ontario Stroke Evaluation Report 2013

Spotlight on Secondary Stroke Prevention and Care

June 2013

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Advancing the Ontario Stroke System

Canadian Stroke Network
Réseau Canadien contre les accidents cérébrovasculaires

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About the Organizations Involved in this Report

The Ontario Stroke Network

With its vision of Fewer Strokes, Better Outcomes, the mission of the **Ontario Stroke Network** (OSN) is to provide provincial leadership and planning for the 11 Ontario Regional Stroke Networks supporting the 14 Local Health Integration Networks (Ontario Stroke System) through: measuring and reporting on performance; partnering to achieve best practices; and supporting innovations for stroke prevention, care, recovery and reintegration. The OSN delivers on its mission by establishing province-wide goals and initiatives to implement best practices across the stroke continuum, evaluating and reporting on the progress of the Ontario Stroke System, and translating and exchanging knowledge. The OSN is funded by the Ontario Ministry of Health and Long-Term Care.

The Ontario Stroke System

The **Ontario Stroke System** (OSS) is a client-centred collaboration of Ontario's 11 **Regional Stroke Networks** supporting the 14 Local Health Integration Networks. Each region has a regional stroke centre and many have one or more district stroke centres. Each stroke network is a collaborative partnership of health care organizations and providers that spans the care continuum from prevention to community re-engagement. Regional stroke networks develop and implement plans and strategies to achieve equitable access and improve outcomes for stroke survivors and their families through the integration of stroke best practices across the care continuum.

The Canadian Stroke Network

The **Canadian Stroke Network** (CSN), one of Canada's Networks of Centres of Excellence, is a collaborative effort that brings together researchers, students, government, industry and the non-profit sector. First funded in 1999, the CSN is a not-for-profit corporation with headquarters at the University of Ottawa. The CSN in partnership with the OSN helped to fund the data collection for the Secondary Stroke Prevention Clinic audit as part of the Ontario Stroke Registry (formerly known as the Registry of the Canadian Stroke Network).

In partnership with the **Heart and Stroke Foundation**, the CSN established the **Canadian Best Practice Recommendations for Stroke Care**. This report presents high-quality, evidence-based stroke care recommendations in a standardized framework to support health care professionals in all disciplines. Implementation of these recommendations is expected to contribute to reducing practice variations and closing the gaps between evidence and practice.

Institute for Clinical Evaluative Sciences

The **Institute for Clinical Evaluative Sciences** (ICES) is an independent, non-profit organization that produces knowledge to enhance the effectiveness of health care for Ontarians. Internationally recognized for its innovative use of population-based health information, ICES' evidence supports health policy development and guides changes to the organization and delivery of health care services.

Key to ICES' work is its ability to link population-based health information, at the patient level, in a way that ensures the privacy and confidentiality of personal health information. Linked databases reflecting 13 million of 33 million Canadians allow researchers to follow patient populations through diagnosis and treatment, and to evaluate outcomes.

ICES brings the best and the brightest together under one roof. Many ICES scientists are not only internationally recognized leaders in their fields, but are also practicing clinicians who understand the grassroots of health care delivery, making the knowledge produced at ICES clinically-focused and useful in changing practice. Other team members have statistical training, epidemiological backgrounds, project management or communications expertise. The variety of skill sets and educational backgrounds ensures a multi-disciplinary approach to issues and creates a real-world mosaic of perspectives that is vital to shaping Ontario's future health care system.

ICES receives core funding from the Ontario Ministry of Health and Long-Term Care. In addition, ICES faculty and staff compete for peer-reviewed grants from federal funding agencies, such as the Canadian Institutes of Health Research, and project-specific funds from provincial and national organizations. These combined sources enable ICES to have a large number of projects underway, covering a broad range of topics. The knowledge that arises from these efforts is always produced independently of funding bodies, which is critical to ICES' success as Ontario's objective, credible source of evidence guiding health care.

About this Report

Background and Purpose

In 2003, the Ontario Ministry of Health and Long-Term Care launched a monitoring and evaluation initiative for stroke prevention and care. The initiative's goals included:

- measuring changes and outcomes attributable to the Ontario Stroke System (OSS)[a];
- identifying areas of excellence and areas for improvement;
- making recommendations to achieve better performance and outcomes at the provincial, regional, Local Health Integration Network (LHIN), facility and patient levels;
- reporting on improvements and gaps in stroke prevention and care.

In 2008, after a strategic planning process, the Ontario Stroke Network (OSN) was created as the governing body to provide coordination and leadership for the OSS, including responsibility for evaluation and reporting. The OSN is dedicated to driving system change and coordinating the implementation of best practices across the province. The Stroke Evaluation and Quality Committee (SEQC) is a committee of the OSN Board that, in collaboration with the OSN Evaluation Specialist, is responsible for measuring, monitoring, evaluating and reporting on the progress of the OSS.

The purpose of the SEQC's annual Stroke Evaluation Report is to:

- provide detailed information on outcomes and progress toward best practices across the care continuum and at multiple levels of analysis (province, LHIN, sub-LHIN, facility);
- enable the OSN and each LHIN to compare their performance to other LHINs and identify best practice sites;
- highlight stroke system successes while pointing out inefficiencies and opportunities for improvement; and
- provide recommendations for improving the stroke care system at the provincial and regional/LHIN levels.

Methods

INDICATOR SELECTION

To evaluate how well the Ontario Stroke System delivers best practice stroke care across the care continuum, in 2010 the SEQC reviewed over 150 performance indicators included in the Canadian Stroke Strategy's **2008 Performance Measurement Manual** (based on **national best practices**) and identified 45 core performance indicators. The 2013 Stroke Evaluation Report examines each core performance indicator and the variation in stroke care by stroke care sectors, including Emergency Department, Acute Inpatient Care, Inpatient Rehabilitation, Complex Continuing Care, and Home Care Services in Ontario from 2003/04 to 2011/12. A review of Long-Term Care performance is not included in this report but will be provided separately later in 2013.

Ontario Stroke Audit of Acute Care Facilities

Because the biennial Ontario Stroke Audit of Acute Care Facilities was last conducted in 2010/11, the 13 Emergency Department and Acute Inpatient Care indicators it considers are not addressed in this report.[b]

a The OSS is a collaborative system comprising a provider organization and partners who deliver stroke care across the province and the care continuum.

b Acute care indicators not included in this report: Proportion of patients who sought medical attention within the treatment window, neuroimaging rates, proportion of patients who received tPA and the door-to-needle time, proportion of patients treated on a stroke unit, dysphagia screening rates, SPC referral rates, carotid imaging rates, secondary prevention medication prescription rates, anticoagulant prescription rates, modified Rankin scores, discharge destinations by Rankin score, and characteristics of patients who received AlphaFIM assessments.

Ontario Stroke Audit of Secondary Prevention Clinics

In 2011/12, the first Ontario Stroke Audit of Secondary Prevention Clinics (OSA-SPC) was conducted. The goal of the OSA-SPC is to report on the quality of secondary stroke prevention care across the province. The OSN's Acute and Secondary Prevention Best Practice Group reviewed the Canadian Stroke Strategy's 2008 Performance Measurement Manual and identified a subset of 16 performance indicators to be included in the 2013 report (*see* **Appendix A**).

DATA SOURCES

This report includes three main sources of data: administrative data, data from the Ontario Stroke Audit of Secondary Prevention Clinics, and data from Statistics Canada's Canadian Socio-Economic Information Management System (CANSIM).

Administrative Data

The following data sources, all housed at the Institute for Clinical Evaluative Sciences, were used:

- from the Canadian Institute for Health Information: the Discharge Abstract Database (CIHI–DAD), the National Ambulatory Care Reporting System (NACRS) Emergency Department subset, the National Rehabilitation Reporting System (NRS) and the Continuing Care Reporting System (CCRS); and
- from the Ontario Ministry of Health and Long-Term Care: the Home Care Database (HCD) and the Registered Persons Database (RPDB).

Encrypted Ontario health card numbers were used to link patients diagnosed with stroke or transient ischemic attack (TIA) across the various administrative databases.

Stroke Cohorts

Stroke cohorts from administrative databases were generated using codes from the International Classification of Diseases, 10th Revision, Canada (ICD-10-CA), which are listed in **Appendix D**. The most responsible or "main problem" diagnosis was used to identify the record as an adult stroke/TIA record in the CIHI–DAD and NACRS databases. For paediatric stroke/TIA records, all diagnostic code fields were searched. The first record for an individual in each fiscal year was used to measure the various indicators.

Analyses

Process-Based Indicators Indicator analyses counted only unique patients for each fiscal year. The majority of indicators reported at the regional and LHIN levels are facility-based rather than patient residence-based (i.e., they examine how well the facilities in a LHIN performed on various indicators). Time-based measures are reported as median values. Median time is the time required for half of the patients to receive a given service (e.g., carotid intervention, inpatient rehabilitation, home care-based rehabilitation therapy).

Population-Based Indicators Most of the indicators in the report are observed rates or proportions, which are appropriate for process-based indicators. To make comparisons across regions and hospital types, age- and sex-adjusted rates were calculated for prevalence and outcomes. For admissions data, direct standardization was used to compare rates between regions as if they had similar population compositions. The direct standardized rates were calculated using the 2003/04 Ontario adult population 18 years and older to examine the overall provincial rate over time. To compare each region's rate we used the Ontario population each fiscal year as the standard population, and each region's rate was calculated as if it had the same age-sex distribution as the province.

Outcome Indicators Revisit/readmission rates relate to patients who survived the initial stroke emergency department (ED) visit or hospitalization but revisited or were readmitted to hospital at least once within 30 days and 90 days of the index visit or admission. Indirect standardization based on an age-sex regression model was used to calculate an expected revisit/readmission rate for each region; then the crude (observed) rate for each region was divided by the expected rate and multiplied by the overall annual Ontario rate to provide the age- and sex-adjusted rate. Readmission rate is a good indicator of whether there was appropriate discharge planning to prevent secondary complications or another stroke/TIA event. Thirty-day outcomes are based on the discharges between April 1 and February 28/29 in each fiscal year.

Mortality rates were also calculated using indirect standardization based on a risk-adjustment model to adjust death rates for differences across regions in socio-demographic comorbidity and condition-specific indicators of severity of illness, similar to the Get With The Guidelines ischemic stroke mortality risk-adjustment model.[1] The model adjusts for age, sex, stroke type, arrival by ambulance and common risk factors (atrial fibrillation, previous stroke/TIA, coronary artery disease, percutaneous coronary intervention (PCI), coronary artery bypass graft surgery (CABG), carotid disease, carotid endarterecomy/carotid artery stenting (CEA/CAS), diabetes, hypertension, peripheral vascular disease, and hyperlipidemia). Mortality indicators were analyzed among inpatients only (*see* **Appendix K** *for model specifications*). In-hospital mortality is based on the CIHI–DAD separation in that fiscal year. Thirty-day mortality measures the number of deaths that occurred within 30 days from the first stroke/TIA admission date each fiscal year, with death being identified in the CIHI–DAD or RPDB. Data are presented by 3-year combined rates in order to provide stable rates for smaller regions and facilities.

Ontario Stroke Audit of Secondary Prevention Clinics, 2011/12

The 2011/12 Ontario Stroke Audit of Secondary Prevention Clinics (OSA-SPC) was a retrospective chart review of all patients with an initial clinic visit in 2011/12 at an SPC in Ontario using a web-based data collection platform. This was the first comprehensive assessment of secondary stroke prevention services in the province.

Participating Institutions

All Ontario SPCs were invited to participate in the OSA-SPC if they were operational for the full 2011/12 fiscal year. Of the 43 SPCs in Ontario, two were not operational during the study period and one did not participate due to site circumstances, resulting in 40 SPCs participating.

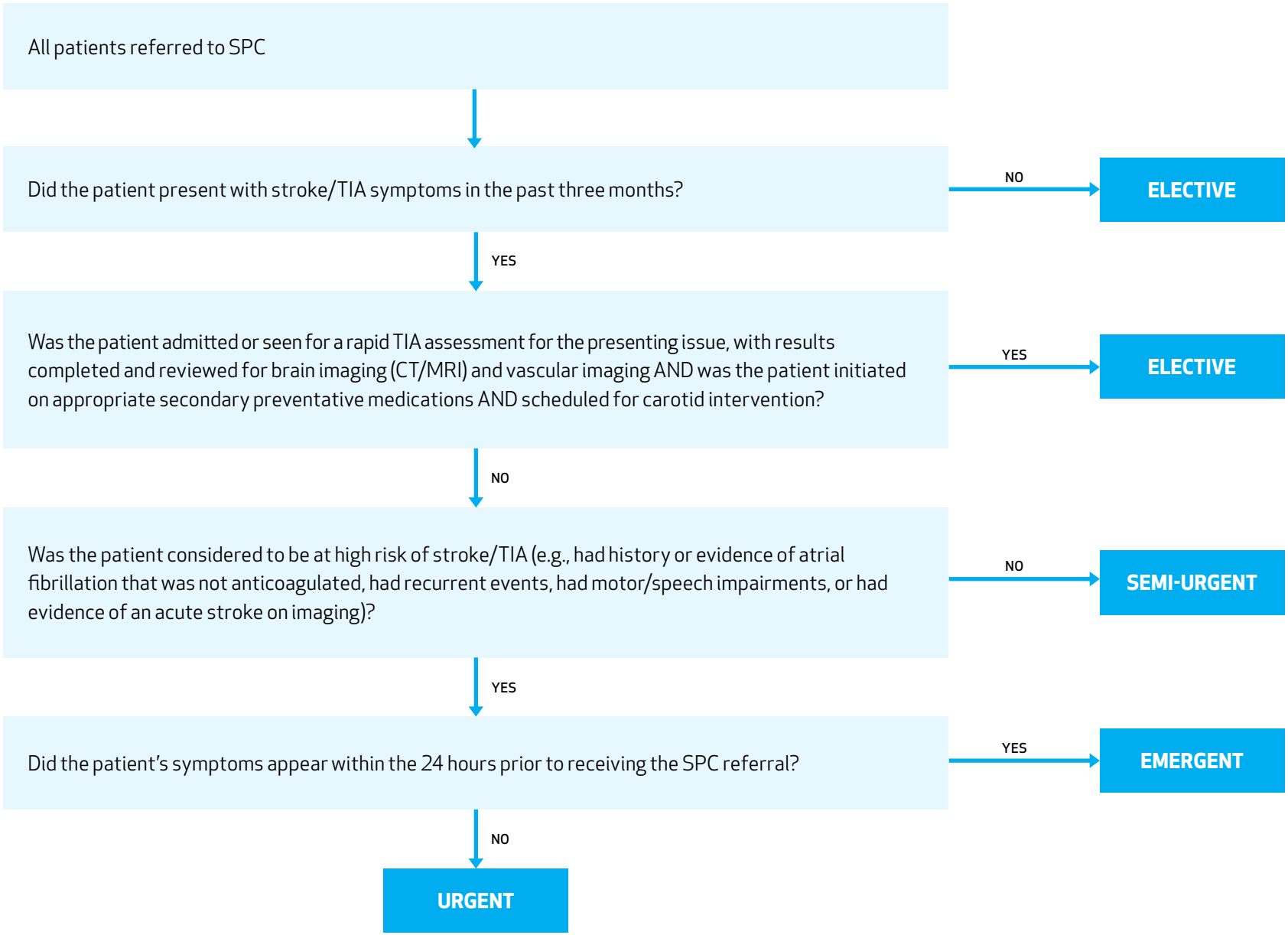
Patient Sample

The objective of the OSA-SPC was to collect data on every patient who had an initial visit for secondary prevention at an SPC between April 1, 2011 and March 31, 2012. A complete sample was obtained at all but one clinic, where a 34% sample was collected due to resource-related issues at the clinic. In total, data was collected for 16,167 unique patients, representing 16,487 initial visits and 7,126 follow-up visits (*see* **Appendix M** *for inclusion and exclusion criteria and data collection and management*). Centrally-trained chart abstractors performed data collection at the participating SPCs. The data collected included information about each patient's referral, initial visit, and any follow-up visits that occurred during the study period. View the case record form at **osr.ices.on.ca**. The overall research project was approved by the Research Ethics Board at Sunnybrook Health Sciences Centre in Toronto, and data sharing agreements were executed with each of the participating clinics. ICES is a prescribed entity under Ontario's *Personal Health Information Protection Act*; therefore, charts were audited without patient consent for the purposes of monitoring and improving the quality of stroke care delivery.

Patient Triage Assignment

The OSA-SPC case record form utilized a new triage algorithm developed by the SPC Advisory Committee (*see* **Appendix C**) in 2011 to assign the triage level, or how quickly the patient should be seen in the clinic. The algorithm was based on Canadian best practices so that, through a series of responses to specific questions, the web-based application generates the triage level instead of the abstractors selecting it, allowing for consistent triage assignment across the province. The triage algorithm includes up to four yes or no questions, each with detailed components about symptoms, diagnostics and treatment provided for a patient at the time of referral to an SPC.

OSA-SPC Triage Algorithm



Statistical Analysis

Of the 16 SPC performance indicators, 11 used the visit as the unit of analysis and five used the unique patient as the unit of analysis. All indicators reported are facility-based.

Unique patient identification numbers were used to link the OSR–SPC database with the NACRS–ED database to determine which ED-discharged patients had a completed referral and initial visit at an SPC (*see* **exhibit 2.3**). The OSR–SPC database was also linked with the CIHI–DAD database in order to assess carotid endarterectomy and stent rates, as the OSR–SPC case record form did not capture the date/time when carotid endarterectomy or stent procedures were done (*see* **exhibit 2.13**). Linkages to both NACRS and CIHI–DAD allowed for assessment of readmissions and revisits (*see* **exhibits 2.15** *and* **2.16**). All other SPC exhibits use the OSR–SPC database only.

Statistics Canada – CANSIM Data

The provincial stroke risk factor data is taken from the Statistics Canada 2011 CANSIM Table 105-0501.[2] The CANSIM database stores statistics from the Canadian Community Health Survey (CCHS) (annual component 3226, 2011), and produces health indicator profiles and annual estimates, by age group and sex, for Canada, provinces, territories, health regions (2011 boundaries) and peer groups.

Hypertension prevalence is based on the population 20 years of age and older who reported that they had been diagnosed by a health professional as having high blood pressure.

Smoking prevalence is based on the population 20 years of age and older who reported being current smokers. Current smokers were those who reported smoking cigarettes daily or occasionally at the time of survey. Smoking included cigarettes, cigars and pipes. Daily smokers were those who reported smoking cigarettes every day. Survey data did not take into account the number of cigarettes smoked. Occasional smokers were those who reported smoking cigarettes occasionally. This includes former daily smokers who smoked only occasionally at the time of survey.

Overweight and obesity prevalence is based on the population 18 years of age and older (excluding pregnant females and persons less than 3 feet [0.91 metres] tall or more than 6 feet 11 inches [2.11 metres] tall) who have self-reported their height and weight. Self-reported height and weight are used to calculate Body Mass Index (BMI) and then to classify body weight as normal, overweight or obese. According to World Health Organization and Health Canada guidelines, the BMI range for body weight classification is: less than 18.5 (underweight); 18.5 to 24.9 (normal weight); 25.0 to 29.9 (overweight); 30.0 to 34.9 (obese, class I); 35.0 to 39.9 (obese, class II); 40.0 or greater (obese, class III).

Diabetes prevalence is based on the population 20 years of age and older who reported that they had been diagnosed by a health professional as having type 1 or type 2 diabetes. Also included were females 15 years of age and older who reported that they had been diagnosed with gestational diabetes.

REPORT LAYOUT AND INTERPRETATION

The *Summary by Sector* section provides an overview of findings and recommendations by stroke care sector.

- ✓ A green check mark indicates a statistically significant improvement (where available), a positive trend relative to best practices and/or expected course.
- ✖ A red X indicates statistically significant negative results, a negative trend relative to best practices and/or expected course.
- ◆ Neutral or descriptive results are marked with a blue diamond.
- The *spotlights* illustrate specific examples of regions where efforts have resulted in significant and important system change/improvements.

The sections of the report pertaining to adult patients are divided into secondary prevention care; emergency department care; acute inpatient care; inpatient rehabilitation and complex continuing care; home care services; and patient outcomes. Each section includes a presentation of key findings (with a grading of results as outlined above), an interpretation of the findings, and recommendations, if appropriate. Paediatric stroke patients aged 0–17 years were identified and are reported on separately from adult stroke/TIA patients. The paediatric stroke sections include emergency department care, acute inpatient care and longer-term patient outcomes.

Where possible, data are presented by sex, OSS designation (regional stroke centres, district stroke centres and non-designated hospitals), and Local Health Integration Network.

Executive **Summary**

Spotlight on Stroke Prevention and Care

The 2013 Ontario Stroke Evaluation Report continues the Ontario Stroke Network's comprehensive examination of stroke prevention and care across the continuum and by patient sex.

What's New?

People with a recent history of transient ischemic attack (TIA) or minor stroke are at high risk of a recurrent stroke and should have timely evaluation and treatment. The 2013 Ontario Stroke Evaluation Report provides the first comprehensive review of secondary prevention clinic care across the province as collected through the Ontario Stroke Audit of Secondary Prevention Clinics (OSA-SPC). The OSA-SPC included over 16,000 patient visits across 40 SPCs in 2011/12. This report provides a spotlight on stroke prevention and identifies areas of progress and opportunities for improvement. In addition, in June 2012 the OSN established challenging five-year goals and targets to improve stroke care and measure progress toward achieving its vision of Fewer Strokes, Better Outcomes (*see* **Appendix L**). Progress toward achieving two of the four targets set by the OSN in 2012 is reported.

Spotlight on Secondary Stroke Prevention Clinics

- ✓ The vast majority of patients have their required neuroimaging (94%) and carotid imaging (84%) completed or ordered prior to or at the first secondary prevention clinic (SPC) visit.
- ✓ Among patients with atrial fibrillation, anticoagulant therapy is prescribed or recommended in 80% of visits.
- ✖ Seventeen percent of patient visits to Ontario's SPCs are considered emergent/urgent.
- ✖ When preventative surgery or intervention to open the carotid artery is required, the median wait time is more than 30 days from the initial SPC visit.
- ✖ The median time from an urgent SPC referral to an initial clinic visit is 8 days.
- ✖ Eighteen percent of visits for patients deemed emergent are seen within the recommended time frame of 24 hours.
- ✖ Most 30-day recurrent stroke/TIA hospital visits/admissions occur prior to the SPC visit.

This first-ever audit of Ontario's SPCs provides baseline data to examine and report on processes and impacts of care. Overall, the results show marked improvements in outcomes compared to the expected course of a stroke/TIA following an emergency department (ED) visit; however, there still appear to be significant opportunities for improvement, particularly with respect to timely access to SPCs for emergent and urgent cases. The results pose many questions and identify gaps in data and knowledge that need to be explored in more detail through further analysis or research. Specifically, the wait times for emergent patients and for carotid intervention should be addressed.

At present, there is no funding available to continue to monitor and report on the performance of Ontario's SPCs. It is critical to find alternatives for data capture and reporting, ideally through administrative databases such as the National Ambulatory Care Reporting System, to support ongoing improvement in SPC care and further inform the need for additional sites across the province.

Spotlight on Emergency, Acute, Rehabilitation and Community Stroke Care

AREAS OF CONTINUED PROGRESS:

- ✓ Since 2003, an estimated 3,300 ED visits for stroke have been avoided annually.
- ✓ Since 2003, an estimated 4,400 acute care inpatient visits have been avoided annually.
- ✓ Since 2003, an estimated 330 deaths have been avoided annually.
- ✓ Since 2003, total acute care inpatient length of stay has decreased by one day.
- ✓ Since 2009, alternate level of care (ALC) length of stay has decreased by one day.
- ✓ Since 2003, the time to carotid intervention among admitted patients has been reduced by 32 days.
- ✓ Since 2003, wait times for admission to inpatient rehabilitation from acute care have been reduced by three days.
- ✓ Since 2010, access to inpatient rehabilitation for severely disabled stroke patients has increased by 2%.

AREAS FOR ONGOING WORK AND IMPROVEMENT:

- The proportion of home care provided by Community Care Access Centres to stroke/TIA patients receiving rehabilitation services has decreased by more than 5%. In addition, service levels are low: an average of 6 visits from all therapies over a 60-day period, with the first visit occurring, on average, more than 2 weeks after discharge from hospital.
- Facilities in most LHINs are not meeting the Rehabilitation Patient Group length of stay targets for rehabilitation services set by the Ontario Stroke Network. The data indicate that rehabilitation system change may be needed to achieve these targets (*see* **Appendix L**).
- There is ongoing opportunity to improve patient flow. Despite clear progress, wait times for rehabilitation remain longer than the five-day OSN best practice target. Although there is a trend toward greater access to rehabilitation for the severely disabled stroke survivor, options remain limited. These factors, along with limited community-based rehabilitation services, limit patient flow and outcomes, contributing to high ALC rates.
- Although progress is evident in many indicators, high variation across and within LHINs is an area needing continued attention to improve access to care for all. Implementation of Stroke – Quality Based Procedures should provide a means of reducing variation in LHIN best practices.

Key Recommendations

1. The OSN should facilitate and support the uptake of standardized triage processes for people with TIA or minor stroke that support best practices for accessing stroke prevention clinics.

2. All Ontario SPCs should adopt a standard triage algorithm/protocol, review processes and increase awareness to ensure that patients who are at greatest risk of a recurrent event or death (i.e., those considered emergent or urgent cases) are seen within best practice time frames.

3. There is a need for increased focus on chronic disease prevention and management approaches for the reduction of stroke/vascular risk factors, including timely access to lifestyle and behaviour modification programs (particularly smoking cessation programs) through coordination and collaboration among agencies and services, or in collaboration with other agencies and services.

4. The Vascular Health Strategy for Ontario, led by the Cardiac Care Network, the Heart and Stroke Foundation and OSN, should continue to pursue its goal of reducing the burden of vascular disease through a focus on an integrated chronic disease prevention and management approach.

5. The OSN should continue to work with Health Quality Ontario and the Ministry of Health and Long-Term Care to implement and evaluate the impact of inpatient acute and rehabilitation Stroke – Quality Based Procedures and support the development of these procedures for best practice community care (for timely secondary prevention for TIA/minor stroke patients and for outpatient rehabilitation).

6. Successful models of community rehabilitation services in the South East and South West LHINs should be shared and used to inform models of care in order to enhance community services. The OSN should continue to work with the Regional Stroke Networks and LHINs to develop a case for change according to the report ***The Impact of Moving to Stroke Rehabilitation Best Practices in Ontario***.[3]

7. Efforts to consolidate care into specialized stroke centres should continue. LHINs should work with the Regional Stroke Networks to facilitate movement of patients to centres with appropriate stroke infrastructure.

8. The OSN and the Canadian Institute for Health Information should continue their work on a common risk-adjustment model for stroke mortality using administrative data and develop ways to capture key data not currently available in administrative data sets.

Conclusions

Significant and steady improvements in acute care outcomes and positive trends in the rehabilitation sector are being seen. The decreases in hospital admissions alone represent reductions of 3,300 ED visits, 4,400 inpatient admissions and 22,000 inpatient days, with annual savings estimated to be $27 million. In addition, the significant reduction in mortality represents approximately 330 deaths avoided per year.

Given the complexity of making changes in health care, as well as the aging population, it is impressive that steady progress is being made year over year. The OSN and the Regional Stroke Networks are well positioned to make further progress in those areas of the patient journey that have not shown improvement, most notably community care. There remains tremendous opportunity for improvement by addressing the gaps in stroke prevention clinic care and reducing LHIN variation. The OSN needs to continue to take a leadership role in collaboration with the Ministry of Health and Long-Term Care and Health Quality Ontario on the Stroke – Quality Based Procedures funding initiative to support implementation and evaluation for the inpatient acute care and rehabilitation sectors while developing a robust funding model that extends best practices to community-based prevention, rehabilitation and care.

Summary **by Sector**

Spotlight on Secondary Stroke Prevention and Care

Background

There is increasing evidence that a transient ischemic attack (TIA) or minor stroke indicates a high early risk of stroke, other vascular events, or death. U.S. and Ontario data show that for patients who present to an emergency department (ED) with TIA.[4,5,6,7]

- One in 20 patients returns to the ED within 48 hours with a stroke and one in 10 patients is readmitted within 90 days;
- One in four patients has an adverse event within 90 days (including stroke, myocardial infarction and death) and half of these adverse events occur within four days of the initial event.

The seven-day risk of stroke following a TIA can be as high as 36% for patients with certain risk factors.[8] Secondary stroke prevention is essential to reducing the risk of recurrent vascular events in patients with prior stroke or TIA. It is estimated that one in two strokes is potentially preventable.[9] Aggressive risk factor reduction (including more widespread use of antihypertensive agents, statins and antiplatelet medications) has been credited with significant reductions in stroke incidence on a population level.[10]

Urgent assessment and treatment of patients with TIA or minor stroke who were referred to a specialist outpatient clinic is associated with reduced subsequent hospital bed-days, acute care costs and six-month disability,[11] and referrals to Ontario Stroke Prevention Clinics (SPCs) are associated with a 25% reduction in mortality.[12]

Secondary Stroke Prevention in Ontario

Secondary stroke prevention clinics (SPCs) were established in Ontario in 2001, and there are currently 43 in the province. Data on these SPCs are not available in any administrative database. As a result, in 2006 a web-based data collection tool, Stroke Performance Indicators for Reporting, Improvement and Translation (SPIRIT), was established by the Registry of the Canadian Stroke Network to collect risk factor and secondary stroke prevention quality of care data. There was limited voluntary participation by Ontario SPCs; therefore, in 2012 a formal audit of all SPCs (involving over 16,000 patients) was conducted to evaluate best practice stroke/TIA care. The results of this audit are the focus of the 2013 Ontario Stroke Evaluation Report.

The purpose of secondary stroke prevention clinics in Ontario includes[13]:

- Providing coordinated services for all high-risk patients to allow for access to prevention programs, clinics, referrals and communication with primary care providers.
- Developing and implementing referral and triage processes that incorporate best practice standards to facilitate the transition of care management (e.g., from the ED or primary care practitioner to the stroke prevention clinic).
- Establishing processes with the regional or district stroke centres to coordinate timely access to consults, specialty diagnostics and surgery.
- Ensuring diagnostic services (e.g., CT scans, Doppler ultrasound tests) are available and/or accessible in a timely manner for clinic patients.
- Providing access to interdisciplinary team member(s) for behaviour modification activities such as risk factor reduction and lifestyle management.
- Establishing processes for timely access to carotid revascularization.

Characteristics of Ontario's Secondary Prevention Clinics

- ♦ Most clinics operate 3 to 5 days per week and none are open on weekends. Just over two-thirds (27 of 40) of Ontario's SPCs are located in hospitals that are designated stroke centres. Twelve SPCs are located in other hospitals and one is a stand-alone clinic; collectively, these 13 clinics are referred to as community hospital SPCs. Clinics within regional stroke centres accounted for over 50% of all SPC visits.
- ♦ Provincially, 52.9% of SPC referrals are from ED physicians, 27.0% are from primary care providers, 12.4% follow inpatient care and 7.7% are from other medical specialists, such as neurologists, neurosurgeons and cardiologists.

Patient Characteristics

- ♦ The median age of patients seen in Ontario's SPCs in 2011/12 was 68.5 years, and women represented 52.0% of referrals. The most common risk factors among SPC patients were hypertension (62.4%), hyperlipidemia (52.4%), smoking (22.2%, including current and reformed smokers), and diabetes (20.5%), with very little difference between men and women. Approximately one in five patients had a previous stroke or TIA, and one in 10 patients had atrial fibrillation.
- ♦ The majority of patients (88.6%) were referred to an SPC for evaluation of a new, recent, or query stroke/TIA diagnosis, with routine follow-up care indicated as the reason for referral in only 4.0% of cases. Patients were most likely to be referred with a diagnosis of "query" stroke (i.e., diagnosis unknown) at community hospital SPCs (79.5%), followed by district stroke centres (62.6%) and regional stroke centres (59.8%).
- ✖ Across Ontario, 16.5% of SPC visits were for emergent or urgent cases (7.9% and 8.6%, respectively), and 83.4% of visits were for patients deemed semi-urgent or elective (41.9% and 41.5%, respectively).

- After the first SPC visit, 43.9% of patients were determined to have had a new or recent stroke or TIA or to be at high risk for such an event, 23.7% were classified as having had a possible TIA or stroke, and 32.5% were given a non-stroke diagnosis.

INTERPRETATION

Almost two in three patients seen in an SPC had hypertension, which is both a leading and treatable cause of stroke and a signifier of broader underlying risks (tobacco use, poor diet, lack of physical activity, excessive alcohol consumption, etc.).[14] There is a high prevalence of other vascular risk factors, such as hyperlipidemia (52.4%), previous stroke/TIA (18.4%), current smoking (16.3%) and atrial fibrillation (9.7%). One in five patients seen in an SPC had diabetes, highlighting the need for a chronic disease management approach.

Compared to the self-reported prevalence of hypertension among adult Ontarians,[2] patients seen in SPCs had a higher prevalence of hypertension, smoking and diabetes.

The majority of clinic referrals are initiated following an ED visit or acute care hospitalization, which is appropriate as the focus of SPCs is on immediate follow-up post-stroke/TIA event.

Previous studies have found that between 19% and 31% of patients presenting to the ED with stroke symptoms are ultimately given a diagnosis of non-stroke or stroke mimic. It is notable that approximately one in three referrals to Ontario SPCs is found to be non-stroke-related.[15,16]

RECOMMENDATIONS

1. The Vascular Health Strategy for Ontario, led by the Cardiac Care Network, the Heart and Stroke Foundation and the Ontario Stroke Network (OSN), should continue to pursue its goal of reducing the burden of all vascular risk factors through a focus on an integrated chronic disease prevention and management approach.

2. The OSN commitment to the Hypertension Management Program is relevant given the high prevalence of hypertension among adults 45 years of age and older visiting SPCs and given that hypertension is the leading risk factor for stroke. This program and other approaches should be reviewed and evaluated to determine effective approaches for improved hypertension and vascular risk factor control.

3. SPCs should provide access to relevant and ongoing lifestyle modification and prevention programs.

Access

BEST PRACTICE RECOMMENDATION[17]

Patients presenting within one week of a suspected TIA or non-disabling ischemic stroke should have an immediate clinical evaluation and investigations. All individuals with a diagnosis of mild stroke or TIA who are not admitted to hospital should be followed up in a secondary prevention clinic, as the time of highest risk for major stroke is within 48 hours after the index event.

ED Referral Rates

- In 2011/12, there were almost 30,000 ED visits for patients with suspected or confirmed stroke/TIA. Of these, 21.3% were subsequently assessed in an SPC.

Wait Times

- The median time from referral to the first scheduled SPC visit varied based on patient triage level from 6 days for emergent cases to 8 days for urgent cases, 12 days for semi-urgent cases and 23 days for elective cases.

- Provincially, only 17.5% of emergent SPC cases were scheduled for their first visit within the 24-hour recommended time frame guideline, and 14.5% of urgent cases were scheduled within the recommended target of 72 hours. It is important to note that the time frame guideline for urgent cases was previously 7 days,[17] but was changed to between 48 hours and 2 weeks from symptom onset for patients without persistent or fluctuating motor or speech symptoms in the new Canadian Stroke Network *Taking Action in Stroke Prevention* quick response guide.[18] Under the previous guidelines, 46.8% of urgent cases in Ontario would have been seen within the appropriate time (7 days). Sixty-one percent of semi-urgent cases were seen within the 30-day guideline.

INTERPRETATION

There is a lower than expected referral rate to SPCs from EDs. The majority of patients at the highest risk of a recurrent stroke or other vascular event (urgent and emergent categories) are not being seen within the best practice time frame guidelines. However, SPCs are not available in every area of the province, and limited base funding support ($100,000 to $200,000 per clinic) may limit the ability of a clinic to provide urgent/emergent services. Additionally, there may be a lack of awareness of TIA as an emergency condition among patients and health care professionals, which may delay referrals.

Access to SPCs is limited, and given that approximately 3,000 TIA patients are hospitalized annually in Ontario, there may be an opportunity to move some of these patients into the SPC setting for appropriate diagnostic work-up and evaluation.

The low prevalence of patients presenting to SPCs who are triaged as emergent may indicate that EDs are providing timely emergent stroke/TIA symptom care (i.e., imaging completed and reviewed and secondary prevention medication initiated).

CHAMPLAIN LHIN

The Champlain LHIN utilizes a TIA algorithm in its EDs to encourage early intervention and diagnostic testing for stroke/TIA patients. A centralized referral process ensures that SPC intake and triage is uniform across all referral sources. Through the standardized referral process, all diagnostic tests are ordered through medical directive and completed prior to a patient's initial SPC visit, and once the tests are reviewed, patients are re-triaged by SPC nurses as test results become available. The majority (65.5%) of patients who visit SPCs in the Champlain LHIN are therefore considered elective cases, since much of the assessment and treatment is initiated prior to the initial visit. ED TIA algorithms or pathways are a common element of the process of care at regional and district stroke centres. Implementation of such algorithms in a LHIN-wide manner across all EDs reinforces access to best practice TIA care and reduces variation in triage to care.

NORTH WEST LHIN

To increase awareness of secondary prevention services, the Thunder Bay Regional Health Sciences Centre SPC provides its ED with packages containing a fact sheet, requisition forms for required tests, an SPC referral form and a patient information pamphlet about the SPC and its location. The use of SPC packages in all EDs helps to promote the link with SPCs and is an expected standard of care for stroke centres.

RECOMMENDATIONS

1. All Ontario SPCs should adopt a standard triage algorithm/protocol and focus the service on achieving the best practice targets for time to assessment of patients classified as urgent and emergent.
2. SPCs should continue to work with their area EDs to ensure ED TIA algorithms are in place to initiate management of emergent patients in the ED using evidence-based practice with timely links to the SPC for follow-up care.
3. OSN should work with Health Quality Ontario and the Ministry of Health and Long-Term Care to establish a Quality Based Procedures funding model for TIA and minor stroke, and to develop a mechanism to monitor its impact and outcomes.
4. The results of the recently funded OSN research project assessing the management of TIA patients in the province should be used to determine whether care for TIA patients currently admitted could be managed in an SPC setting and to consider the current capacity for this service.

Diagnostic Imaging

- ✓ In Ontario, neuroimaging was completed or ordered, either prior to or at the SPC visit, in 94.0% of cases, and was completed or ordered prior to the first SPC visit in 65.2% of cases.
- ✓ Across the province, 92.7% of patients with ischemic stroke or TIA seen at SPCs had carotid imaging completed or ordered; this occurred prior to the initial SPC visit in 56.7% of cases.
- ✓ Among patients with ischemic stroke or TIA diagnoses, rates of vascular imaging were similar for women and men (92.0% vs. 93.4%, p=0.0331).
- ◆ Almost one in five visits involved more than one neuroimaging procedure completed or ordered, with higher rates of duplicate neuroimaging at clinics based in regional stroke centres (23.9%) than at clinics based in district stroke centres (11.4%).

INTERPRETATION

Overall, a substantial proportion of patients seen at SPCs had neuroimaging and vascular imaging completed or ordered. In comparison to the results of an Ontario study on four SPCs located at acute tertiary care centres (regional stroke centres), access to diagnostics has dramatically improved. The higher rates of repeat neuroimaging performed at regional stroke centres deserve further study to determine whether this improved patient care and outcomes.

There was no observed gender difference in access to carotid investigation, which is consistent with other findings.[19]

RECOMMENDATION

Continued effort is needed to ensure that timely brain and carotid artery imaging is completed for all patients visiting an SPC.

Carotid Intervention for Preventing Recurrent Stroke

BEST PRACTICE RECOMMENDATION[17,20]

Patients with either TIA or non-disabling stroke and ipsilateral 50% to 99% internal carotid artery stenosis should be evaluated by a health care provider with stroke expertise, and selected patients should be offered carotid intervention as soon as possible, optimally within 14 days of the incident event when the patient is clinically stable.

- ✓ Among patients admitted to Ontario hospitals for stroke or TIA, the median time from admission to carotid intervention decreased substantially from 51 days in 2003/04 to 19 days in 2011/12 (p<0.0001).
- ✖ In 2011/12, carotid revascularization procedures were performed on 1,414 patients in Ontario. Of these, 235 patients (16.6%) were seen in an SPC; their median time from the index stroke event to carotid intervention was 50 days, and from first SPC visit to carotid intervention, 28 days.

INTERPRETATION

For patients seen at SPCs, the median time to carotid revascularization exceeds the best practice target of 14 days.

RECOMMENDATIONS

1. SPCs should review their processes of care to ensure timely access to carotid revascularization.
2. The OSN should continue its efforts to understand the causes of prolonged delays to carotid intervention, and promote best practice monitoring through the Wait Time Strategy.

Cognitive Screening

BEST PRACTICE RECOMMENDATION[17]

All patients considered at high risk for cognitive impairment should be assessed periodically throughout the stages of care, including outpatient settings. All patients with vascular risk factors and those with clinically evident stroke or TIA should be considered at increased risk for vascular cognitive impairment, particularly those patients with cognitive, perceptual or functional changes that are clinically evident or reported during history taking.

✓ There were no differences in rates of screening between women and men.

✖ Across the province, 10.4% of initial SPC visits included cognitive screening, with higher rates (16.0%) at SPCs within regional stroke centres compared to district stroke centres (4.8%) or community-based hospitals (1.8%).

INTERPRETATION

Ten percent of patients are diagnosed with dementia soon after the first stroke and approximately 30% after a recurrent stroke. Furthermore, patients referred to an SPC that have not had a stroke often have vascular risk factors that are associated with cognitive impairment. Mai et al suggest that an acknowledgement of cognitive decline may influence patients to adhere to vascular risk factor modification therapies.[21]

There is significant room for improvement in rates of screening for cognitive impairment in Ontario's SPCs. Vascular cognitive impairment affects up to 60% of stroke survivors and is associated with decreased function in activities of daily living and instrumental activities of daily living.[22,23] Among stroke survivors, those with cognitive impairment have increased long-term dependence, and this is associated with an increased mortality rate (61% vs. 25%).[24] Low cognitive screening rates may be related to limited resources in Ontario SPCs or a need for increased awareness of the need for screening.

RECOMMENDATIONS

1. SPCs should develop a process to complete cognitive screening for all patients diagnosed with TIA or stroke using a validated tool such as the Montreal Cognitive Assessment (MoCA) or refer to the Canadian Best Practices Recommendations for Stroke Care[25] for other options.

2. The processes used to implement cognitive screening could inform other best practices, such as screening for depression and sleep apnea.

3. Screening processes should ensure appropriate linkages are made with primary care and other community services for ongoing follow-up and care.

To address the limited time available in the SPC to administer validated cognitive screening tools, a group of researchers in Hamilton developed a mini-Montreal Cognitive Assessment (MoCA) tool designed to be delivered in a busy clinic setting and found its results to be highly correlated with those of the full MoCA (R = 0.901).[21]

Secondary Prevention Medications

BEST PRACTICE RECOMMENDATIONS[17,20]

- All patients with ischemic stroke or transient ischemic attack should be prescribed antiplatelet therapy for secondary prevention of recurrent stroke unless there is an indication for anticoagulation.

- Patients with TIA and atrial fibrillation should begin oral anticoagulation with dabigatran, rivaroxiban, apixaban or warfarin immediately after brain imaging has excluded intracranial hemorrhage or large infarct. Most patients with acute ischemic stroke and atrial fibrillation should receive oral anticoagulant therapy with dabigatran, rivaroxiban, apixaban or warfarin as soon as it is thought to be safe.[c]

✓ Overall, 94.4% of patients with ischemic stroke or TIA without atrial fibrillation had antiplatelet therapy prescribed or recommended, with no differences in rates for men and women (p=0.32).

✓ Overall, 80.1% of patients with ischemic stroke or TIA and atrial fibrillation had oral anticoagulant therapy prescribed or recommended, with no differences in rates for men and women (p=0.62).

c At the time of the SPC audit, only dabigatran and warfarin were approved for use by patients with TIA or acute ischemic stroke and atrial fibrillation.

CHAMPLAIN LHIN

The Champlain LHIN introduced the Ottawa Model for Smoking Cessation in 2002 to address smoking intervention needs in inpatient, outpatient and primary care settings. This program was developed by the University of Ottawa Heart Institute and is now well integrated into every hospital and SPC in the LHIN. For more information about this model, visit **www.ottawamodel.ca**.

NORTHWEST LHIN

Smoking cessation is a primary focus at the Thunder Bay Regional Health Sciences Centre SPC. The nurse practitioner is certified in Training Enhancement in Applied Cessation Counselling and Health (TEACH), a specialized smoking cessation training program, and uses a carbon monoxide meter to quantify improvements in lung function for patients who have quit smoking. A new initiative being implemented in Thunder Bay will include smoking cessation counselling and support for inpatients and outpatients.

- Overall, 68.0% of patients with ischemic stroke or TIA had antihypertensive medications prescribed or recommended, with lower rates for women than for men (65.4% vs. 70.5%, p<0.0001). Lipid-lowering therapy was prescribed or recommended in 65.7% of patients, with lower rates for women than for men (62.8% vs. 68.4%, p<0.0001).

INTERPRETATION

Prescription rates for antiplatelet and/or anticoagulant therapy are excellent, and are higher than the rates observed following discharge from acute care in 2010/11 (72%).[26] However, the results for antihypertensive and lipid-lowering therapy are lower than expected. In addition, there is a significant gender bias toward men. This may be due to better risk factor stratification, or to the opportunity to trial lifestyle modification as a first line of intervention.

RECOMMENDATIONS

1. The OSN's commitment to the Hypertension Management Program is relevant, given the high prevalence of hypertension among adults 45 years of age and older attending SPCs and given that hypertension is the leading risk factor for stroke. This program and other approaches should be reviewed and evaluated to determine effective approaches for improved hypertension and vascular risk factor control.
2. Future research should focus on understanding the overall rates and gender differences in prescribing antihypertensive and lipid-lowering medications.

Smoking Cessation

BEST PRACTICE RECOMMENDATION[17,20]

All members of the interdisciplinary team should address smoking cessation at every health care encounter. Patient smoking status should be identified, assessed and documented. A combination of pharmacological therapy and behavioural therapy should be considered for all smoking cessation programs and interventions.

- For patients who are current smokers, 20.2% of SPC visits included a prescription or recommendation for smoking cessation therapy/education. A higher proportion of visits at regional stroke centres included a smoking cessation intervention (24.5%) compared to community hospitals (18.3%) and district stroke centres (14.8%).

INTERPRETATION

Only one in five current smokers was prescribed or recommended smoking cessation medications or programs. This is a significant missed opportunity to address a major risk factor for stroke and other chronic diseases.

RECOMMENDATION

Processes to ensure access to evidence-based smoking cessation medications/programs/resources at SPCs should be reviewed and enhanced.

Recurrent Stroke/TIA

At 30 Days

✓ Within 30 days of the referral date to an SPC, 1.8% of ischemic stroke/TIA patients were admitted to hospital and 4.7% of patients had either visited the ED or were readmitted to hospital for a stroke/TIA; 69% of these occurred prior to the first SPC visit.

At 90 Days

✓ Within 90 days of the referral date to an SPC, 2.9% of ischemic stroke/TIA patients were admitted to hospital and 6.6% of patients were either seen in the ED or admitted to hospital for a stroke/TIA; 56% of these occurred prior to the first SPC visit.

INTERPRETATION

The observed 30-day age- and sex-adjusted readmission rates following an SPC referral for ischemic stroke or TIA are lower than the 5% previously observed in 2000 (prior to the establishment of SPCs).[7] The 2.9% rate observed at 90 days for ischemic stroke/TIA patients following an SPC referral was previously reported at 6.0% among TIA patients discharged from the ED.[7] Almost two in three 30-day readmissions occur prior to SPC visits.

The decrease in recurrent stroke/TIA readmissions observed reflects the success of Ontario's stroke program in advancing access to best practice stroke care.

RECOMMENDATIONS

1. Results and recommendations from the OSN-funded research project Optimal TIA Management should be used to assess the impact of SPCs on recurrent events and leading practices.

2. SPCs should continue to focus on processes of care to ensure early access, with a particular focus on those patients at highest risk.

Acute Care

Emergency Department

Visits

✓ When emergency department (ED) visit rates for stroke/TIA patients are standardized to the 2003/04 population, there has been a decrease from 2.0 per 1,000 population to 1.7 per 1,000 population ($p<0.0001$). This amounts to approximately 3,300 ED visits avoided annually, equalling a savings of $6.2 million.[27]

✓ The decrease in ED visits for stroke/TIA was observed across all LHINs.

Undetermined Stroke

✓ The prevalence of undetermined stroke type as a diagnostic code has been steadily decreasing from 2003/04 to 2011/12 in both the ED and inpatient sectors, dropping from 51.0% to 38.1% among ED patients and from 32.7% to 12.0% among inpatients.

INTERPRETATION

Despite the aging population, the rate of ED visits for stroke or TIA has decreased over time. This may reflect the impact of increasing uptake of stroke prevention best practices supported by the Regional Stroke Networks across the province. The reduction in ED visits is associated with approximately 3,300 fewer visits and an estimated savings of $6.2 million per year.

ERIE ST. CLAIR LHIN: REDUCING INPATIENT ADMISSIONS THROUGH ENHANCED STROKE PREVENTION STRATEGIES

The Erie St. Clair LHIN has had the highest rates of ED visits for stroke/TIA patients in the province over the past nine years (2.1 per 1,000 LHIN population in 2011/12). In 2003/04, it also had the highest stroke/TIA inpatient admission rate (2.2 per 1,000 LHIN population), but reduced its rate dramatically to 1.4 per 1,000 LHIN population in 2011/12 ($p<0.0001$).

The stroke coordinators in the Erie St. Clair LHIN attribute the decline in inpatient admissions to an integrated approach to stroke prevention across the inpatient setting and secondary stroke prevention clinics (SPCs). Each of the three counties in the Erie St. Clair LHIN has an SPC, which allows the region to provide adequate geographic access to ambulatory prevention clinics. These SPCs receive the highest proportion of confirmed stroke/TIA patients referred directly from an ED compared to all other LHINs (29.9%; see exhibit 2.3), and have the shortest median wait times for initial visits in the province (4 days compared to 14 days provincially; see exhibit 2.6). The provision of comprehensive patient/caregiver follow-up education and support is a focus of the stroke prevention strategy within this LHIN, with 91% of SPC patients returning for follow-up visits to receive risk reduction and lifestyle modification education (*see* **exhibit 2.10**).

The trends observed in the Erie St. Clair LHIN demonstrate that despite high stroke ED visit rates, inpatient admissions can be reduced through an increased focus on prevention strategies and appropriate utilization of SPCs.

Continued progress is being made in the reduction of cases diagnosed as "undetermined stroke." This may be due to increased rates of care at designated stroke centres (where imaging and specialized stroke care are available, allowing more accurate diagnoses), improved coding and the piloting of stroke data elements in CIHI-DAD and NACRS-ED.

RECOMMENDATIONS

The OSN has set a target of 1.65 ED visits per 1,000 population by 2016/17; however, the rate has remained at 1.7 visits for the past two years. If the OSN target is to be achieved, greater attention must be given to prevention strategies, as well as improved access to stroke prevention/rapid TIA assessment clinics.

Inpatient Stays

- ✓ Provincially, the age- and sex-adjusted incidence rate of acute care inpatient admission for stroke/TIA per 1,000 population declined from 1.7 in 2003/04 to 1.3 in 2011/12 ($p<0.0001$). This amounts to approximately 4,400 inpatient stays avoided annually, equalling an estimated savings of $20.7 million.
- ✓ The decrease in the number of Ontario inpatient stays for stroke/TIA has been observed across all LHINs.

Length of Stay and Alternate Level of Care

- ✓ Provincially, the total inpatient length of stay (LOS) decreased from a median of 7 days in 2003/04 to a median of 6 days in 2011/12.
- ✓ The proportion of Alternate Level of Care (ALC) days to total LOS declined from 32.7% in 2009/10 to 27.3% in 2011/12 ($p<0.0001$). Regional stroke centres had the lowest proportion of ALC days (22.0%), compared to district stroke centres (25.7%) and non-designated hospitals (32.1%).

- ✓ Among patients with ALC days, the median ALC LOS declined from 7 days in 2009/10 to 6 days in 2011/12, resulting in an estimated savings of 3,300 bed-days.

- ✓ Provincially, the proportion of stroke/TIA patients discharged to long-term care and complex continuing care decreased between 2003/04 and 2011/12; the proportion of patients discharged to long-term care decreased from 8.5% to 6.4%, and the proportion discharged to complex continuing care decreased from 8.8% to 6.6% (p<0.0001). With approximately 13,500 stroke/TIA patients discharged alive per year, the absolute decrease in discharges to long-term care of 2.1% would be expected to result in 284 fewer institutionalizations each year.

- ✖ In 2011/12, if patients were waiting for discharge to long-term care, complex continuing care or home with services, ALC represented at least half of their total acute care LOS.

Stroke/TIA and All-Cause Readmissions

At 30 Days

- ✓ The 30-day all-cause readmission rate following the first ED visit or inpatient admission for stroke/TIA declined in Ontario from 8.8% in 2003/04 to 8.0% in 2011/12 (p<0.0001). A decrease in rates occurred across all stroke types, with TIA patients experiencing the most dramatic decline, from 8.9% to 7.6% between 2003/04 and 2011/12 (p=0.0003).

- ◆ Following the first ED visit or inpatient admission for stroke/TIA, the rate of another stroke-related revisit or readmission within 30 days was 4.9% in 2011/12, a fairly constant rate from 2003/04 onward. Compared to other stroke subtypes, TIA patients had the highest rate of stroke/TIA-related revisits or readmissions (6.5%) in 2011/12, a modest decline from 6.7% in 2003/04.

At 90 Days

- ◆ Following the first ED visit or inpatient admission for stroke/TIA, the rate of another stroke/TIA revisit or readmission within 90 days remained at 6.6% in 2010/11 and 2011/12. Compared to other stroke subtypes, TIA patients had the highest rate of revisits or readmissions, at 8.3%.

- ✖ In 2010/11, non-designated hospitals consistently had the highest rate of readmission within 90 days (7.1%), compared with regional stroke centres (5.5%) and district stroke centres (6.9%) (p=0.0003). The North West LHIN had the lowest 90-day revisit/readmission rate in 2010/11 (3.8%) and the Central West LHIN had the highest (7.6%). This may be due to the fact that the Central West LHIN does not have a designated stroke centre or stroke prevention clinic.

Approximately 3,300 patients in Ontario have Alternate Level of Care days. At a cost of $600 per day,[3] reducing the median ALC length of stay by one day equals almost $2 million in savings.

Mortality

- ✓ Ontario's in-hospital 3-year risk-adjusted mortality rate among admitted stroke/TIA patients decreased significantly, from 13.8% in 2003/04–2005/06 to 11.3% in 2009/10–2011/12 (p<0.0001).

- ✓ The 3-year combined 30-day risk-adjusted mortality rate among patients admitted for stroke or TIA in Ontario declined from 15.8% in 2003/04–2005/06 to 13.5% in 2009/10–2011/12 (p<0.0001).

- ✓ Provincially, the 3-year combined risk-adjusted mortality rate at one year following admission for stroke/TIA declined from 27.5% in 2003/04–2005/06 to 25.3% in 2009/10–2010/11 (p<0.0001).

✓ There has been a relative decline in in-hospital, 30-day and 1-year mortality rates following admission for stroke/TIA (respectively 17.5%, 14.6% and 8.0%; p<0.0001). With approximately 15,000 stroke admissions per year, the absolute decrease in 1-year mortality of 2.2% would be expected to reflect 330 fewer deaths each year.

INTERPRETATION

There has been a reduction of almost one day in the median ALC length of stay for stroke/TIA patients between 2010/11 and 2011/12, which translates into a savings of 3,300 bed-days. There is still an opportunity to reduce ALC days and improve access for patients discharged to LTC, complex continuing care or home with services.

Acute care in-hospital admission rates and all-cause readmission rates have significantly improved. This, together with the overall decline in mortality rates over the nine years from 2003/04 to 2011/12, is a reflection of a mature, organized acute stroke system and an improvement in regions directing patients to designated stroke centres where they are more likely to have access to thrombolysis, stroke unit care, health care providers with expertise in stroke, and inpatient rehabilitation.

Interestingly, the readmission rates for stroke/TIA have not shown the same improvement. Stroke/TIA patients cared for at non-designated stroke centres have higher readmission and mortality rates than those seen at designated centres.

RECOMMENDATIONS

1. Efforts to consolidate care into specialized stroke centres should continue. The data support the view that patients admitted to designated stroke centres have better outcomes in relation to rates of readmission, mortality, ALC and having a confirmed diagnosis at discharge.

2. Local Health Integration Networks should work with Regional Stroke Networks to ensure patients are cared for in centres with appropriate stroke infrastructure.

3. The OSN should continue its work in support of the Stroke – Quality Based Procedures funding initiative of the Ministry of Health and Long-Term Care and Public Health Ontario. The standards of care identified by the OSN, if implemented, would support ongoing improvement in access to best practices, reducing ALC days and costs of care while improving patient flow and outcomes.

4. The OSN should monitor the impact of the Stroke – Quality Based Procedures funding initiative.

Inpatient Rehabilitation

Access

BEST PRACTICE RECOMMENDATIONS[17]

- All patients admitted to hospital with acute stroke should have an initial assessment by rehabilitation professionals as soon as possible after admission, preferably within the first 24 to 48 hours.

- The rehabilitation needs of survivors of a severe or moderate stroke should be reassessed weekly for the first month and then at intervals as indicated by their health status.

- Patients with moderate or severe stroke who are rehabilitation-ready and have rehabilitation goals should be given an opportunity to participate in inpatient stroke rehabilitation.

- Stroke patients should receive, through an individualized treatment plan, a minimum of three hours of direct task-specific therapy by the interprofessional stroke team for a minimum of five days per week.

- Early, supported discharge services provided by a well-resourced, coordinated and specialized interprofessional team are an acceptable alternative to more prolonged hospital stroke rehabilitation unit care and can reduce the length of hospital stay for selected patients.

- Patients should receive the intensity and duration of clinically relevant therapy defined in their individualized rehabilitation plan and appropriate to their needs and tolerance levels.

Wait Times

✓ The median wait time from stroke onset to admission into inpatient rehabilitation has declined from 13 days in 2003/04 to 10 days in 2010/11 and remains unchanged in 2011/12. There is wide variation in the time from stroke onset to inpatient rehabilitation admission across LHINs. Wait times tend to be longer for freestanding rehabilitation centres.

Admission Rates

◆ Provincially, admission to inpatient rehabilitation has remained stable from 2009/10 to 2011/12 at approximately 31.5%; however, there is wide variation across the LHINs. In 2011/12, the North West LHIN had the highest admission rate (39.1%) and the Central LHIN had the lowest (24.0%).

Patient Disability

✓ An increase in admission to inpatient rehabilitation has been observed for moderately disabled patients (from 40.6% in 2003/04 to 47.4% in 2011/12; p<0.0001).

✖ The proportion of severely disabled patients being admitted to inpatient rehabilitation in Ontario has increased from 31.6% in 2010/11 to 33.8% in 2011/12, yet is still lower than the 2003/04 rate of 36.1%. This indicates challenges with access to rehabilitation for severely disabled stroke survivors, particularly at freestanding rehabilitation centres where rates have dropped from 36.9% in 2003/04 to 26.2% in 2011/12.

✖ There has been little change in median admission Functional Independence Measure (FIM) scores over time (from 76 in 2003/04 to 77 in 2011/12).

Length of Stay

✓ Provincially, the total median LOS in inpatient rehabilitation has decreased from 31 days in 2003/04 to 28 in 2011/12. The proportion of days spent in Alternate Level of Care decreased from 6.6% in 2009/10 to 5.2% in 2011/12.

✓ The median LOS by Rehabilitation Patient Group (RPG) has decreased across the province in the past nine years, most dramatically among severely disabled stroke patients and minimally among mildly disabled stroke patients.

✖ Most LHINs are not meeting the RPG LOS targets.

Discharge Destination

✓ In Ontario, the proportion of patients discharged to long-term care has decreased from 13.5% in 2003/04 to 8.0% in 2011/12.

✖ The proportion of patients discharged to an acute care facility has increased from 5.8% in 2003/04 to 8.0% in 2011/12.

INTERPRETATION

Stroke patients are being admitted to and discharged from inpatient rehabilitation sooner (10 median days in 2011/12). The OSN has set a target of 5 median days by 2016/17.

These results have been achieved as the proportion of moderately disabled stroke patients being admitted to inpatient rehabilitation has increased from 40.6% in 2003/04 to 47.4% in 2011/12, while the proportion of severely disabled stroke patients admitted has declined slightly from 36.1% to 33.8% over the same period. Access to rehabilitation for the severely disabled stroke survivor is an ongoing challenge.[d]

The ongoing admission of mildly disabled stroke survivors to inpatient rehabilitation (18.7% of inpatient rehabilitation admissions) highlights the need for greater outpatient and community rehabilitation services.

d Overall, the proportion of stroke patients admitted to inpatient rehabilitation remained at 31.5% from 2009/10 to 2011/12, which is 6% to 10% lower than the expected rate.[27]

COMMUNITY STROKE REHABILITATION TEAMS IN THE SOUTH WEST LHIN

In 2009, the South West LHIN funded the Community Stroke Rehabilitation Teams (CSRT) initiative to deliver specialized rehabilitation services to rural communities. As part of the Aging at Home Strategy, the CSRT established three interprofessional rehabilitation teams, one in each of the LHIN's three planning areas (North, Central and South), consisting of a physiotherapist, occupational therapist, speech-language pathologist, social worker, registered nurse, therapeutic recreation specialist, and two rehabilitation therapists. The new model of care focuses on providing individualized in-home therapy to patients, incorporating a variety of rehabilitation needs into normal daily activities.

Through this initiative, the number of clients receiving rehabilitation has increased, and patients' acute care length of stay, ALC length of stay, and wait times for admission to rehabilitation have decreased. The majority of patients indicated that this initiative met their needs and allowed them to stay at home and return to family roles and social activities.

The OSN has recently determined target lengths of stay to deliver best practice stroke rehabilitation for all stroke Rehabilitation Patient Groups (*see* **Appendix L**). The 2011/12 results reveal that mildly disabled stroke patients (RPG 1160, 1150) exceed the expected best practice length of stays by 12.3 and 14 days, respectively. Among the moderately disabled stroke patients (RPG 1140, 1130, 1120), only RPG 1120 is meeting the best practice length of stay, and among the severely disabled stroke group, only RPG 1110 is meeting the best practice length of stay.

The recently released report *The Impact of Moving to Stroke Rehabilitation Best Practices*[3] provides an estimate of the improved outcomes and system savings associated with implementing these recommendations.

The reduction in patients being discharged to long-term care after inpatient rehabilitation may be due to the increased proportion of moderately disabled stroke patients, better outcomes, or improved discharge planning within inpatient rehabilitation.

RECOMMENDATIONS

1. More work is needed across the province to move mildly disabled stroke patients to outpatient programs and admit severely disabled stroke patients to inpatient rehabilitation where the intensity of rehabilitation required for optimal functional improvement can be achieved. Without access to rehabilitation services, they will continue to be a major source of acute care Alternate Level of Care (ALC) days and long-term care admissions. Stroke patients in complex continuing care have, on average, 7.5 acute care ALC days, compared to one such day for patients receiving inpatient rehabilitation. Rehabilitation programs should identify and reduce barriers to admission for patients with severe stroke, as evidence indicates these patients benefit from rehabilitation.

2. The implementation of early supported discharge and access to outpatient rehabilitation are necessary to achieve improved efficiency and the LOS targets for inpatient stroke rehabilitation. The OSN should monitor the LOS within RPG groups, as well as access to early supported discharge and outpatient programs, to determine uptake of stroke rehabilitation best practices.

3. The OSN should continue its work in support of the Stroke – Quality Based Procedures initiative of the MOHLTC and Health Quality Ontario. The standards of care for rehabilitation identified by the OSN, if implemented, would support ongoing improvement in access to best practices, reducing ALC days and costs of care while improving patient outcomes. In particular, the OSN should continue to monitor discharge from acute care facilities to stroke inpatient rehabilitation as the Stroke-QBP initiative begins to be implemented: ischemic stroke patients are to be discharged from acute care at day 5 and hemorrhagic stroke patients discharged at day 7.

4. To improve access to inpatient rehabilitation and facilitate decision-making, the OSN recommends the adoption of the AlphaFIM assessment, to be completed on day 3 post-stroke, and inclusion of this instrument in Resource Matching and Referral algorithms for admission to stroke rehabilitation. In addition, the OSN should continue to advocate for inclusion of the AlphaFIM assessment in the provincial Discharge Abstract Database.

5. The OSN should continue to work with the Canadian Institute for Health Information and the Ministry of Health and Long-Term Care to define a metric to monitor and evaluate the intensity of rehabilitation and ensure consistency in the measurement of functional improvement across rehabilitation sectors.

Complex Continuing Care

✓ From 2009/10 to 2011/12, time to complex continuing care (CCC) admission from acute care has decreased by 8 days, and the CCC LOS has decreased by 5 days. A minimal increase in the intensity of rehabilitation therapy has been observed.

✓ Fewer patients are being discharged to long-term care from CCC, while more are discharged home with services.

✖ There has been an increase in the proportion of patients being discharged back to an acute care setting.

✖ The prevalence of depression among stroke patients admitted to and staying at least three months in CCC has increased over time from 14.6% at initial assessment to 20.1% at 3 months (p=0.008).

INTERPRETATION

The shorter time to admission and LOS in CCC facilities may contribute to the increase in discharges back to an acute care setting.

RECOMMENDATIONS

1. More investigation is needed to assess the stroke patient population receiving care in CCC facilities in order to identify those who may benefit from more intensive rehabilitation as hospital inpatients.

2. Further research is required to better understand post-stroke depression and its treatment, as well as access to specialized mental health services in complex continuing care CCC and across the care continuum.

In Ontario, the median total length of stay for inpatient rehabilitation has decreased by three days since 2003/04. This reduction was achieved without significant changes to the FIM efficiency or discharge scores over the same period. It approximates to savings of 10,500 patient days and an estimated $6.2 million.[27]

3. The OSN should continue to work with the Canadian Institute for Health Information and the Ministry of Health and Long-Term Care to define a metric to monitor and evaluate the intensity of rehabilitation and ensure consistency in the measurement of functional improvement across rehabilitation sectors.

Community Care

✖ The number of stroke patients referred to Community Care Access Centre (CCAC) rehabilitation in the province is increasing, but the proportion receiving CCAC-based rehabilitation has declined from 57.8% in 2006/07–2007/08 to 50.6% in 2010/11–2011/12.

ENHANCED REHABILITATION SERVICES IN SOUTHEASTERN ONTARIO: THE DISCHARGE LINK

In 2009, a community-based rehabilitation services initiative in the South East LHIN called the "Discharge Link" aimed to enhance the intensity and timeliness of community-based rehabilitation therapy for stroke survivors living in this largely rural region. The initiative also sought to improve health system utilization, maximize patient outcomes and increase interprofessional collaboration and stroke expertise.

Through the Discharge Link, eligible patients receive timely rehabilitation therapy with enhanced intensity for the first two months following their hospital discharge, with the highest intensity provided in the first month. The mean number of CCAC visits in the South East LHIN was 10.9 in 2010/11–2011/12, compared to the provincial benchmark of 7.9 (data from the 2010/11 and 2011/12 Ontario Stroke Report Cards). For patients in the South East LHIN referred to the Discharge Link program from an inpatient rehabilitation setting, CCAC rehabilitation intensity increased from 16.4 rehabilitation visits to 25.6 visits in the first three months.

To increase the timeliness of rehabilitation services, therapists initiate rehabilitation for stroke patients within 5 days of hospital discharge. The wait time for rehabilitation services has decreased from 44.0 to 4.4 days. The mean active length of acute care and rehabilitation hospital stay has decreased by 15.7 days without any negative impact on functional outcomes at hospital discharge; a positive impact has been observed in FIM efficiency. Readmission rates have been lower for patients discharged from acute care who received enhanced CCAC rehabilitation service. These positive results have led to sustained LHIN funding in the South East CCAC base budget for ongoing delivery of the enhanced rehabilitation services.

Results are from the South East LHIN's evaluation of the Discharge Link initiative (2009 to the present). For more information about the Discharge Link, contact Caryn Langstaff, Regional Stroke Rehabilitation Coordinator for the Stroke Network of Southeastern Ontario at 613-549-6666 ext. 6841, or at **langstac@kgh.kari.net**.

- The proportion of stroke patients receiving CCAC rehabilitation services varied from 29.0% in the North East LHIN to 73.0% in the South East LHIN.
- There has been very little change in wait times for patients receiving CCAC-based rehabilitation between 2009/10 and 2011/12 (approximately 15 median days). Across LHINs, the time to the first CCAC rehabilitation visit varied from 7 days in the Central West LHIN to 25 days in the North Simcoe Muskoka LHIN.
- CCAC services to stroke patients have declined over time with the exception of care provided by personal support workers. The average number of rehabilitation service visits (for occupational therapy, physiotherapy, speech therapy or social work) per patient has declined from 6.9 visits over 180 days in 2006/07–2007/08 to 5.7 visits over 180 days in 2010/11–2011/12. The variation in the average number of CCAC rehabilitation visits varied from 4 in the Toronto Central and North West LHINs to 10.9 in the South East LHIN. The benchmark is a mean of 7.9 rehabilitation visits per client *(see supplementary exhibit 6.2s at* **www.ices.on.ca***)*.

INTERPRETATION

Only 50% of stroke/TIA patients received CCAC-based rehabilitation therapy, and the intensity of therapy was not sufficient to obtain optimal functional outcomes. However, due to the lack of standardized measures of functional outcomes, the effectiveness of CCAC rehabilitation services is unknown.

Overall, there has been no notable improvement in CCAC services. The work of the Ontario Association of CCACs in developing a stroke pathway and plans to develop quality-based funding for community services could assist in addressing the significant gaps in service. The pathway will need to address wait times, the proportion of stroke patients referred to CCAC rehabilitation services and the intensity of those services in order to support best practices in stroke rehabilitation.

RECOMMENDATIONS

1. The OSN should continue to work through the Stroke – Quality Based Procedures process to establish best practices and appropriate funding for CCAC rehabilitation services that could potentially improve patient flow and reduce rates of readmission to hospitals and admission to long-term care.
2. The OSN should continue to collaborate with the Ontario Association of Community Care Access Centres on the development of the Stroke Outcome-Based Pathway to support uptake of best practices by CCAC service providers.
3. Successful models of community rehabilitation services in the South East and South West LHINs should be shared and used to inform models of care that will enhance community services.

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EXHIBIT 5.4B Median length of stay in inpatient rehabilitation by adult stroke patients with mild disability, in Ontario and by Local Health Integration Network, 2011/12

EXHIBIT 5.4C Median length of stay in inpatient rehabilitation by adult stroke patients with moderate disability, in Ontario and by Local Health Integration Network, 2011/12

EXHIBIT 5.4D Median length of stay in inpatient rehabilitation by adult stroke patients with severe disability, in Ontario and by Local Health Integration Network, 2011/12

EXHIBIT 5.5 Characteristics of adult patients admitted to complex continuing care following an acute care inpatient stroke/TIA discharge, in Ontario and by Local Health Integration Network, 2008/09–2010/11

EXHIBIT 5.6 Characteristics of adult patients admitted to complex continuing care following an acute care inpatient stroke/TIA discharge, in Ontario, 2008/09–2010/11, and assessed 3 months after the initial assessment

6. Home Care Services

EXHIBIT 6.1 Length of time to provision of Community Care Access Centre support services to adult home care clients (active and new) following an acute care hospitalization for stroke, in Ontario and by sex and Local Health Integration Network, 2006/07–2011/12

EXHIBIT 6.1A Proportion of adult stroke home care clients receiving Community Care Access Centre support services, in Ontario and by sex, 2006/07 and 2008/09–2011/12

EXHIBIT 6.1B Proportion of adult stroke home care clients receiving Community Care Access Centre rehabilitation services in Ontario, by service type, 2010/11–2011/12

7. Patient Outcomes

EXHIBIT 7.1 Age- and sex-adjusted stroke/TIA-related revisit or readmission rates within 30 days following a stroke or transient ischemic attack, in Ontario and by stroke type, Ontario Stroke System designation and Local Health Integration Network, 2003/04 and 2009/10–2011/12

EXHIBIT 7.2 Age- and sex-adjusted stroke/TIA-related revisit or readmission rates within 90 days following a stroke or transient ischemic attack, in Ontario and by stroke type, Ontario Stroke System designation and Local Health Integration Network, 2003/04 and 2008/09–2010/11

EXHIBIT 7.3 Age- and sex-adjusted all-cause readmission rates within 30 days following a stroke or transient ischemic attack, in Ontario and by stroke type, Ontario Stroke System designation and Local Health Integration Network, 2003/04 and 2009/10–2011/12

EXHIBIT 7.4 Risk-adjusted in-hospital mortality rates among adult patients following a stroke or transient ischemic attack, in Ontario and by Ontario Stroke System designation and Local Health Integration Network, based on a 3-year combined rate for 2003/04–2005/06, 2006/07–2008/09 and 2009/10–2011/12

EXHIBIT 7.5 Risk-adjusted mortality rates at 30 days following a stroke or transient ischemic attack, in Ontario and by Ontario Stroke System designation and Local Health Integration Network, based on a 3-year combined rate for 2003/04–2005/06, 2006/07–2008/09 and 2009/10–2011/12

EXHIBIT 7.5A Risk-adjusted in-hospital mortality rates at 30 days following a stroke or transient ischemic attack in Ontario, 2003/04 and 2009/10–2011/12

EXHIBIT 7.6 Risk-adjusted mortality rates at 1 year following a stroke or transient ischemic attack, in Ontario and by Ontario Stroke System designation and Local Health Integration Network, based on a 3-year combined rate for 2003/04–2005/06 and 2006/07–2008/09 and a 2-year combined rate for 2009/10–2010/11

EXHIBIT 7.6A Risk-adjusted mortality rates at 1 year following a stroke or transient ischemic attack, in Ontario and by Ontario Stroke System designation, 2003/04–2005/06, 2006/07–2008/09 and 2009/10–2010/11

EXHIBIT 7.6B Risk-adjusted mortality rates at 1 year following a stroke or transient ischemic attack, in Ontario and by Local Health Integration Network, 2009/10–2010/11

Adult Stroke

1 Stroke Risk Factors

EXHIBIT 1.1A Stroke risk factor prevalence, in Ontario and by sex, 2011

Key Findings

- In Ontario, the self-reported prevalence of stroke risk factors among adults aged 20 and older indicated that overweight/obesity was the most prominent stroke risk factor (50.7%), followed by smoking (19.9%), hypertension (15.0%) and diabetes (5.5%).
- In 2011, 19.9% of Ontarians reported they were current smokers, with rates higher among men than women (24.4% vs. 15.7%).
- Differences between men and women in rates of self-reported diabetes and hypertension were minimal, but rates of self-reported overweight/obesity and smoking were higher among men than women (58.0% vs. 43.5% and 24.4% vs. 15.7%, respectively).

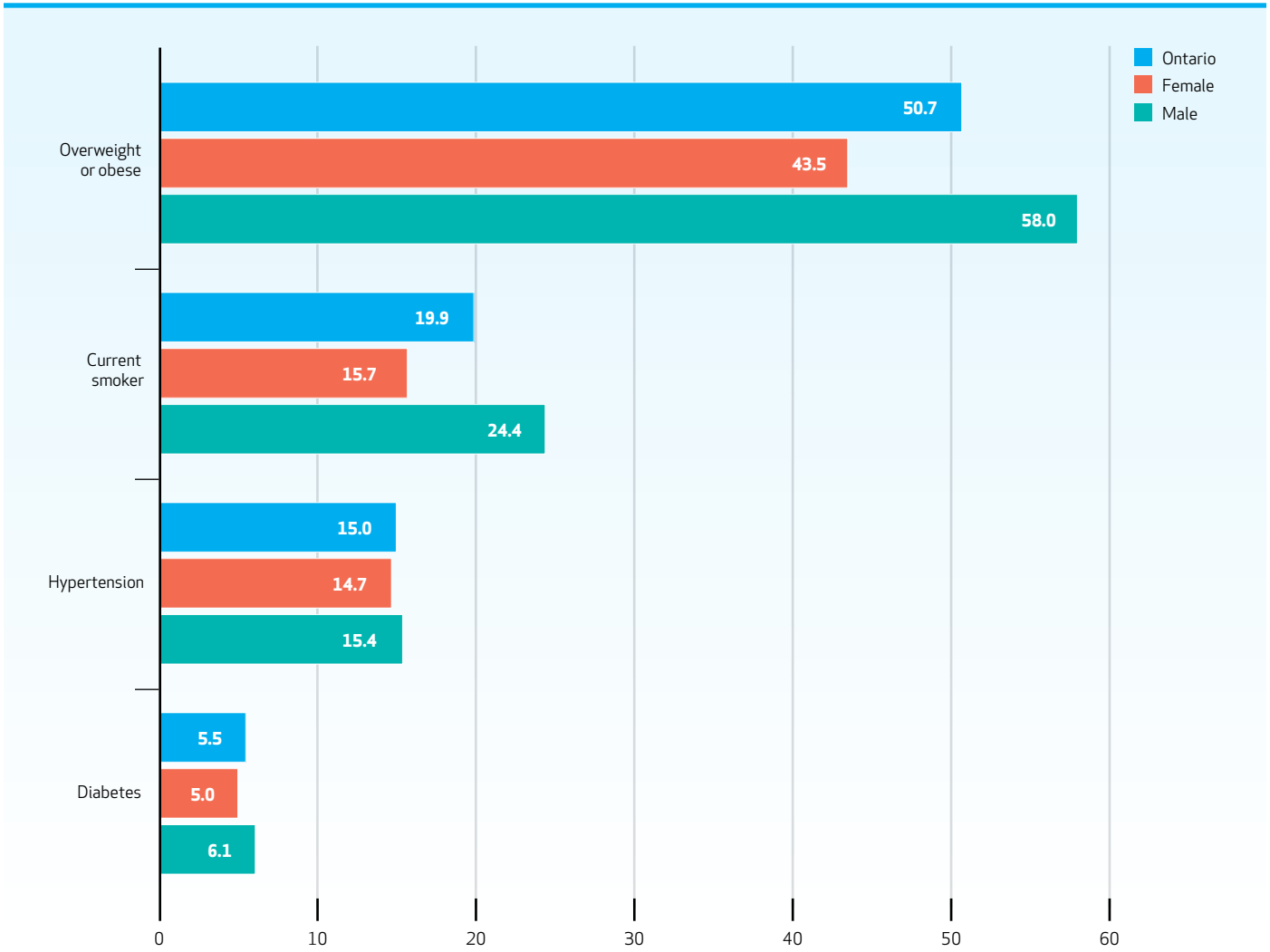


EXHIBIT 1.2A Proportion of self-reported overweight and obese adults, in Ontario and by age group and sex, 2011

Key Findings

- In 2011, the prevalence of overweight or obesity among Ontarians aged 20 and older was 50.7%. Those aged 45–64 had the highest prevalence (59.9%), followed by those aged 65 and older (58.3%).
- The prevalence of obesity was significantly higher among men than women across all age groups.
- The prevalence of overweight or obese women steadily increased with age.

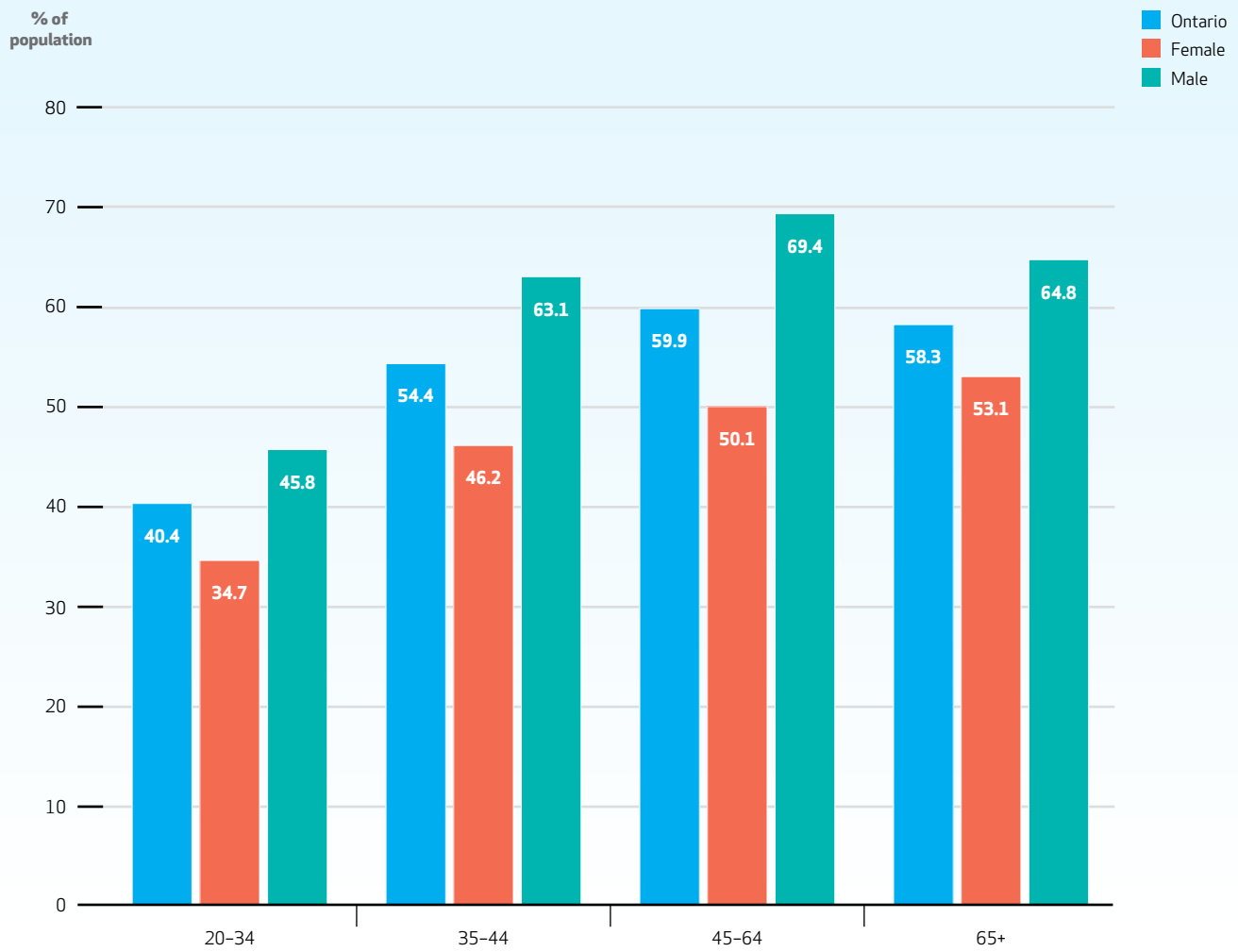


EXHIBIT 1.2B Proportion of self-reported overweight and obese adults, in Ontario and by Local Health Integration Network and age group, 2011

Key Finding

- The Hamilton Niagara Haldimand Brant LHIN had the highest prevalence of overweight/obesity among adults aged 45–64 (71.6%), while the Toronto Central LHIN had the lowest (49.2%).

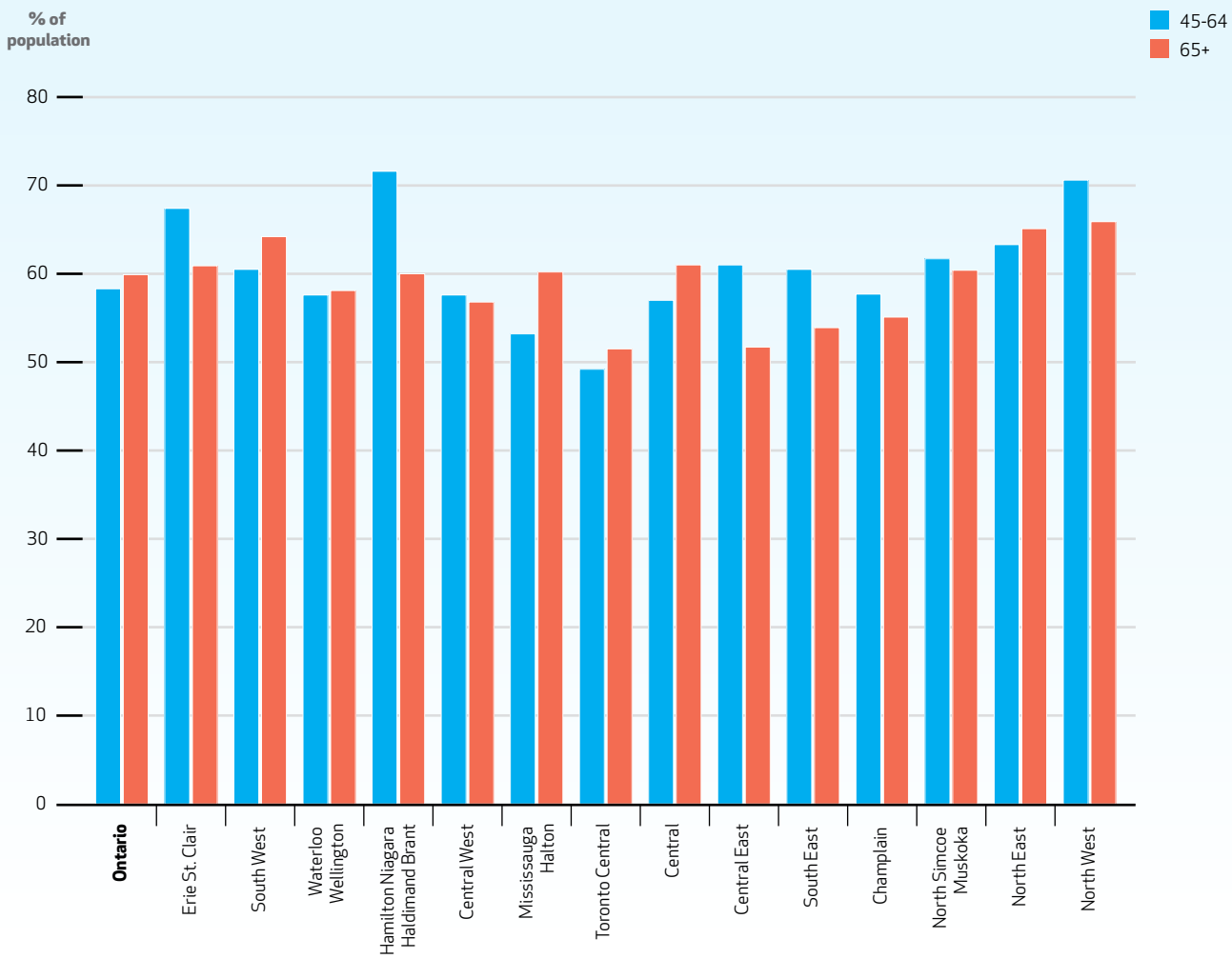


EXHIBIT 1.3A Proportion of adults who are current smokers, in Ontario and by age group and sex, 2011

Key Findings

- Adults aged 20–34 had the highest prevalence of smokers (26.5%), followed by those aged 35–44 (24.7%), 45–64 (21.0%), and 65 and older (9.6%).
- Smoking rates were highest for men aged 35–44 (32.5%) and for women aged 20–34 (21.3%).

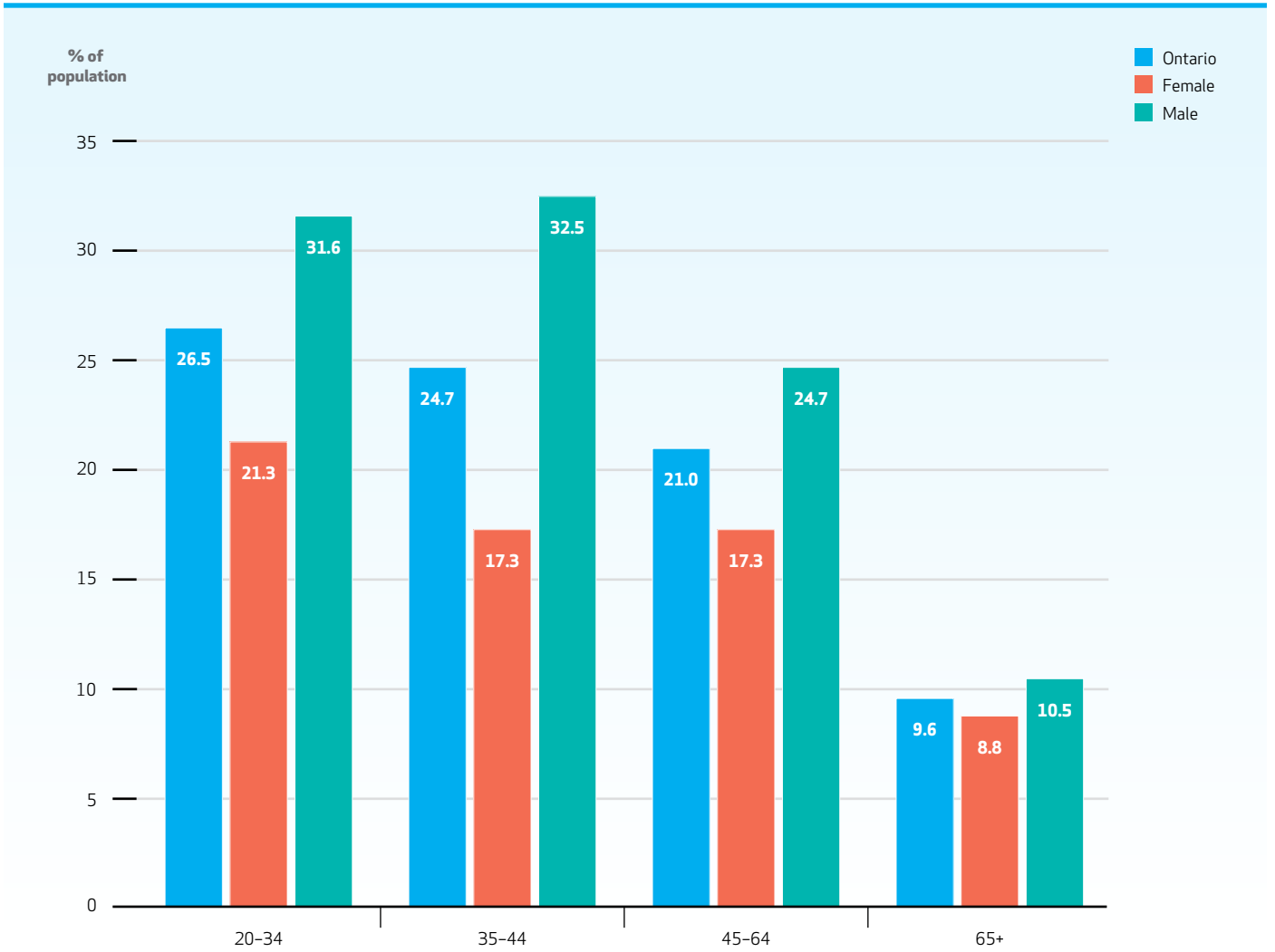
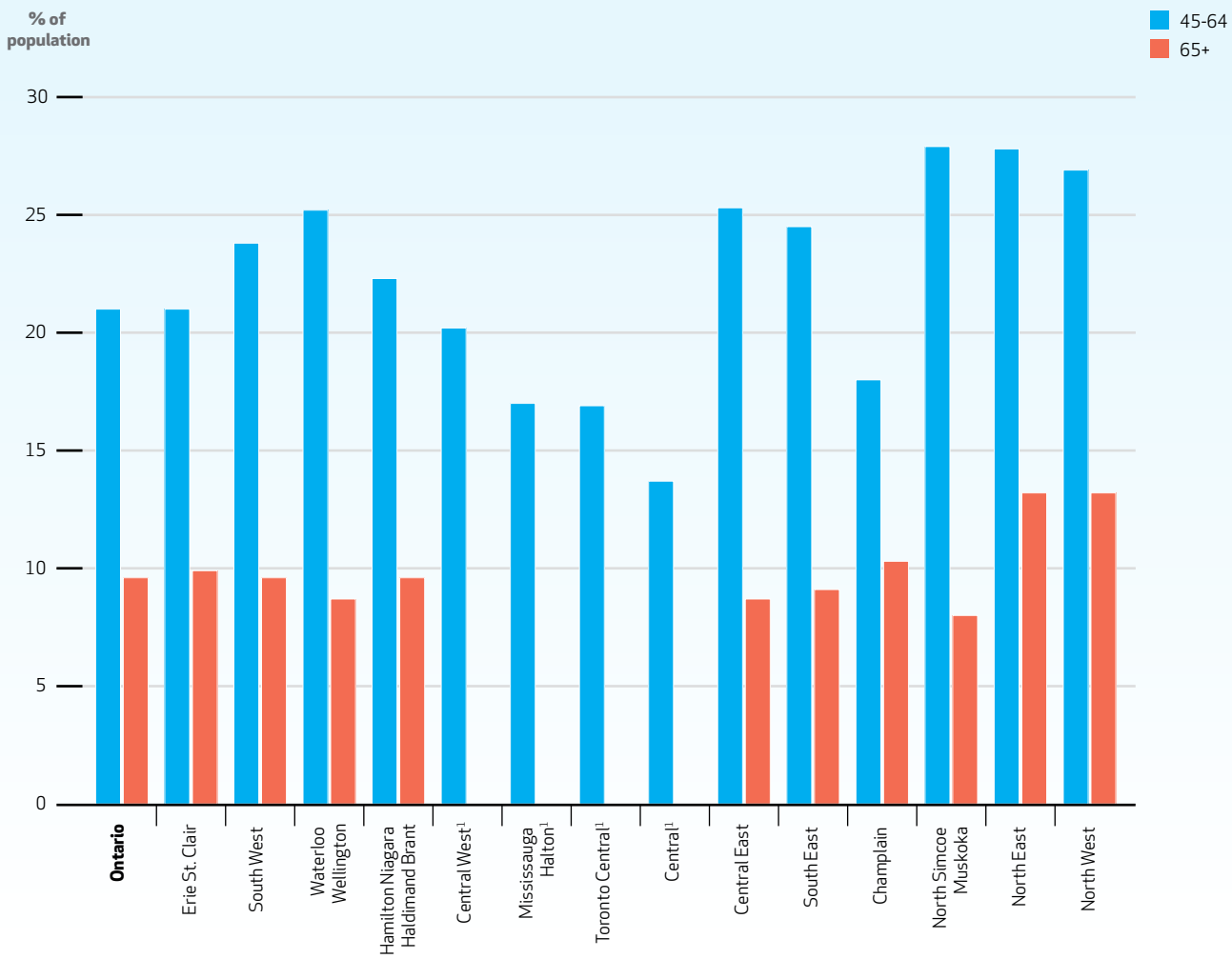


EXHIBIT 1.3B Proportion of adults who are current smokers, in Ontario and by Local Health Integration Network and age group, 2011

Key Findings

- Smoking rates among adults aged 45–64 ranged from 13.7% in the Central LHIN to 27.9% in the North Simcoe Muskoka LHIN.
- Across all LHINs, the proportion of reported current smokers among adults aged 65 and older was dramatically lower than for those aged 45–64.



1 Data too unreliable to publish.

EXHIBIT 1.4A Proportion of adults diagnosed with hypertension, in Ontario and by sex and age group, 2011

Key Findings

- In 2011, 15.0% of Ontario adults 20 years of age and older reported being diagnosed with hypertension, with prevalence increasing with age.
- The prevalence of hypertension among adults aged 65 and older was two times higher than among those aged 45–64 (51.1% vs. 25.1%).
- Among adults younger than 65 years of age, hypertension was more prevalent among men than women, but among those aged 65 and older, there was minimal gender difference (50.7% for men vs. 51.4% for women).

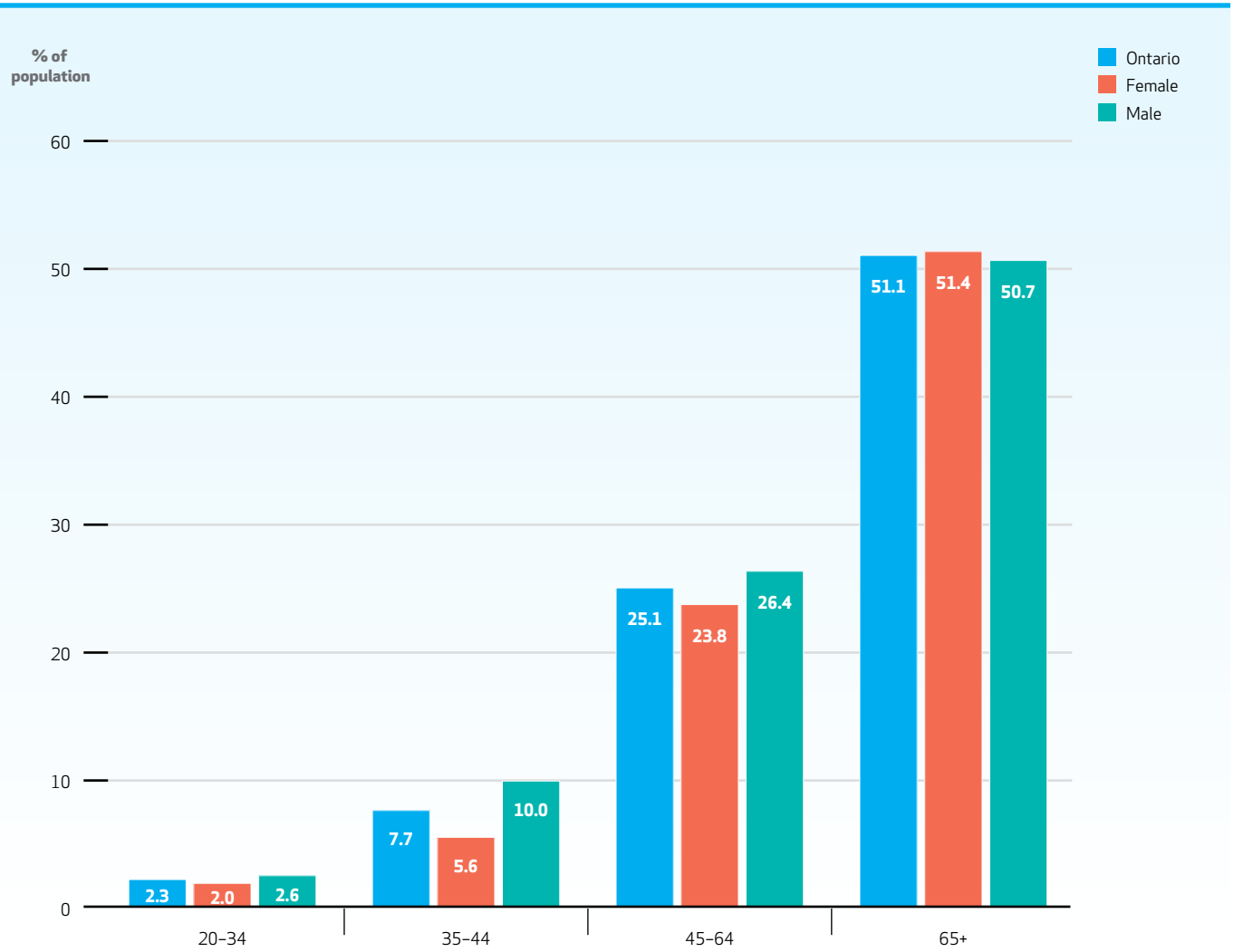


EXHIBIT 1.4B Proportion of adults diagnosed with hypertension, in Ontario and by Local Health Integration Network and age group, 2011

Key Finding

- For adults aged 65 and older, the Central West LHIN had the lowest prevalence of self-reported hypertension at 41.1% and the Mississauga Halton LHIN had the highest prevalence at 58.6%.

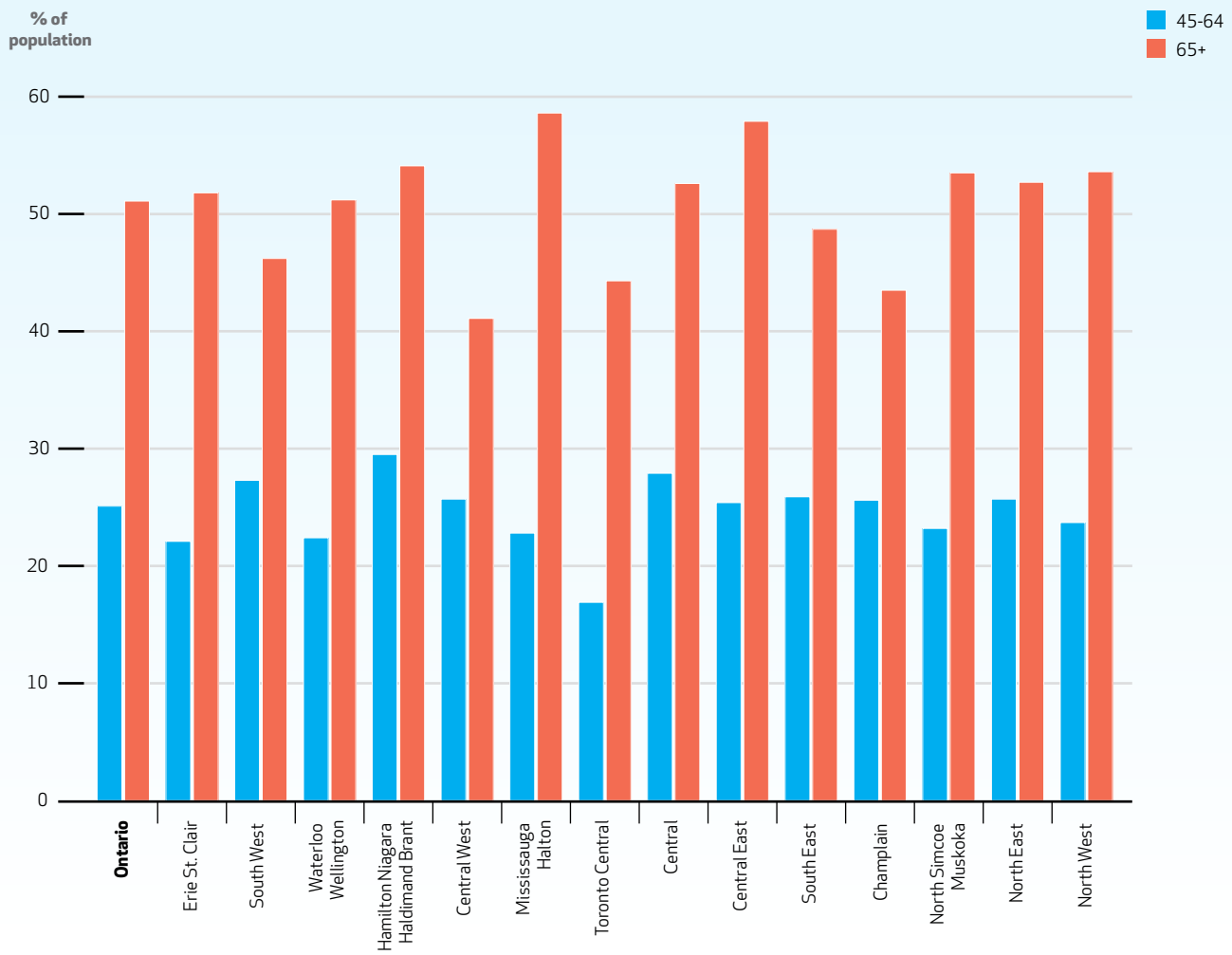


EXHIBIT 1.5A Proportion of adults diagnosed with diabetes, in Ontario and by sex, 2011

Key Findings

- In 2011, 5.5% of adults aged 20 and older reported being diagnosed with diabetes in Ontario, with the prevalence highest among those aged 65 and older (17.8%).
- Diabetes is more prevalent among men than women (6.1% vs. 5.0%).

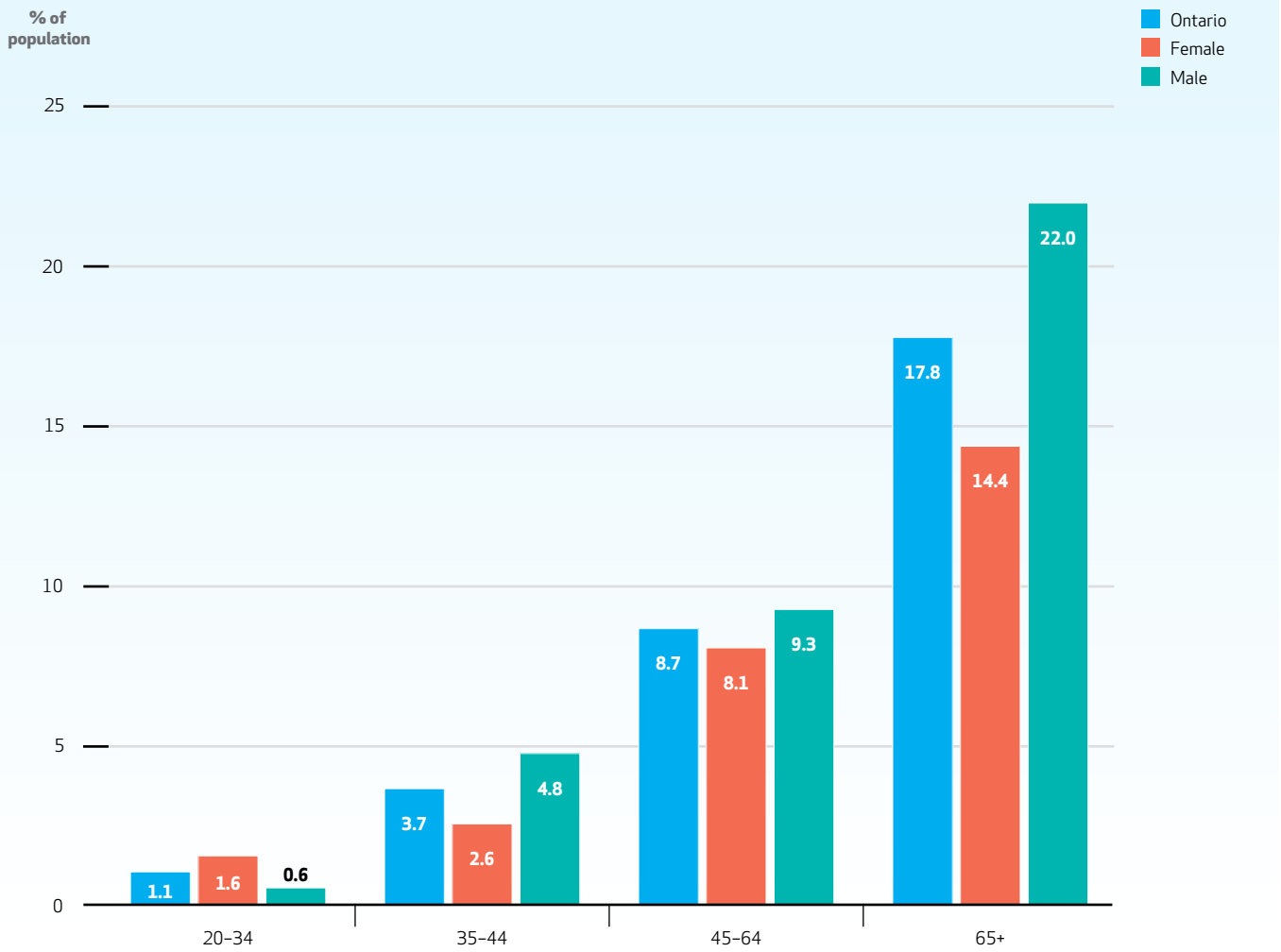
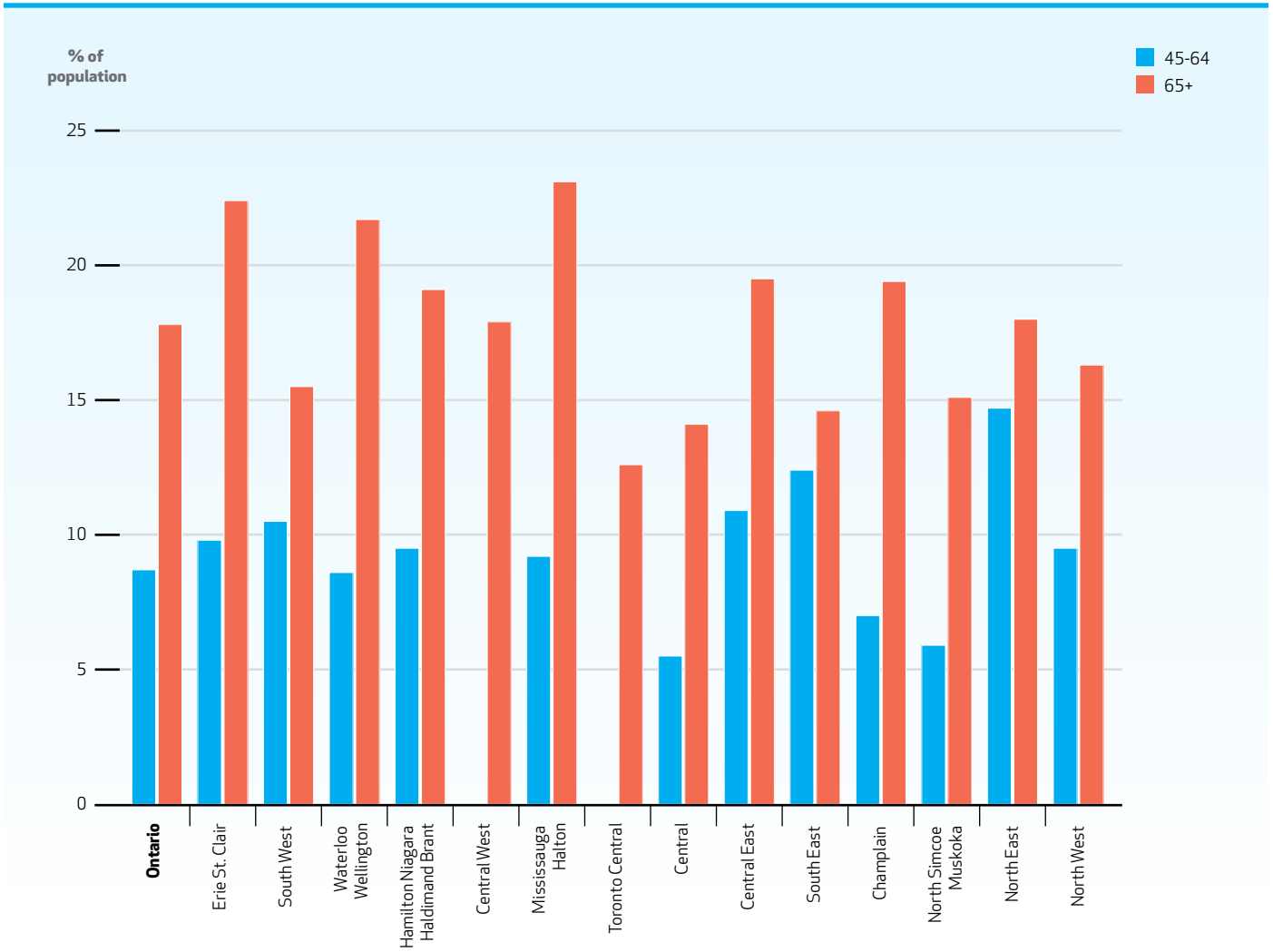


EXHIBIT 1.5B Proportion of adults diagnosed with diabetes, in Ontario and by Local Health Integration Network and age group, 2011

Key Finding

- There was a twofold variation in the prevalence of diabetes across the LHINs among adults aged 65 and older, ranging from 12.6% in the Toronto Central LHIN to 23.1% in the Mississauga Halton LHIN.



Stroke Risk Factors

CONCLUSIONS AND RECOMMENDATIONS

In 2010/11, 5 in 10 adults had at least one of the following stroke risk factors: being overweight or obese, smoking, hypertension and diabetes. The prevalence of smoking decreases with age, while the prevalence of overweight/obesity, hypertension and diabetes increases with age. Compared to the results of the 2003 report *Growing Burden of Heart Disease and Stroke in Canada*,[28] the proportion of adults who reported having hypertension has remained unchanged since 2000 (14.9% vs. 15.0% in 2011), and the percentage who reported having diabetes has increased from 4.8% in 2000 to 5.5% in 2010/11.

The prevalence of overweight and obese adults 20 years of age and older in Ontario is high (50.7%). This amounts to more than five million Ontarians, and the number is likely higher since the percentage is based on a BMI calculated from self-reported height and weight and it has been estimated the prevalence of obesity is 7% higher when BMI is based on clinically measured height and weight.[29] Obesity is associated with other stroke risk factors, such as hypertension and diabetes, and addressing overweight/obesity in the population would have the effect of lowering the incidence of both hypertension and diabetes. Unfortunately, the success of primary and secondary obesity prevention strategies is moderate to weak in terms of evidence for modifiability.[30]

The variation in risk factor prevalence across LHINs supports the need for defining region-specific priorities. Efforts to reduce the prevalence of all stroke risk factors should take both individual and population-based approaches.

2 Secondary Prevention Care

EXHIBIT 2.1 Characteristics of secondary stroke prevention clinics , in Ontario and by Local Health Integration Network, 2011/12

Key Findings

- Forty secondary prevention clinics (SPCs) were included in the 2011/12 Ontario Stroke Audit of Secondary Prevention Clinics (OSA-SPC). Of these, 27 were located in designated stroke centres (11 in regional stroke centres and 16 in district stroke centres).
- Thirteen clinics were open full-time (40 hours or more per week) and 27 operated on a part-time basis. Of the part-time clinics, 3 were open 5 days per week with reduced hours, 11 were open 3 or 4 days per week, and 13 were open 1 or 2 days per week (data not shown).
- The majority (90.0%) of SPCs were located in urban centres, and most (75.0%) were in large community hospitals.
- Every clinic indicated that they provided some form of education to patients, either in group classes or individually in one-on-one counselling sessions or phone calls. The education included topics such as risk factor management, nutrition, smoking cessation, psychosocial needs, health care system navigation, medication, and blood pressure monitoring. Patients were also referred to other programs (diabetes programming, dieticians, registered massage, physiotherapy, cardiac rehabilitation, etc.) when necessary.
- Models of care varied substantially across clinics. Most clinics are staffed by a nurse or nurse practitioner, in addition to administrative support; neurologists, physiatrists, and/or internists are called in or referred to as needed. In many cases, patients are seen by the nurse at the initial visit to obtain health history information and provide risk factor management, and then by a neurologist or other health care provider. In the North West LHIN, the majority of patients have an initial visit at the regional stroke centre SPC, with follow-up at the smaller community-based SPC in the region.
- About three-quarters of clinics indicated that they include regular follow-up as part of their model of care.

Group/Subgroup	Ontario Stroke System designation			Ministry funded SPC[2]	Hours of operation		Annual visits	Location		Ontario hospital peer group			CT[6] onsite	MRI[7] onsite
	Regional stroke centre SPC	District stroke centre SPC	Community hospital SPC		Part-time[3]	Full-time[4]		Urban	Rural[5]	Large community	Small community	Academic		
Ontario[1]	11	16	13	33	27	13	16,788	36	4	30	1	8	38	29
Local Health Integration Network														
1. Erie St. Clair	0	3	0	3	3	0	1,413	3	0	3	0	0	3	3
2. South West	1	2	0	3	2	1	1,285	3	0	2	0	1	3	2
3. Waterloo Wellington	0	1	0	1	0	1	746	1	0	1	0	0	1	1
4. Hamilton Niagara Haldimand Brant	1	3	1	5	3	2	1,972	5	0	3	0	2	5	4
5. Central West	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6. Mississauga Halton	1	0	0	1	0	1	1,684	1	0	1	0	0	1	1
7. Toronto Central	3	0	0	2	2	1	2,364	3	0	0	0	3	3	3
8. Central	0	1	2	0	0	3	1,146	3	0	3	0	0	3	3
9. Central East	0	1	2	1	1	2	1,552	3	0	2	0	0	2	2
10. South East	1	1	2	4	4	0	971	3	1	3	0	1	4	2
11. Champlain	1	1	2	3	3	1	1,853	4	0	3	0	1	4	2
12. North Simcoe Muskoka	1	0	0	1	1	0	499	1	0	1	0	0	1	1
13. North East	1	3	0	4	4	0	678	4	0	4	0	0	4	4
14. North West	1	0	4	5	4	1	625	2	3	4	1	0	4	1

1 Based on a survey of secondary prevention clinic resources in January 2013; includes only those institutions whose records were abstracted in the 2011/12 Ontario Stroke Audit of Secondary Prevention Clinics (N = 40).

2 SPC receives some funding from the Ministry of Health and Long-Term Care to support operations.

3 Open less than 40 hours per week.

4 Open at least 40 hours per week (Monday to Friday, 8 AM to 4 PM or 9 AM to 5 PM).

5 Defined as populations outside of settlements of 1,000 or more residents with a population density of 400 or more inhabitants per square kilometre (Statistics Canada, 2007).

6 Computed tomography scanner.

7 Magnetic resonance imaging equipment.

Notes:

(1) Royal Victoria Hospital is included as a regional stroke centre; Hôtel-Dieu Grace Hospital is included as a district stroke centre.

(2) Peterborough Vascular Health Network is not affiliated with Peterborough Regional Hospital, which is a district stroke centre.

(3) The Willett Hospital and Norfolk General Hospital SPCs are staffed and operated by Brant Community Healthcare System – Brantford site, and have been designated as district stroke centres due to this affiliation.

EXHIBIT 2.1A Number of visits to secondary stroke prevention clinics in Ontario, by Local Health Integration Network, 2011/12

Key Finding

- Of the LHINs with SPCs, Toronto Central had the highest number of annual visits (2,364), and North Simcoe Muskoka had the lowest (499).

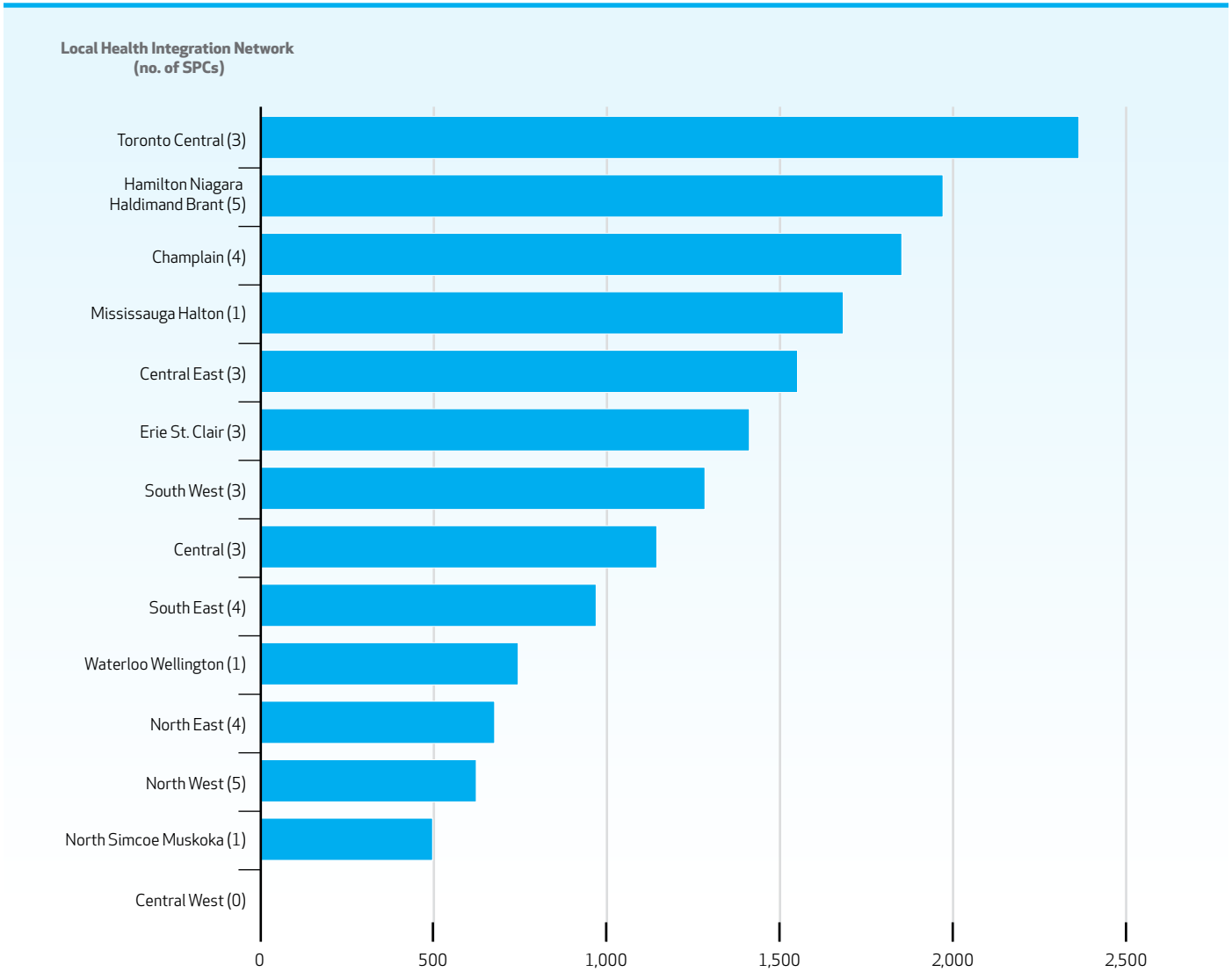


EXHIBIT 2.1B Proportion of visits to secondary stroke prevention clinics in Ontario, by Ontario Stroke System designation, 2011/12

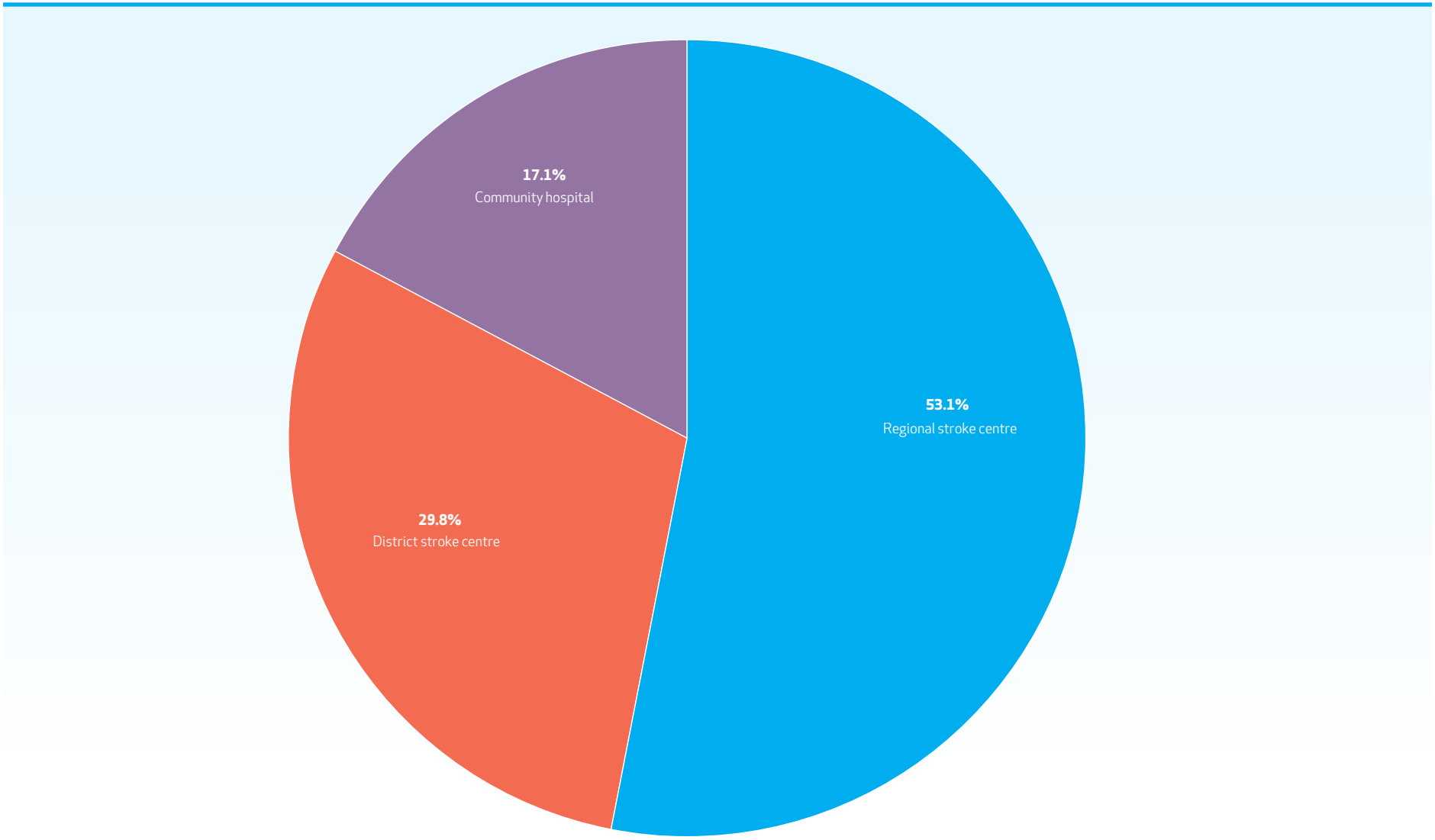


EXHIBIT 2.2 Age at initial visit, reason for referral and referral source of patients visiting secondary stroke prevention clinics, in Ontario and by sex, Ontario Stroke System designation and Local Health Integration Network, 2011/12

Key Findings

- In Ontario, the median age of patients referred to SPCs was 68.5 years; women represented 51.7% of referrals.
- Query stroke (i.e., diagnosis unknown) referrals were most common at community hospital SPCs (79.5%), followed by district stroke centre SPCs (62.6%) and regional stroke centre SPCs (59.8%).
- Women were more likely than men to have query stroke as the reason for referral (66.7% vs. 60.6%).
- Provincially, 65.3% of SPC referrals arose from hospitals and only 27.0% from primary care.
- The majority of hospital-based referrals were from emergency physicians (52.9%). Patients with referrals from emergency physicians were most often seen at community hospital SPCs (67.5%), followed by district stroke centre SPCs (55.1%) and regional stroke centre SPCs (47.5%).
- There was substantial variation in referral reason and referral source across LHINs. The Toronto Central and North West LHINs had the highest hospital/inpatient care referral source at 32.2% and 31.2%, respectively, compared to a low of 1.0% in the Mississauga Halton LHIN.
- SPCs in the Erie St. Clair LHIN had the highest proportion of referrals from emergency physicians (67.7%) and SPCs in the Toronto Central LHIN had the lowest (31.0%).
- SPCs in the North West LHIN were most likely to cite routine follow-up care as the reason for referral (21.8%); for all other LHINs, routine follow-up care accounted for fewer than 10% of referrals.
- Query stroke/TIA (i.e., diagnosis unknown) as a reason for SPC referral varied from a high of 87.2% in the North Simcoe Muskoka LHIN to a low of 32.7% in the Waterloo Wellington LHIN.

Group/Subgroup	Ontario	Female	
Patients[1], N	16,167	8,364	
Age at Initial SPC Visit			
Mean ± SD	67.2 ± 14.3	67.4 ± 15.1	
Median (IQR)	68.5 (57.4, 78.4)	69.0 (57.1, 79.4)	
Patients[2], N	16,487	8,522	
Referral Reason , n (%)			
New or recent stroke/TIA	4,112 (24.9)	1,939 (22.8)	
Remote stroke/TIA (>180 days)	346 (2.1)	168 (2.0)	
Query stroke/TIA (diagnosis unclear)	10,510 (63.7)	5,680 (66.7)	
Abnormal imaging (not related to sentinel event)	180 (1.1)	103 (1.2)	
Asymptomatic carotid artery disease	173 (1.0)	74 (0.9)	
Routine follow-up post hospital discharge	667 (4.0)	290 (3.4)	
Other	499 (3.0)	268 (3.1)	
Referral Source , n (%)			
Emergency physician	8,729 (52.9)	4,649 (54.6)	
Family care provider[3]	4,449 (27.0)	2,365 (27.8)	
Hospitalist/inpatient care	2,038 (12.4)	897 (10.5)	
Other medical specialist[4]	1,271 (7.7)	611 (7.2)	

		Ontario Stroke System designation			Local Health Integration Network													
	Male	Regional stroke centre SPC	District stroke centre SPC	Community hospital SPC	1. Erie St. Clair	2. South West	3. Waterloo Wellington	4. Hamilton Niagara Haldimand Brant	5. Central West	6. Mississauga Halton	7. Toronto Central	8. Central	9. Central East	10. South East	11. Champlain	12. North Simcoe Muskoka	13. North East	14. North West
	7,803	8,703	4,944	2,520	1,391	1,272	742	1,927	-	1,660	2,310	829	1,540	960	1,758	498	672	608
	67.0 ± 13.5	66.5 ± 14.7	68.1 ± 13.7	67.9 ± 14.1	67.6 ± 14.4	67.2 ± 14.6	67.8 ± 13.4	68.1 ± 13.9	-	65.8 ± 14.6	65.6 ± 15.3	68.0 ± 14.0	68.0 ± 13.9	68.4 ± 13.0	67.2 ± 14.7	67.3 ± 14.8	67.1 ± 13.6	67.0 ± 13.9
	68.1 (57.8, 77.4)	67.7 (56.5, 78.0)	69.5 (58.6, 78.9)	69.2 (58.6, 79.0)	69.1 (58.0, 78.7)	69.0 (57.7, 78.8)	69.5 (57.9, 78.2)	70.1 (58.7, 79.0)	-	67.1 (55.2, 77.4)	66.5 (55.9, 77.6)	68.1 (58.5, 80.0)	69.4 (58.7, 78.8)	69.4 (60.1, 78.6)	68.5 (56.5, 78.6)	69.6 (58.1, 78.5)	68.2 (57.5, 77.6)	67.8 (56.8, 78.2)
	7,965	8,909	5,004	2,574	1,413	1,285	746	1,969	-	1,684	2,364	849	1,552	971	1,853	499	677	625
	2,173 (27.3)	2,269 (25.5)	1,457 (29.1)	386 (15.0)	302 (21.4)	525 (40.9)	439 (58.8)	332 (16.9)	-	56 (3.3)	817 (34.6)	75 (8.8)	323 (20.8)	149 (15.3)	620 (33.5)	36 (7.2)	325 (48.0)	113 (18.1)
	178 (2.2)	263 (3.0)	65 (1.3)	18 (0.7)	6 (0.4)	27 (2.1)	9 (1.2)	34 (1.7)	-	6 (0.4)	156 (6.6)	9 (1.1)	16 (1.0)	12 (1.2)	48 (2.6)	**	13 (1.9)	7 (1.1)
	4,830 (60.6)	5,330 (59.8)	3,134 (62.6)	2,046 (79.5)	1,024 (72.5)	702 (54.6)	244 (32.7)	1,434 (72.8)	-	1,451 (86.2)	955 (40.4)	677 (79.7)	1,138 (73.3)	759 (78.2)	1,032 (55.7)	435 (87.2)	327 (48.3)	332 (53.1)
	77 (1.0)	149 (1.7)	16 (0.3)	15 (0.6)	**	**	**	15 (0.8)	-	32 (1.9)	76 (3.2)	**	10 (0.6)	**	29 (1.6)	-	**	**
	99 (1.2)	139 (1.6)	21 (0.4)	13 (0.5)	6 (0.4)	**	**	43 (2.2)	-	13 (0.8)	47 (2.0)	**	**	**	41 (2.2)	**	**	**
	377 (4.7)	424 (4.8)	206 (4.1)	37 (1.4)	43 (3.0)	19 (1.5)	37 (5.0)	63 (3.2)	-	**	230 (9.7)	75 (8.8)	7 (0.5)	19 (2.0)	12 (0.6)	22 (4.4)	**	136 (21.8)
	231 (2.9)	335 (3.8)	105 (2.1)	59 (2.3)	29 (2.1)	6 (0.5)	11 (1.5)	48 (2.4)	-	124 (7.4)	83 (3.5)	8 (0.9)	53 (3.4)	29 (3.0)	71 (3.8)	**	7 (1.0)	28 (4.5)
	4,080 (51.2)	4,236 (47.5)	2,756 (55.1)	1,737 (67.5)	956 (67.7)	721 (56.1)	435 (58.3)	946 (48.0)	-	962 (57.1)	733 (31.0)	574 (67.6)	1,005 (64.8)	403 (41.5)	1,085 (58.6)	325 (65.1)	339 (50.1)	245 (39.2)
	2,084 (26.2)	2,496 (28.0)	1,365 (27.3)	588 (22.8)	279 (19.7)	393 (30.6)	217 (29.1)	568 (28.8)	-	646 (38.4)	456 (19.3)	121 (14.3)	420 (27.1)	421 (43.4)	544 (29.4)	122 (24.4)	125 (18.5)	137 (21.9)
	1,141 (14.3)	1,252 (14.1)	646 (12.9)	140 (5.4)	48 (3.4)	87 (6.8)	79 (10.6)	234 (11.9)	-	17 (1.0)	761 (32.2)	132 (15.5)	83 (5.3)	105 (10.8)	52 (2.8)	44 (8.8)	201 (29.7)	195 (31.2)
	660 (8.3)	925 (10.4)	237 (4.7)	109 (4.2)	130 (9.2)	84 (6.5)	15 (2.0)	221 (11.2)	-	59 (3.5)	414 (17.5)	22 (2.6)	44 (2.8)	42 (4.3)	172 (9.3)	8 (1.6)	12 (1.8)	48 (7.7)

Data sources: Ontario Stroke Audit of Secondary Prevention Clinics (OSA-SPC), 2011/12; Ontario Ministry of Health and Long-Term Care, Registered Persons Database (RPDB), 2011/12.

Inclusion criteria: All patients aged ≥18 years who were referred and completed an initial clinic visit.

1 Based on unique patients with a valid Ontario health card (i.e., does not include multiple patient-visits).

2 Based on multiple initial visits (i.e., includes patients who visited more than one SPC in the same fiscal year).

3 Includes other primary care worker.

4 Includes neurologist, surgeon and other medical specialist (e.g., cardiologist).

** Cell value suppressed for reasons of privacy and confidentiality.

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) See Appendix E for a list of clinics designated as regional and district stroke centres by the OSS.

(3) Cells in which there were no reported/available data are marked with a hyphen (-).

SD = standard deviation. IQR = interquartile range.

EXHIBIT 2.2A Reason for referral to a secondary stroke prevention clinic among completed initial visits, in Ontario, 2011/12

Key Finding

- The predominant reason for referral to an SPC was for query stroke/TIA (63.7%), followed by new or recent stroke/TIA (24.9%).

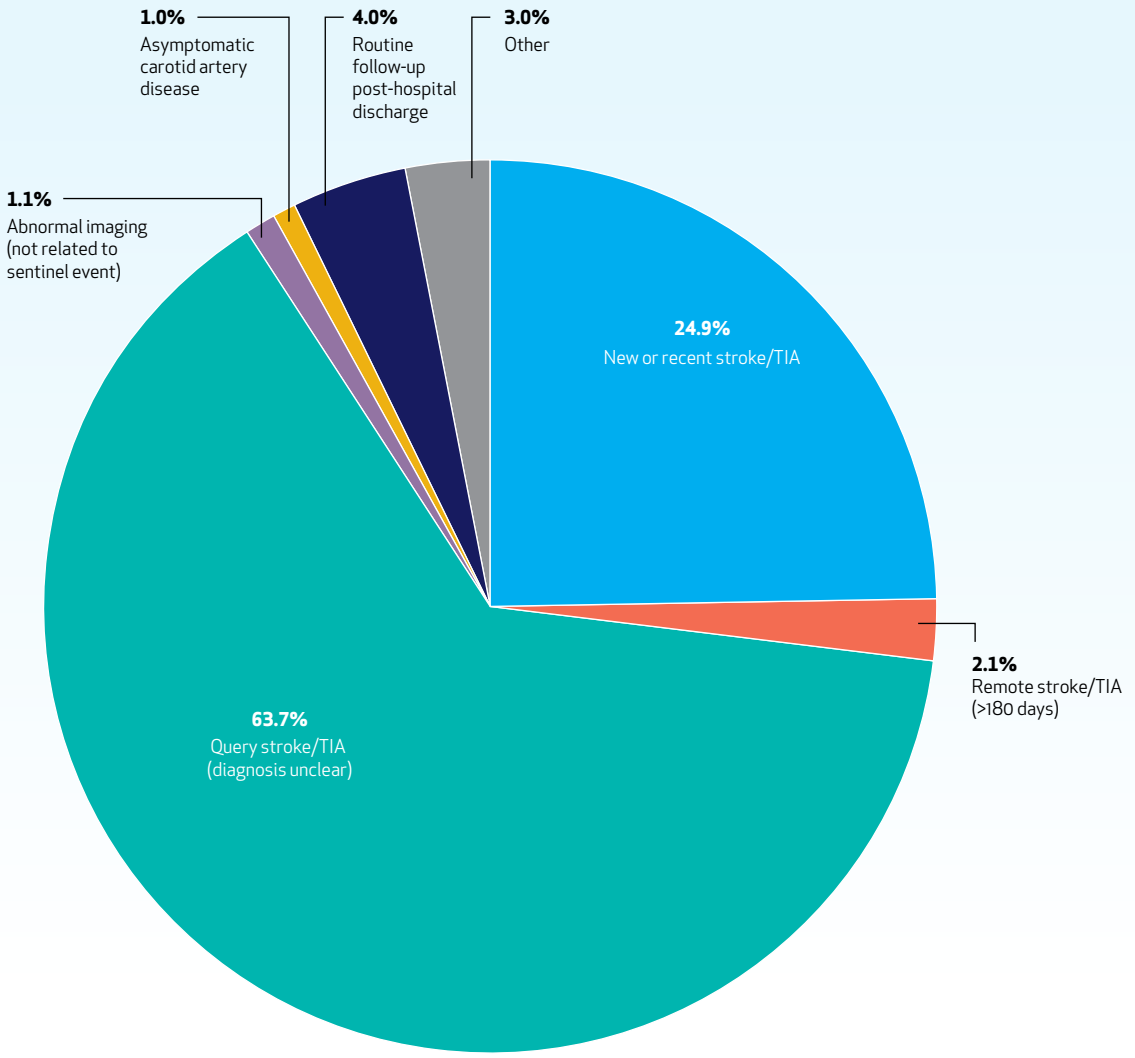
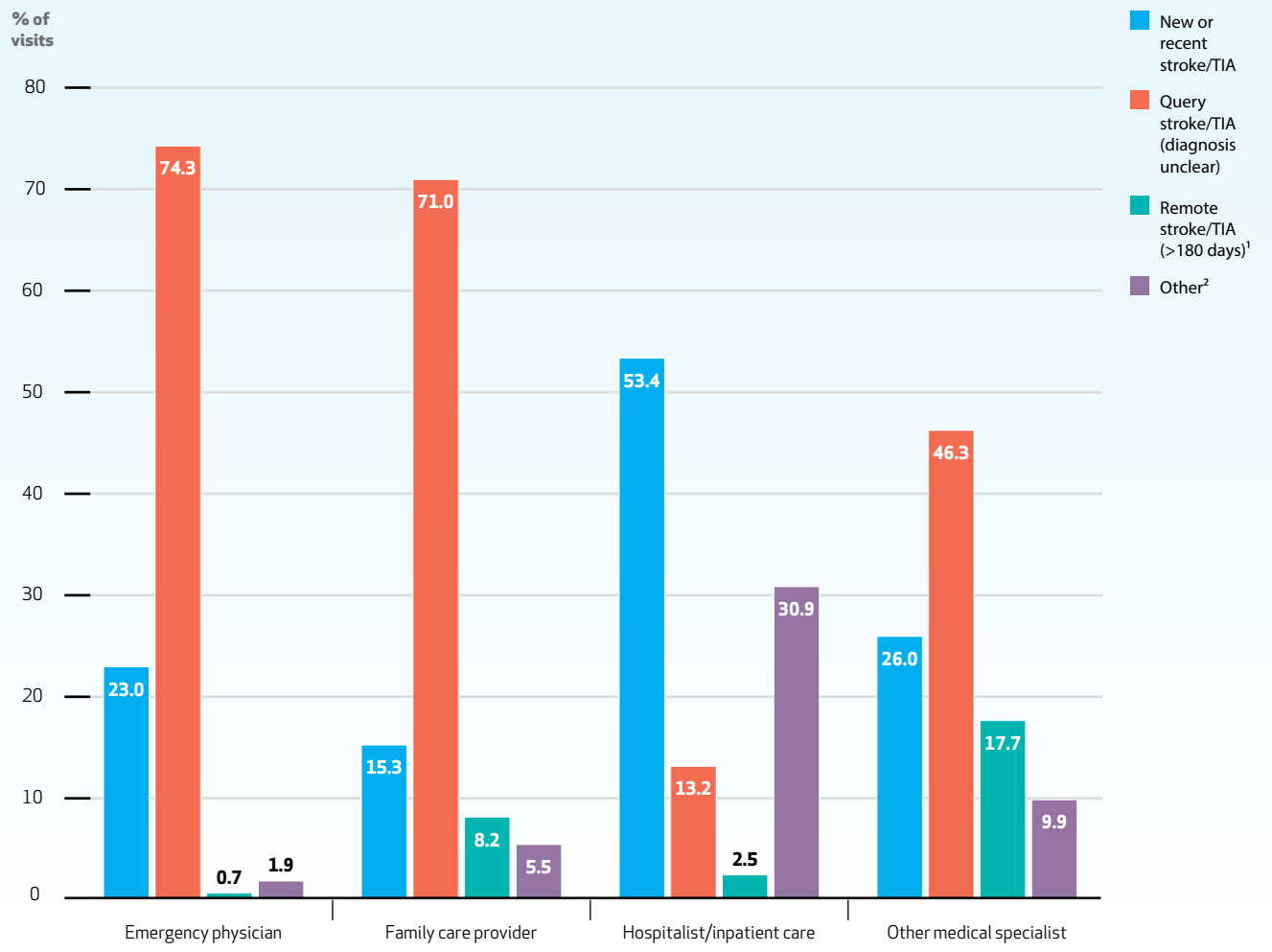


EXHIBIT 2.2B Reason for referral to a secondary stroke prevention clinic in Ontario, by referral source, 2011/12

Key Findings

- Almost 3 in 4 referrals to an SPC from emergency physicians and family care providers were for a query stroke/TIA diagnosis (74.3% and 71.0%, respectively).
- SPC referrals from hospitalists were more likely to be for a new or recent stroke/TIA (53.4%).



1 Includes asymptomatic carotid artery disease and abnormal imaging (not related to sentinel event).
2 Includes routine follow-up after hospital discharge.

EXHIBIT 2.3 Number and proportion of patients with suspected or confirmed stroke or transient ischemic attack who were discharged home from the emergency department and had a completed referral and initial visit to a secondary stroke prevention clinic, in Ontario and by sex, Ontario Stroke System designation and Local Health Integration Network, 2011/12

Key Finding

- Provincially, almost 30,000 emergency department (ED) visits in 2011/12 were made by patients with suspected or confirmed stroke/TIA, and of these, 21.3% were referred to and had an initial visit in an SPC.

	All ED visits for suspected or confirmed stroke/TIA[2]		All ED visits for suspected stroke/TIA[2]		All ED visits for confirmed stroke/TIA	
Group/Subgroup	**N**	**n (%)**	**N**	**n (%)**	**N**	**n (%)**
Ontario[1]	28,626	6,105 (21.3)	13,117	2,703 (20.6)	15,509	3,402 (21.9)
Female	15,027	3,113 (20.7)	7,150	1,467 (20.5)	7,877	1,646 (20.9)
Male	13,599	2,992 (22.0)	5,967	1,236 (20.7)	7,632	1,756 (23.0)
Ontario Stroke System designation for Emergency Department						
Regional stroke centre with SPC	6,241	1,711 (27.4)	2,583	714 (27.6)	3,658	997 (27.3)
District stroke centre with SPC	5,643	1,352 (24.0)	2,542	566 (22.3)	3,101	786 (25.3)
District stroke centre without SPC	696	197 (28.3)	314	88 (28.0)	382	109 (28.5)
Community hospital with SPC	2,880	745 (25.9)	1,478	383 (25.9)	1,402	362 (25.8)
Community hospital without SPC	13,166	2,100 (16.0)	6,200	952 (15.4)	6,966	1,148 (16.5)
Local Health Integration Network						
1. Erie St. Clair	2,073	590 (28.5)	854	225 (26.3)	1,219	365 (29.9)
2. South West	2,747	600 (21.8)	1,274	269 (21.1)	1,473	331 (22.5)
3. Waterloo Wellington	1,508	385 (25.5)	595	145 (24.4)	913	240 (26.3)
4. Hamilton Niagara Haldimand Brant	3,551	667 (18.8)	1,560	280 (17.9)	1,991	387 (19.4)
5. Central West	1,164	55 (4.7)	569	17 (3.0)	595	38 (6.4)
6. Mississauga Halton	1,966	484 (24.6)	939	249 (26.5)	1,027	235 (22.9)
7. Toronto Central	2,249	418 (18.6)	1,010	171 (16.9)	1,239	247 (19.9)
8. Central	2,198	520 (23.7)	1,156	272 (23.5)	1,042	248 (23.8)
9. Central East	3,551	590 (16.6)	1,702	259 (15.2)	1,849	331 (17.9)
10. South East	1,422	383 (26.9)	712	181 (25.4)	710	202 (28.5)
11. Champlain	2,883	843 (29.2)	1,148	354 (30.8)	1,735	489 (28.2)
12. North Simcoe Muskoka	1,305	198 (15.2)	595	85 (14.3)	710	113 (15.9)
13. North East	1,387	187 (13.5)	680	98 (14.4)	707	89 (12.6)
14. North West	622	185 (29.7)	323	98 (30.3)	299	87 (29.1)

Data sources: Canadian Institute for Health Information, National Ambulatory Care Reporting System (NACRS), 2011/12; Ontario Stroke Audit of Secondary Prevention Clinics (OSA-SPC), 2011/12.

Inclusion criteria: All patients aged ≥18 years with a valid Ontario health card with suspected or confirmed stroke or transient ischemic attack discharged alive from the ED to home or to place of residence (e.g., retirement home).

Exclusion criteria: Planned or scheduled visits.

1 Based on multiple ED visits within fiscal year.

2 Includes NACRS records with ICD codes that include the prefix "Q" (suspected, questionable diagnoses).

Notes:

(1) Cornwall Hospital, Toronto East General Hospital and Humber River Regional Hospital were excluded from the analysis as their respective SPC clinics were not included in the OSA-SPC for 2011/12.

(2) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(3) See Appendix E for a list of clinics designated as regional and district stroke centres by the OSS.

EXHIBIT 2.3A Proportion of emergency department visits for suspected or confirmed stroke/TIA by patients seen at a secondary stroke prevention clinic, in Ontario and by sex, 2011/12

Key Finding

- Women with a confirmed diagnosis of stroke/TIA at the time of their ED discharge were less likely than men to be seen in an SPC (20.9% vs. 23.0%).

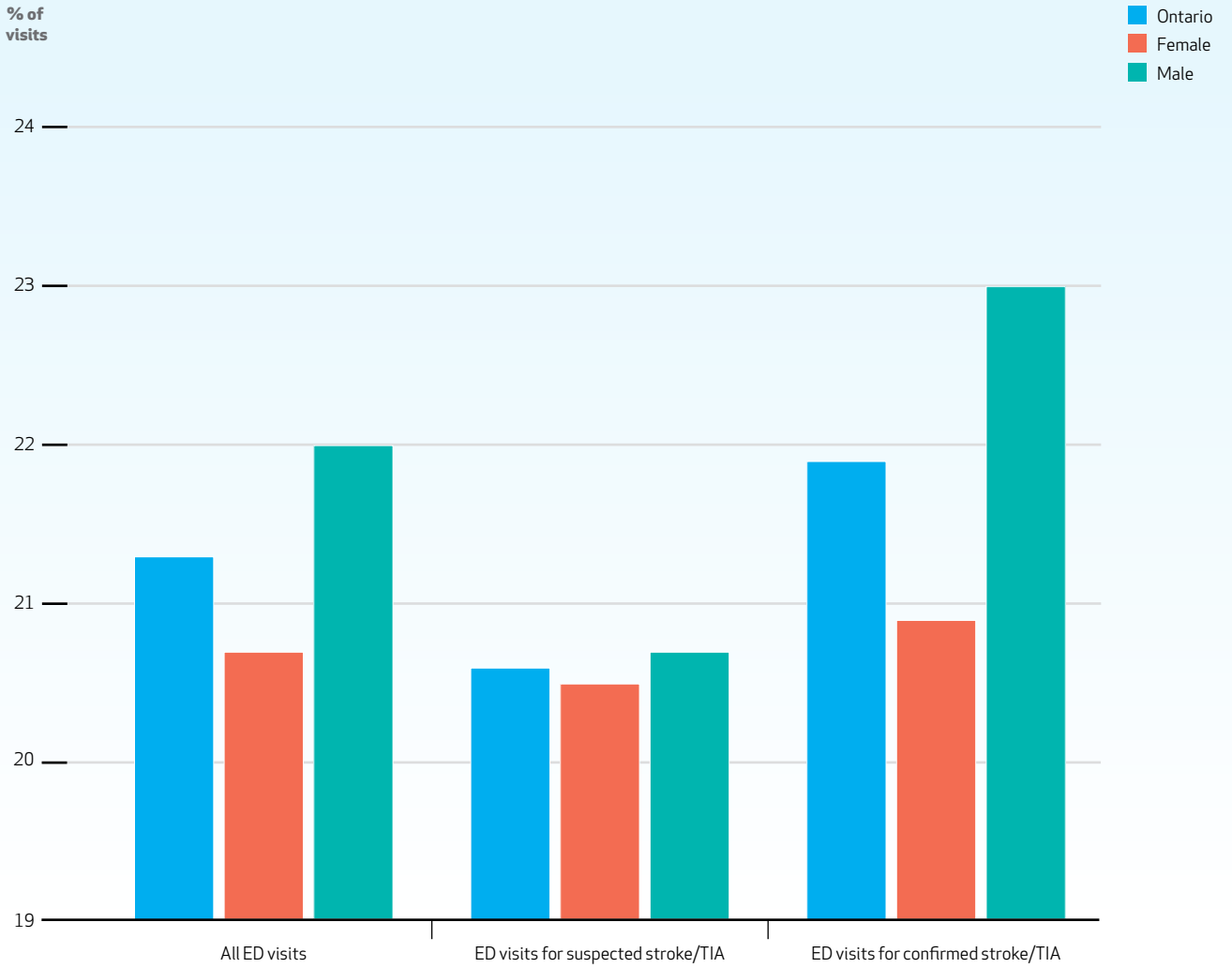


EXHIBIT 2.3B Proportion of emergency department visits for suspected or confirmed stroke/TIA by patients seen at a secondary stroke prevention clinic, in Ontario and by Ontario Stroke System designation, 2011/12

Key Findings

- Among hospitals with an SPC on site, approximately 1 in 4 suspected or confirmed stroke/TIA patients discharged from the ED were referred to the SPC.
- Community hospitals without an SPC on site referred 1 in 6 suspected stroke/TIA patients discharged from the ED to an SPC (16.0%).

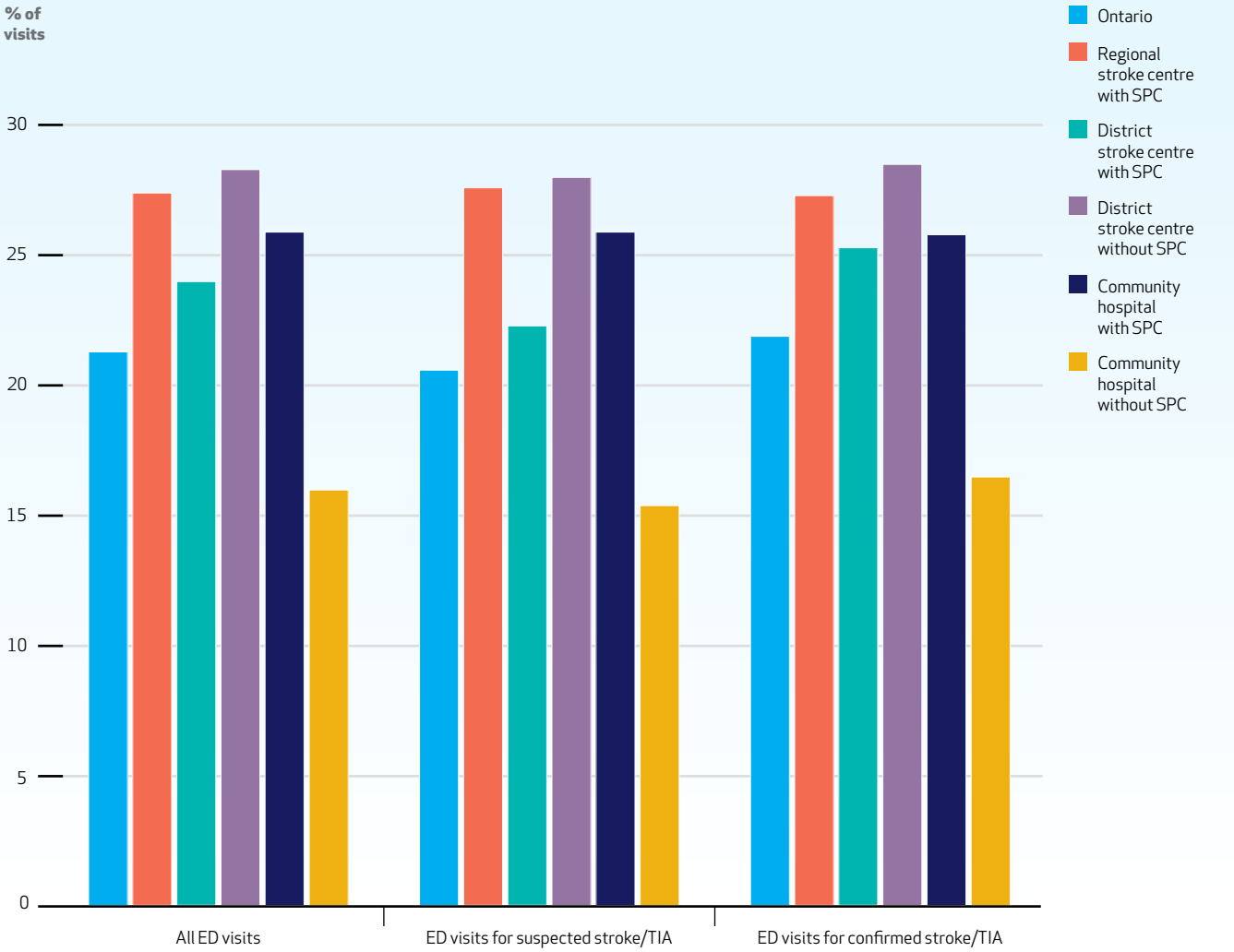


EXHIBIT 2.3C Proportion of emergency department visits for suspected or confirmed stroke/TIA by patients seen at a secondary stroke prevention clinic, in Ontario and by Local Health Integration Network, 2011/12

Key Finding

- The rate of SPC referrals for suspected or confirmed stroke/TIA from EDs across LHINs varied from 4.7% in the Central West LHIN (where there are no SPCs) to 29.7% in the North West LHIN.

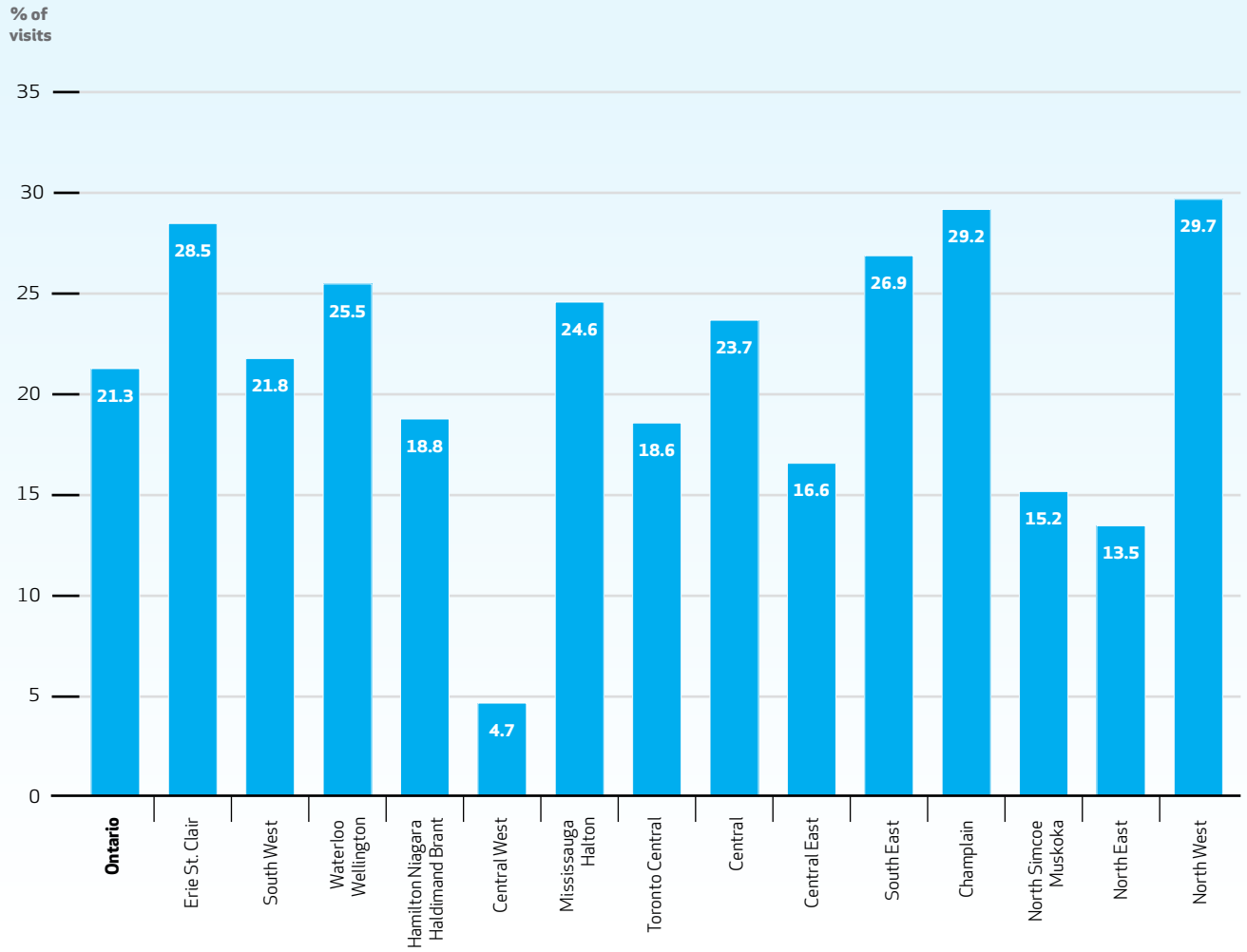


EXHIBIT 2.4 Stroke risk factor profile of patients visiting stroke prevention clinics, in Ontario and by sex, Ontario Stroke System designation and Local Health Integration Network, 2011/12

Key Findings

- The most common risk factors among SPC patients were hypertension (62.4%), hyperlipidemia (52.4%), smoking (22.2%, including current and reformed smokers), and diabetes (20.5%).
- Among SPC patients, 18.4% had a history of previous stroke or TIA, 9.7% had a history of atrial fibrillation and 9.9% had carotid stenosis.
- Minimal variation in risk factors was observed across LHINs or hospital designations.

Group/Subgroup	Patients[1]	Hypertension	Hyperlipidemia	Diabetes	Peripheral vascular disease	
	N	n (%)				
Ontario	16,167	10,087 (62.4)	8,477 (52.4)	3,322 (20.5)	443 (2.7)	
Female	8,364	5,076 (60.7)	4,010 (47.9)	1,492 (17.8)	166 (2.0)	
Male	7,803	5,011 (64.2)	4,467 (57.2)	1,830 (23.5)	277 (3.5)	
Ontario Stroke System designation						
Regional stroke centre SPC	8,703	5,352 (61.5)	4,471 (51.4)	1,807 (20.8)	288 (3.3)	
District stroke centre SPC	4,944	3,150 (63.7)	2,510 (50.8)	967 (19.6)	97 (2.0)	
Community hospital SPC	2,520	1,585 (62.9)	1,496 (59.4)	548 (21.7)	58 (2.3)	
Local Health Integration Network						
1. Erie St. Clair	1,391	848 (61.0)	630 (45.3)	233 (16.8)	11 (0.8)	
2. South West	1,272	777 (61.1)	650 (51.1)	250 (19.7)	25 (2.0)	
3. Waterloo Wellington	742	506 (68.2)	468 (63.1)	156 (21.0)	11 (1.5)	
4. Hamilton Niagara Haldimand Brant	1,927	1,191 (61.8)	1,050 (54.5)	424 (22.0)	42 (2.2)	
5. Central West	-	-	-	-	-	
6. Mississauga Halton	1,660	1,003 (60.4)	840 (50.6)	382 (23.0)	53 (3.2)	
7. Toronto Central	2,310	1,435 (62.1)	1,173 (50.8)	488 (21.1)	66 (2.9)	
8. Central	829	512 (61.8)	423 (51.0)	167 (20.1)	13 (1.6)	
9. Central East	1,540	935 (60.7)	895 (58.1)	284 (18.4)	31 (2.0)	
10. South East	960	595 (62.0)	420 (43.8)	204 (21.3)	50 (5.2)	
11. Champlain	1,758	1,097 (62.4)	933 (53.1)	336 (19.1)	69 (3.9)	
12. North Simcoe Muskoka	498	299 (60.0)	254 (51.0)	89 (17.9)	17 (3.4)	
13. North East	672	480 (71.4)	408 (60.7)	152 (22.6)	16 (2.4)	
14. North West	608	409 (67.3)	333 (54.8)	157 (25.8)	39 (6.4)	

	Prothrombotic state[2]	Coronary intervention[3]	Atrial fibrillation	Non-atrial fibrillation sources of cardiac embolism[4]	Valvular heart disease	Carotid stenosis (>50%)	Previous stroke/TIA	Current smoker (including quit < 30 days)	Reformed smoker (quit > 1 month to 5 years)	Non-smoker (including quit > 5 years)
	n (%)									
	183 (1.1)	2,628 (16.3)	1,568 (9.7)	405 (2.5)	747 (4.6)	1,597 (9.9)	2,980 (18.4)	2,641 (16.3)	954 (5.9)	11,396 (70.5)
	100 (1.2)	979 (11.7)	769 (9.2)	175 (2.1)	375 (4.5)	642 (7.7)	1,446 (17.3)	1,229 (14.7)	379 (4.5)	6,121 (73.2)
	83 (1.1)	1,649 (21.1)	799 (10.2)	230 (2.9)	372 (4.8)	955 (12.2)	1,534 (19.7)	1,412 (18.1)	575 (7.4)	5,275 (67.6)
	117 (1.3)	1,437 (16.5)	907 (10.4)	318 (3.7)	533 (6.1)	859 (9.9)	1,612 (18.5)	1,321 (15.2)	611 (7.0)	5,986 (68.8)
	54 (1.1)	748 (15.1)	447 (9.0)	47 (1.0)	127 (2.6)	501 (10.1)	928 (18.8)	888 (18.0)	247 (5.0)	3,535 (71.5)
	12 (0.5)	443 (17.6)	214 (8.5)	40 (1.6)	87 (3.5)	237 (9.4)	440 (17.5)	432 (17.1)	96 (3.8)	1,875 (74.4)
	23 (1.7)	180 (12.9)	103 (7.4)	12 (0.9)	35 (2.5)	113 (8.1)	226 (16.2)	260 (18.7)	67 (4.8)	960 (69.0)
	12 (0.9)	200 (15.7)	104 (8.2)	17 (1.3)	35 (2.8)	108 (8.5)	250 (19.7)	211 (16.6)	66 (5.2)	973 (76.5)
	12 (1.6)	115 (15.5)	70 (9.4)	**	23 (3.1)	80 (10.8)	167 (22.5)	127 (17.1)	29 (3.9)	579 (78.0)
	12 (0.6)	314 (16.3)	174 (9.0)	40 (2.1)	65 (3.4)	240 (12.5)	334 (17.3)	336 (17.4)	98 (5.1)	1,245 (64.6)
	-	-	-	-	-	-	-	-	-	-
	23 (1.4)	217 (13.1)	112 (6.7)	14 (0.8)	50 (3.0)	73 (4.4)	251 (15.1)	222 (13.4)	134 (8.1)	1,290 (77.7)
	39 (1.7)	364 (15.8)	304 (13.2)	114 (4.9)	110 (4.8)	202 (8.7)	470 (20.3)	264 (11.4)	266 (11.5)	1,325 (57.4)
	**	114 (13.8)	86 (10.4)	12 (1.4)	23 (2.8)	49 (5.9)	135 (16.3)	99 (11.9)	26 (3.1)	624 (75.3)
	**	313 (20.3)	142 (9.2)	23 (1.5)	39 (2.5)	168 (10.9)	286 (18.6)	260 (16.9)	60 (3.9)	1,177 (76.4)
	**	152 (15.8)	73 (7.6)	10 (1.0)	32 (3.3)	123 (12.8)	148 (15.4)	212 (22.1)	50 (5.2)	582 (60.6)
	25 (1.4)	304 (17.3)	190 (10.8)	133 (7.6)	120 (6.8)	238 (13.5)	348 (19.8)	288 (16.4)	78 (4.4)	1,366 (77.7)
	**	73 (14.7)	48 (9.6)	6 (1.2)	15 (3.0)	21 (4.2)	51 (10.2)	81 (16.3)	36 (7.2)	377 (75.7)
	10 (1.5)	148 (22.0)	74 (11.0)	7 (1.0)	56 (8.3)	87 (12.9)	177 (26.3)	147 (21.9)	19 (2.8)	473 (70.4)
	11 (1.8)	134 (22.0)	88 (14.5)	14 (2.3)	144 (23.7)	95 (15.6)	137 (22.5)	134 (22.0)	25 (4.1)	425 (69.9)

Data source: Ontario Stroke Audit of Secondary Prevention Clinics (OSA-SPC), 2011/12.

Inclusion criteria: All patients aged ≥18 years with a valid Ontario health card who were referred and completed an initial clinic visit.

1 Based on unique patients (i.e., does not include multiple patient-visits).

2 Includes metastatic cancer.

3 Includes angina, myocardial infarction, prior percutaneous transluminal coronary angioplasty and prior coronary artery bypass surgery.

4 Includes dilated cardiomyopathy, left ventricle: low ejection fraction/aneurysm/thrombus and patent foramen ovale/shunt.

** Cell value suppressed for reasons of privacy and confidentiality.

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) See Appendix E for a list of clinics designated as regional and district stroke centres by the OSS.

(3) Cells in which there were no reported/available data are marked with a hyphen (-).

EXHIBIT 2.4A Stroke risk factors among patients with a completed initial visit to a secondary stroke prevention clinic, in Ontario and by sex, 2011/12

Key Finding

- The prevalence of common stroke risk factors was higher among men than women.

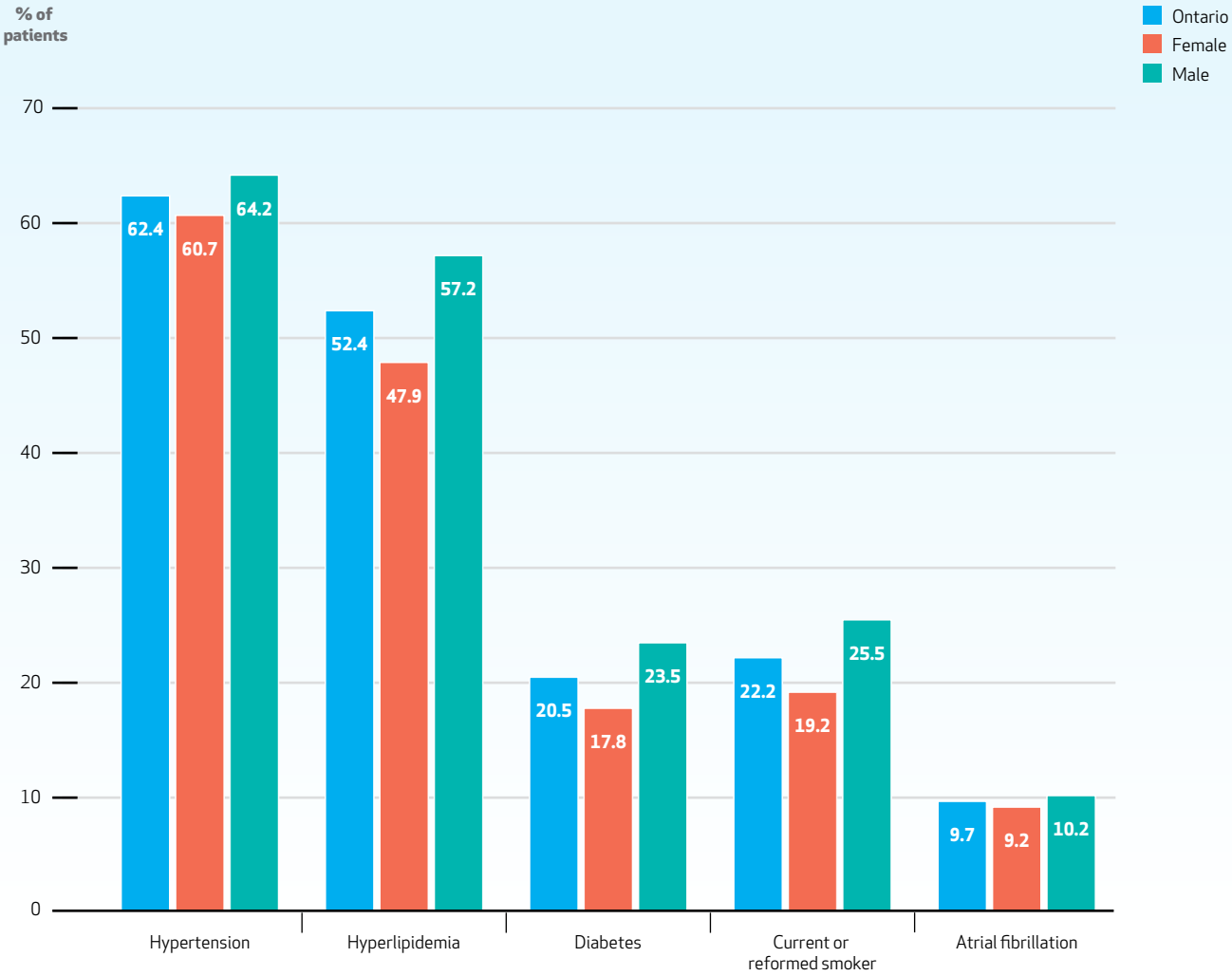


EXHIBIT 2.5 Assigned triage level of patients at initial visit to a secondary stroke prevention clinic, in Ontario and by sex, Ontario Stroke System designation and Local Health Integration Network, 2011/12

Key Findings

- In Ontario, the majority of SPC visits were for patients deemed semi-urgent or elective (41.9% and 41.5%, respectively). Only 7.9% of visits were for emergent patients, and 8.6% were for urgent patients.
- Among women, semi-urgent was the most prevalent type of visit (44.1%), and among men, elective was the most prevalent type of visit (43.0%).
- SPCs in district stroke centres had the highest prevalence of emergent visits (12.1%), compared to 5.2% of regional stroke centre SPC visits. Elective visits represented 50.7% of visits at regional stroke centre SPCs, compared to only 29.7% of visits at district stroke centre SPCs.
- There was substantial variation in triage level assignment across LHINs. Elective visits were the predominant type of visit in SPC clinics in the Waterloo Wellington LHIN (78.1%) and the least common in the Erie St. Clair LHIN (9.5%). SPCs in the South West LHIN had the highest proportion of emergent and urgent visits (41.9%), compared to 4.3% in the Mississauga Halton LHIN.

Group/Subgroup	Patients[1]	Emergent[2]	Urgent[3]	Semi-urgent[4]	Elective[5]
	N	n (%)			
Ontario	16,210	1,287 (7.9)	1,395 (8.6)	6,797 (41.9)	6,731 (41.5)
Female	8,381	647 (7.7)	679 (8.1)	3,694 (44.1)	3,361 (40.1)
Male	7,829	640 (8.2)	716 (9.1)	3,103 (39.6)	3,370 (43.0)
Ontario Stroke System designation					
Regional stroke centre SPC	8,832	460 (5.2)	670 (7.6)	3,228 (36.5)	4,474 (50.7)
District stroke centre SPC	4,813	581 (12.1)	465 (9.7)	2,339 (48.6)	1,428 (29.7)
Community hospital SPC	2,565	246 (9.6)	260 (10.1)	1,230 (48.0)	829 (32.3)
Local Health Integration Network					
1. Erie St. Clair	1,369	150 (11.0)	96 (7.0)	993 (72.5)	130 (9.5)
2. South West	1,256	230 (18.3)	296 (23.6)	551 (43.9)	179 (14.3)
3. Waterloo Wellington	680	**	40 (5.9)	107 (15.7)	531 (78.1)
4. Hamilton Niagara Haldimand Brant	1,917	247 (12.9)	140 (7.3)	681 (35.5)	849 (44.3)
5. Central West	-	-	-	-	-
6. Mississauga Halton	1,684	22 (1.3)	51 (3.0)	1,164 (69.1)	447 (26.5)
7. Toronto Central	2,357	61 (2.6)	155 (6.6)	606 (25.7)	1,535 (65.1)
8. Central	849	61 (7.2)	89 (10.5)	418 (49.2)	281 (33.1)
9. Central East	1,512	205 (13.6)	158 (10.4)	668 (44.2)	481 (31.8)
10. South East	959	**	64 (6.7)	647 (67.5)	244 (25.4)
11. Champlain	1,847	71 (3.8)	102 (5.5)	465 (25.2)	1,209 (65.5)
12. North Simcoe Muskoka	499	121 (24.2)	58 (11.6)	247 (49.5)	73 (14.6)
13. North East	671	49 (7.3)	101 (15.1)	89 (13.3)	432 (64.4)
14. North West	610	64 (10.5)	45 (7.4)	161 (26.4)	340 (55.7)

Data source: Ontario Stroke Audit of Secondary Prevention Clinics (OSA-SPC), 2011/12.

Inclusion criteria: All patients aged ≥18 years who were referred and completed an initial clinic visit.

Exclusion criteria: Patients with missing triage level assignment (n=277).

1 Based on multiple initial visits (i.e., includes patients who visited more than one SPC in the same fiscal year).

2 Emergent patients: Urgent patients referred within 24 hours of symptom onset.

3 Urgent patients: Patients with possible symptomatic carotid artery stenosis or atrial fibrillation that is not anticoagulated.

4 Semi-urgent patients: Patients with symptom onset less than three months previously, without symptomatic carotid artery disease or untreated atrial fibrillation.

5 Elective patients: Patients with symptom onset more than three months previously, or without symptomatic carotid artery disease or already anticoagulated for atrial fibrillation.

** Cell value suppressed for reasons of privacy and confidentiality.

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) See Appendix E for a list of clinics designated as regional and district stroke centres by the OSS.

(3) Cells in which there were no reported/available data are marked with a hyphen (-).

EXHIBIT 2.6 Time from referral to first scheduled initial visit to a secondary stroke prevention clinic by triage level assignment, in Ontario and by sex, Ontario Stroke System designation and Local Health Integration Network, 2011/12

Key Findings

- Overall, the median time from referral to the first scheduled SPC visit was 14 days across the province, with a median time of 6 days for emergent patients, 8 days for urgent patients, 12 days for semi-urgent patients and 23 days for elective patients.
- There was little variation in median wait times across hospital designations for emergent and urgent patients; however, semi-urgent patients were seen twice as fast at district stroke centres (7 days) compared to regional stroke centres and community hospitals (14 days each). Elective patients were seen much faster at community hospitals (14 days) compared to regional and district stroke centres (25 and 23 days, respectively).
- There was substantial variation across LHINs in time to assessment for all triage levels. For the 1,161 emergent visits, the median time across LHINs ranged from 4 days for SPCs in the Hamilton Niagara Haldimand Brant LHIN to 35.5 days for SPCs in the Waterloo Wellington LHIN. For the 1,220 urgent visits, the median time ranged from 4.5 days in the North East LHIN to 23 days in the Waterloo Wellington LHIN. For the 6,181 semi-urgent visits, the time from referral to the initial clinic visit ranged from 3 days in the Erie St. Clair LHIN to 42 days in the Waterloo Wellington LHIN.
- For the 6,315 elective visits, the time from referral to initial clinic visit varied from 7 days in the North East LHIN to 48 days in the Toronto Central LHIN. Overall, the median wait time ranged from 4 days in the Erie St. Clair LHIN to 38 days in the Toronto Central LHIN.

Group/Subgroup	Patients[1] N
Ontario	14,985
Female	7,725
Male	7,260
Ontario Stroke System designation	
Regional Stroke Centre SPC	8,371
District Stroke Centre SPC	4,491
Community Hospital SPC	2,123
Local Health Integration Network	
1. Erie St. Clair	1,352
2. South West	1,199
3. Waterloo Wellington	706
4. Hamilton Niagara Haldimand Brant	1,837
5. Central West	-
6. Mississauga Halton	1,569
7. Toronto Central	2,253
8. Central	843
9. Central East	1,166
10. South East	638
11. Champlain	1,768
12. North Simcoe Muskoka	481
13. North East	622
14. North West	551

	Time from referral to first scheduled initial SPC visit (days)									
	All		Emergent[2]		Urgent[3]		Semi-urgent[4]		Elective[5]	
	Mean ± SD	Median (IQR)	Mean ± SD (n)	Median (IQR)	Mean ± SD (n)	Median (IQR)	Mean ± SD (n)	Median (IQR)	Mean ± SD (n)	Median (IQR)
	23.8 ± 31.4	14.0 (6.0, 32.0)	9.4 ± 12.1 (1,161)	6.0 (3.0, 11.0)	15.2 ± 26.8 (1,220)	8.0 (4.0, 18.0)	18.9 ± 22.6 (6,181)	12.0 (5.0, 27.0)	32.9 ± 38.8 (6,315)	23.0 (8.0, 45.0)
	23.5 ± 30.6	14.0 (6.0, 32.0)	9.5 ± 12.3 (589)	6.0 (3.0, 12.0)	15.4 ± 29.2 (577)	8.0 (5.0, 16.0)	19.7 ± 22.9 (3,352)	12.0 (5.0, 28.0)	31.7 ± 37.6 (3,148)	22.0 (7.0, 43.5)
	24.2 ± 32.2	14.0 (6.0, 33.0)	9.2 ± 12.0 (572)	6.0 (2.0, 11.0)	15.1 ± 24.6 (643)	8.0 (4.0, 21.0)	18.0 ± 22.1 (2,829)	11.0 (5.0, 25.0)	34.0 ± 39.9 (3,167)	24.0 (8.0, 46.0)
	27.5 ± 35.6	16.0 (6.0, 37.0)	9.1 ± 11.2 (444)	6.0 (3.0, 12.0)	16.1 ± 24.6 (631)	8.0 (4.0, 20.0)	21.8 ± 25.6 (3,052)	14.0 (6.0, 30.0)	35.2 ± 42.4 (4,216)	25.0 (8.0, 47.5)
	19.0 ± 24.1	10.0 (4.0, 28.0)	9.8 ± 12.8 (567)	6.0 (2.0, 11.0)	15.6 ± 31.0 (422)	9.0 (5.0, 19.0)	14.5 ± 17.1 (2,061)	7.0 (3.0, 20.0)	29.7 ± 29.4 (1,366)	23.0 (9.0, 42.0)
	19.8 ± 24.7	13.0 (5.0, 27.0)	8.8 ± 12.2 (150)	5.0 (3.0, 9.0)	10.9 ± 22.8 (167)	6.0 (3.0, 12.0)	19.2 ± 21.3 (1,068)	14.0 (7.0, 27.0)	25.1 ± 29.8 (733)	14.0 (5.0, 38.0)
	7.7 ± 13.6	4.0 (2.0, 8.0)	8.4 ± 11.3 (146)	6.0 (3.0, 9.0)	11.9 ± 12.6 (95)	8.0 (5.0, 14.0)	5.1 ± 7.8 (971)	3.0 (2.0, 5.0)	23.1 ± 29.3 (129)	9.0 (5.0, 33.0)
	15.7 ± 29.3	9.0 (4.0, 17.0)	8.7 ± 13.4 (218)	6.0 (2.0, 11.0)	14.2 ± 28.4 (275)	9.0 (4.0, 15.0)	13.7 ± 21.0 (529)	9.0 (5.0, 15.0)	33.8 ± 52.4 (169)	20.0 (8.0, 37.0)
	35.1 ± 19.9	35.5 (18.0, 50.0)	35.5 ± 48.8 (**)	35.5 (1.0, 70.0)	29.5 ± 22.9 (40)	23.0 (7.5, 49.5)	39.4 ± 18.0 (106)	42.0 (24.0, 51.0)	34.3 ± 19.9 (528)	35.0 (17.0, 49.0)
	26.2 ± 22.8	26.0 (8.0, 37.0)	8.1 ± 11.0 (244)	4.0 (1.0, 11.0)	13.8 ± 35.7 (136)	9.5 (6.0, 28.0)	23.5 ± 15.4 (645)	25.0 (10.0, 31.0)	35.9 ± 22.6 (793)	33.0 (20.0, 52.0)
	-	-	-	-	-	-	-	-	-	-
	22.5 ± 31.6	13.0 (6.0, 30.0)	9.9 ± 9.7 (22)	7.5 (4.0, 10.0)	11.4 ± 14.9 (48)	6.5 (3.0, 10.0)	21.2 ± 29.4 (1,084)	12.0 (5.0, 28.0)	28.0 ± 38.1 (415)	17.0 (7.0, 40.0)
	47.2 ± 50.7	38.0 (12.0, 65.0)	11.4 ± 15.2 (60)	5.0 (1.0, 16.5)	29.4 ± 30.9 (148)	18.0 (5.0, 48.0)	30.2 ± 30.9 (586)	20.0 (7.0, 46.0)	57.2 ± 56.4 (1,458)	48.0 (21.0, 76.0)
	16.3 ± 21.9	13.0 (7.0, 20.0)	9.8 ± 8.1 (60)	7.0 (4.0, 14.0)	13.3 ± 39.7 (89)	7.0 (3.0, 14.0)	15.3 ± 21.0 (414)	13.0 (7.0, 19.0)	20.0 ± 16.3 (280)	17.0 (9.0, 26.0)
	23.4 ± 26.7	14.0 (5.0, 35.0)	9.3 ± 14.2 (115)	4.0 (3.0, 6.0)	12.6 ± 33.1 (73)	5.0 (3.0, 8.0)	27.3 ± 24.1 (544)	21.0 (9.0, 41.0)	23.6 ± 29.0 (417)	12.0 (5.0, 33.0)
	26.1 ± 20.6	21.0 (10.0, 35.0)	44.3 ± 40.9 (**)	32.0 (11.0, 90.0)	20.4 ± 15.2 (25)	17.0 (10.0, 27.0)	23.0 ± 18.0 (408)	20.0 (9.0, 31.0)	32.9 ± 24.1 (196)	28.0 (15.0, 47.5)
	16.1 ± 18.8	12.0 (6.0, 21.0)	11.9 ± 9.6 (67)	8.0 (5.0, 18.0)	11.9 ± 9.6 (98)	8.0 (6.0, 17.0)	15.8 ± 13.8 (440)	12.0 (7.0, 21.0)	16.8 ± 21.1 (1,158)	12.0 (6.0, 22.0)
	19.6 ± 13.7	18.0 (8.0, 27.0)	13.3 ± 10.7 (118)	10.0 (7.0, 18.0)	12.1 ± 9.1 (56)	7.0 (6.0, 18.5)	21.2 ± 11.8 (237)	21.0 (12.0, 28.0)	30.6 ± 17.9 (70)	27.5 (17.0, 40.0)
	10.2 ± 19.4	6.0 (3.0, 11.0)	7.6 ± 10.7 (45)	5.0 (2.0, 8.0)	7.4 ± 9.1 (96)	4.5 (2.0, 8.0)	6.8 ± 8.1 (75)	5.0 (3.0, 8.0)	11.7 ± 23.0 (404)	7.0 (3.0, 13.0)
	20.7 ± 27.3	12.0 (5.0, 30.0)	5.5 ± 5.3 (61)	5.0 (2.0, 7.0)	10.1 ± 10.0 (41)	7.0 (5.0, 13.0)	9.9 ± 12.0 (142)	6.0 (3.0, 13.0)	30.2 ± 32.6 (298)	27.0 (8.0, 39.0)

Data source: Ontario Stroke Audit of Secondary Prevention Clinics (OSA-SPC), 2011/12.

Inclusion criteria: All patients aged ≥18 years who were referred and completed an initial clinic visit.

Exclusion criteria: Patients with missing referral date or missing first scheduled intial SPC visit date; or patients who refused or rescheduled initial SPC visit (n=1,502).

1 Based on multiple initial visits (i.e., includes patients who visited more than one SPC in the same fiscal year).

2 Emergent patients: Urgent patients referred within 24 hours of symptom onset.

3 Urgent patients: Patients with possible symptomatic carotid artery stenosis or atrial fibrillation that is not anticoagulated.

4 Semi-urgent patients: Patients with symptom onset less than three months previously, without symptomatic carotid artery disease or untreated atrial fibrillation.

5 Elective patients: Patients with symptom onset more than three months previously, or without symptomatic carotid artery disease or already anticoagulated for atrial fibrillation.

** Cell value suppressed for reasons of privacy and confidentiality.

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) See Appendix E for a list of clinics designated as regional and district stroke centres by the OSS.

(3) There was no significant difference between time from referral to first scheduled visit (shown) and time from referral to initial visit.

(4) Times for patients with missing triage level assignment are not shown.

(5) Cells in which there were no reported/available data are marked with a hyphen (-).

SD = standard deviation.

IQR = interquartile range.

EXHIBIT 2.7 Proportion of initial visits to secondary stroke prevention clinics scheduled within the time frame guidelines for each triage level, in Ontario and by sex, Ontario Stroke System designation and Local Health Integration Network, 2011/12

Key Findings

- Provincially, only 17.5% of emergent SPC patients were scheduled for their initial visit within the best practice time frame of 24 hours, and 14.5% of urgent patients were scheduled within 72 hours. Sixty-one percent of semi-urgent patients were seen within the 30-day time frame guideline. It is important to note that the time frame guideline for urgent patients was previously 7 days,[18] but was changed to between 48 hours and 2 weeks from symptom onset for patients without persistent or fluctuating motor or speech symptoms in the new Canadian Stroke Network quick response guide, *Taking Action in Stroke Prevention*.[19] Under the previous guidelines, 46.8% of urgent patients in Ontario would have been seen in the appropriate amount of time.
- There was wide variation across LHINs in the proportion of patients seen within the recommended time frame, particularly for semi-urgent patients. The Central LHIN saw the highest proportion of semi-urgent patients on time (83.1%) and the Waterloo Wellington LHIN saw the lowest (31.1%). SPCs in the Hamilton Niagara Haldimand Brant LHIN saw the highest proportion of emergent patients (39.8%) within the recommended 24-hour time frame. SPCs in the Central East LHIN saw the highest proportion of urgent patients (31.5%) within the recommended 72-hour time frame.

Group/Subgroup	Emergent[2] (N=1,161)	Urgent[3] (N=1,220)	Semi-urgent[4] (N=6,181)
	n (%)		
Ontario[1]	203 (17.5)	177 (14.5)	3,738 (60.5)
Female	88 (14.9)	72 (12.5)	1,976 (59.0)
Male	115 (20.1)	105 (16.3)	1,762 (62.3)
Ontario Stroke System designation			
Regional stroke centre SPC	68 (15.3)	93 (14.7)	1,882 (61.7)
District stroke centre SPC	131 (23.1)	46 (10.9)	1,083 (52.6)
Community hospital SPC	**	38 (22.8)	773 (72.4)
Local Health Integration Network			
1. Erie St. Clair	19 (13.0)	11 (11.6)	410 (42.2)
2. South West	32 (14.7)	40 (14.6)	385 (72.8)
3. Waterloo Wellington	**	**	33 (31.1)
4. Hamilton Niagara Haldimand Brant	97 (39.8)	9 (6.6)	421 (65.3)
5. Central West	-	-	-
6. Mississauga Halton	**	12 (25.0)	639 (59.0)
7. Toronto Central	18 (30.0)	17 (11.5)	282 (48.1)
8. Central	**	16 (18.0)	344 (83.1)
9. Central East	**	23 (31.5)	289 (53.1)
10. South East	**	**	262 (64.2)
11. Champlain	**	13 (13.3)	347 (78.9)
12. North Simcoe Muskoka	**	**	181 (76.4)
13. North East	9 (20.0)	26 (27.1)	48 (64.0)
14. North West	11 (18.0)	**	97 (68.3)

Data source: Ontario Stroke Audit of Secondary Prevention Clinics (OSA-SPC), 2011/12.

Inclusion criteria: All patients aged ≥18 years who were referred and completed an initial clinic visit.

Exclusion criteria: Patients with missing triage level assignment; or missing referral date; or patients who refused or rescheduled initial SPC visit.

1 Based on multiple initial visits (i.e., includes patients who visited more than one SPC in the same fiscal year).

2 Emergent patients: Urgent patients referred within 24 hours of symptom onset, who should be seen within 24 hours of referral.

3 Urgent patients: Patients with possible symptomatic carotid artery stenosis or atrial fibrillation that is not anticoagulated, who should be seen within 72 hours of referral.

4 Semi-urgent patients: Patients with symptom onset less than three months previously, without symptomatic carotid artery disease or untreated atrial fibrillation, who should be seen within 30 days of referral.

** Cell value suppressed for reasons of privacy and confidentiality.

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) See Appendix E for a list of clinics designated as regional and district stroke centres by the OSS.

(3) There is no time frame guideline for elective patients.

(4) Cells in which there were no reported/available data are marked with a hyphen (-).

EXHIBIT 2.7A Visits to secondary stroke prevention clinics scheduled within the time frame guidelines for each triage level, in Ontario and by sex, 2011/12

Key Finding

- For all non-elective SPC visits, fewer women than men were scheduled for an SPC visit within the recommended time frame for each triage level.

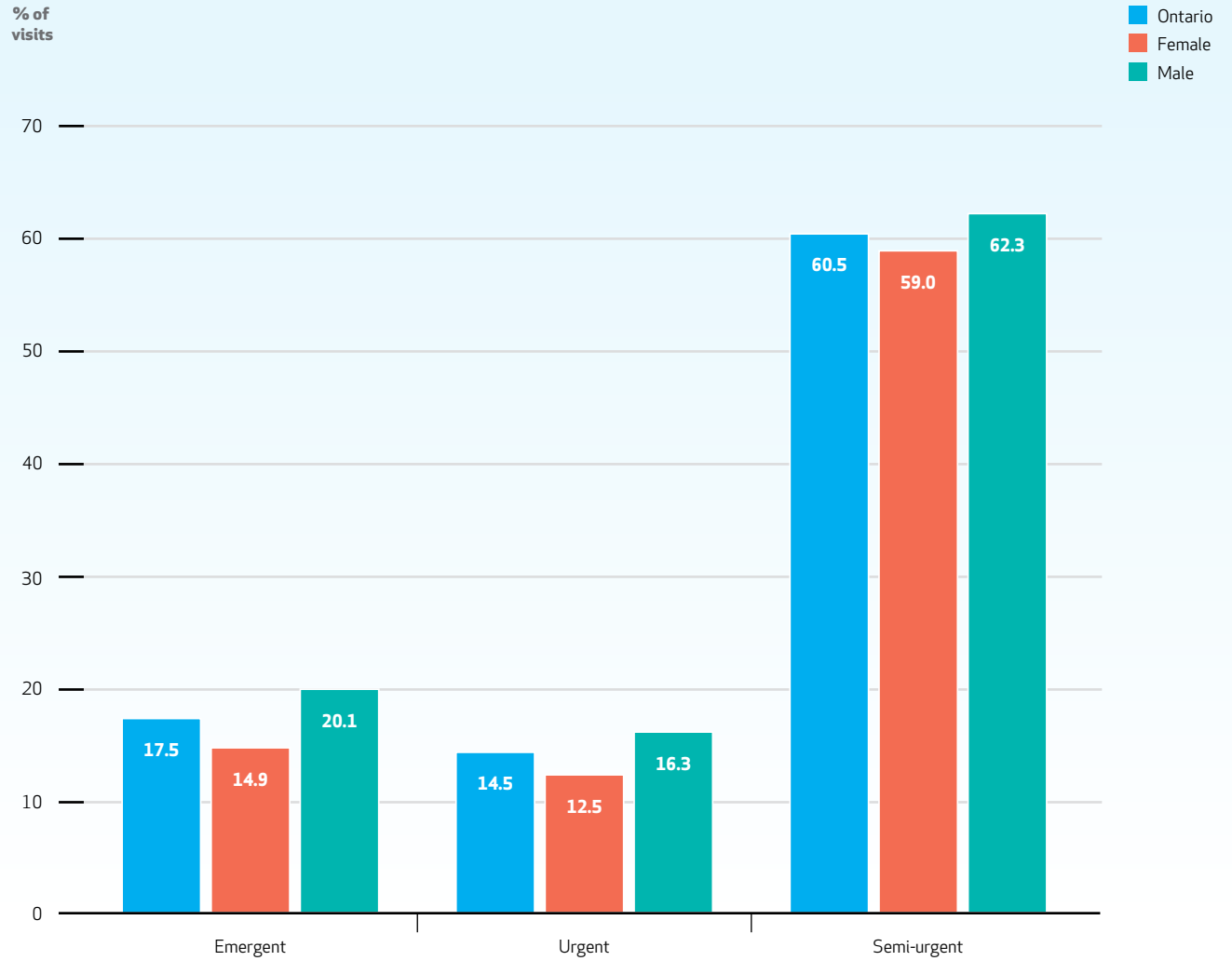


EXHIBIT 2.7B Visits to secondary stroke prevention clinics scheduled within the time frame guidelines for each triage level, in Ontario and by Ontario Stroke System designation, 2011/12

Key Finding

- Emergent patients at district stroke centres were more likely than those at regional stroke centres to be seen at an SPC within 24 hours (23.1% vs. 15.3%). Community hospital SPCs saw a higher proportion of urgent and semiurgent patients within the recommended time frame than did regional or district stroke centres.

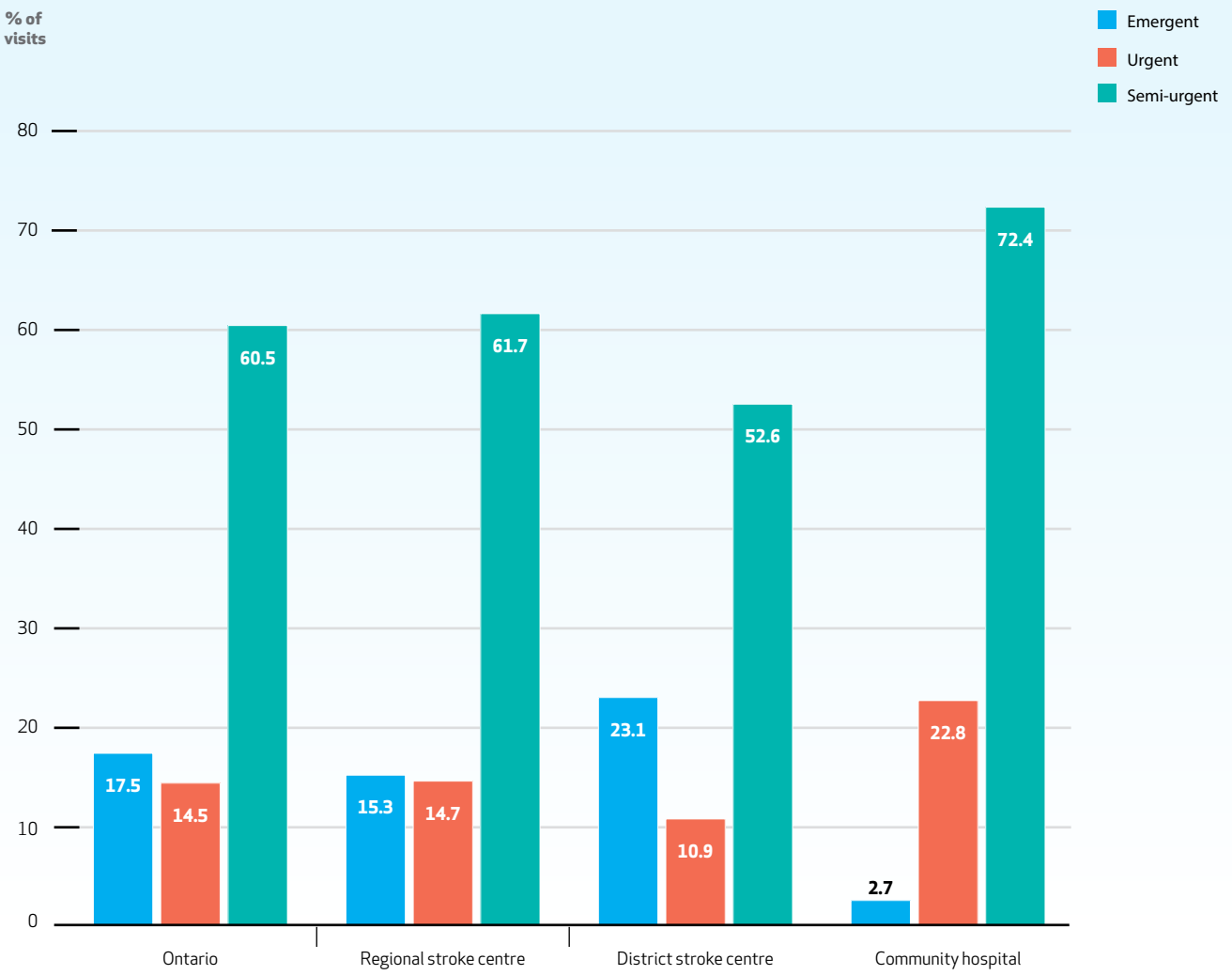


EXHIBIT 2.8 Proportion of visits to secondary stroke prevention clinics where a cognitive screening test was completed at the initial visit, in Ontario and by sex, Ontario Stroke System designation and Local Health Integration Network, 2011/12

Key Findings

- In Ontario, 1 in 10 SPC initial visits included a cognitive screening test.
- There was considerable variation across LHINs, with the most cognitive assessments being completed in the Mississauga Halton LHIN (46.6%) and the least at SPCs within the Hamilton Niagara Haldimand Brant, South West and Central LHINs.

Group/Subgroup	Patients[1]	Received cognitive screen
	N	n (%)
Ontario	16,487	1,711 (10.4)
Female	8,522	814 (9.6)
Male	7,965	897 (11.3)
Ontario Stroke System designation		
Regional stroke centre SPC	8,909	1,423 (16.0)
District stroke centre SPC	5,004	242 (4.8)
Community hospital SPC	2,574	46 (1.8)
Local Health Integration Network		
1. Erie St. Clair	1,413	128 (9.1)
2. South West	1,285	**
3. Waterloo Wellington	746	13 (1.7)
4. Hamilton Niagara Haldimand Brant	1,969	24 (1.2)
5. Central West	-	-
6. Mississauga Halton	1,684	785 (46.6)
7. Toronto Central	2,364	465 (19.7)
8. Central	849	**
9. Central East	1,552	39 (2.5)
10. South East	971	13 (1.3)
11. Champlain	1,853	130 (7.0)
12. North Simcoe Muskoka	499	20 (4.0)
13. North East	677	13 (1.9)
14. North West	625	74 (11.8)

Data source: Ontario Stroke Audit of Secondary Prevention Clinics (OSA-SPC), 2011/12.

Inclusion criteria: All patients aged ≥18 years who were referred and completed an initial clinic visit.

1 Based on multiple initial visits (i.e., includes patients who visited more than one SPC in the same fiscal year).

** Cell value suppressed for reasons of privacy and confidentiality.

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) A cognitive screen was considered as a formal screen with a validated tool (e.g., Montreal Cognitive Assessment), with the exception of Bluewater Health SPC, where a screen was considered to be either a validated tool or a series of questions related to daily functions (e.g., are you able to count money or do you know who to call in an emergency?).

(3) See Appendix E for a list of clinics designated as regional and district stroke centres by the OSS.

(4) Cells in which there were no reported/available data are marked with a hyphen (-).

EXHIBIT 2.8A Initial visits to secondary stroke prevention clinics that included a cognitive screening test, in Ontario and by Ontario Stroke System designation, 2011/12

Key Finding

- Cognitive screening was completed in 16.0% of initial visits at regional stroke centre SPCs, 4.8% of visits at district stroke centre SPCs and 1.8% of visits at community hospital SPCs.

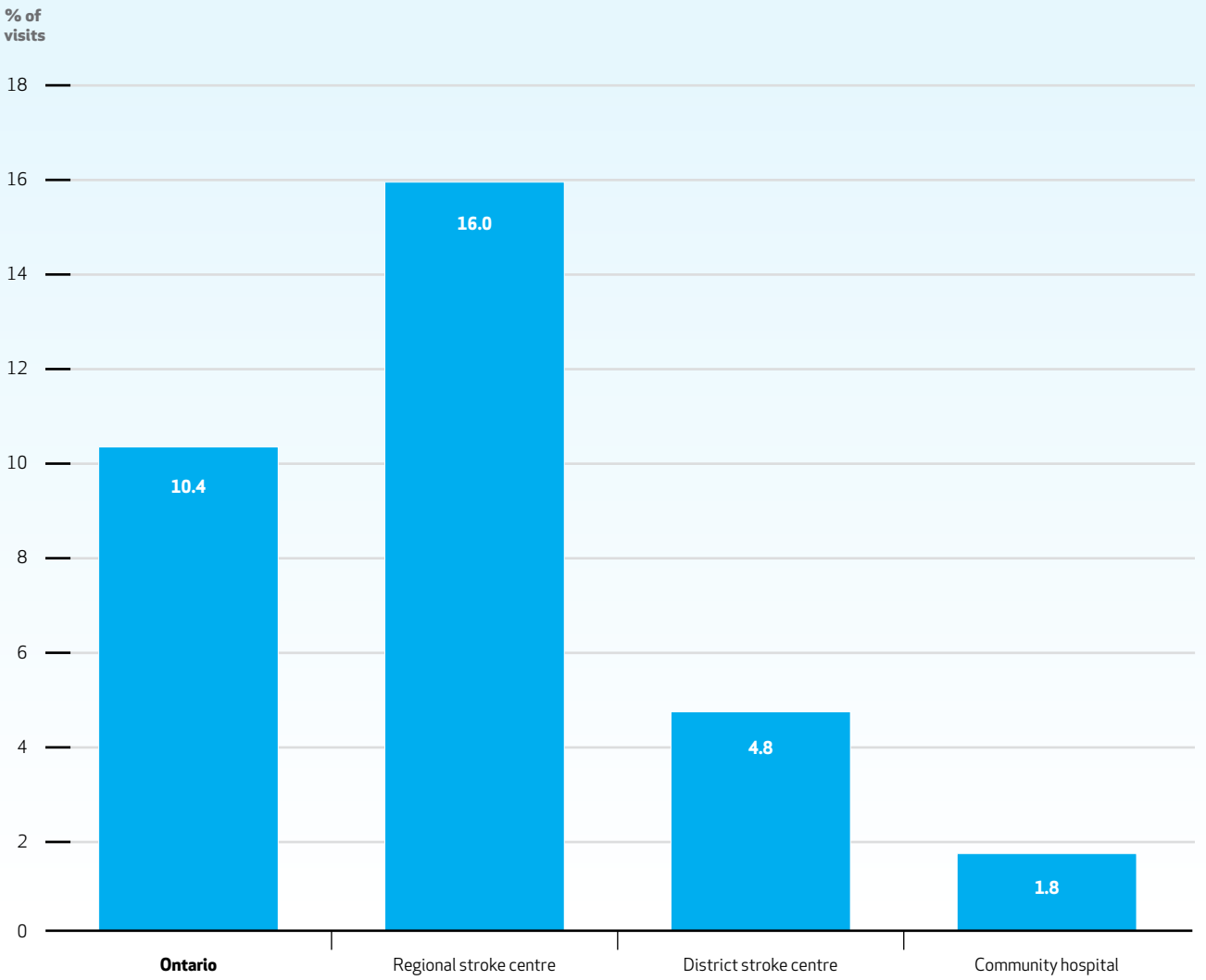


EXHIBIT 2.8B Cognitive screening tests done in Ontario, by Ontario Stroke System designation, 2011/12

Key Finding

- Of the SPC initial visits that included cognitive screening, 83.2% occurred at SPCs within regional stroke centres.

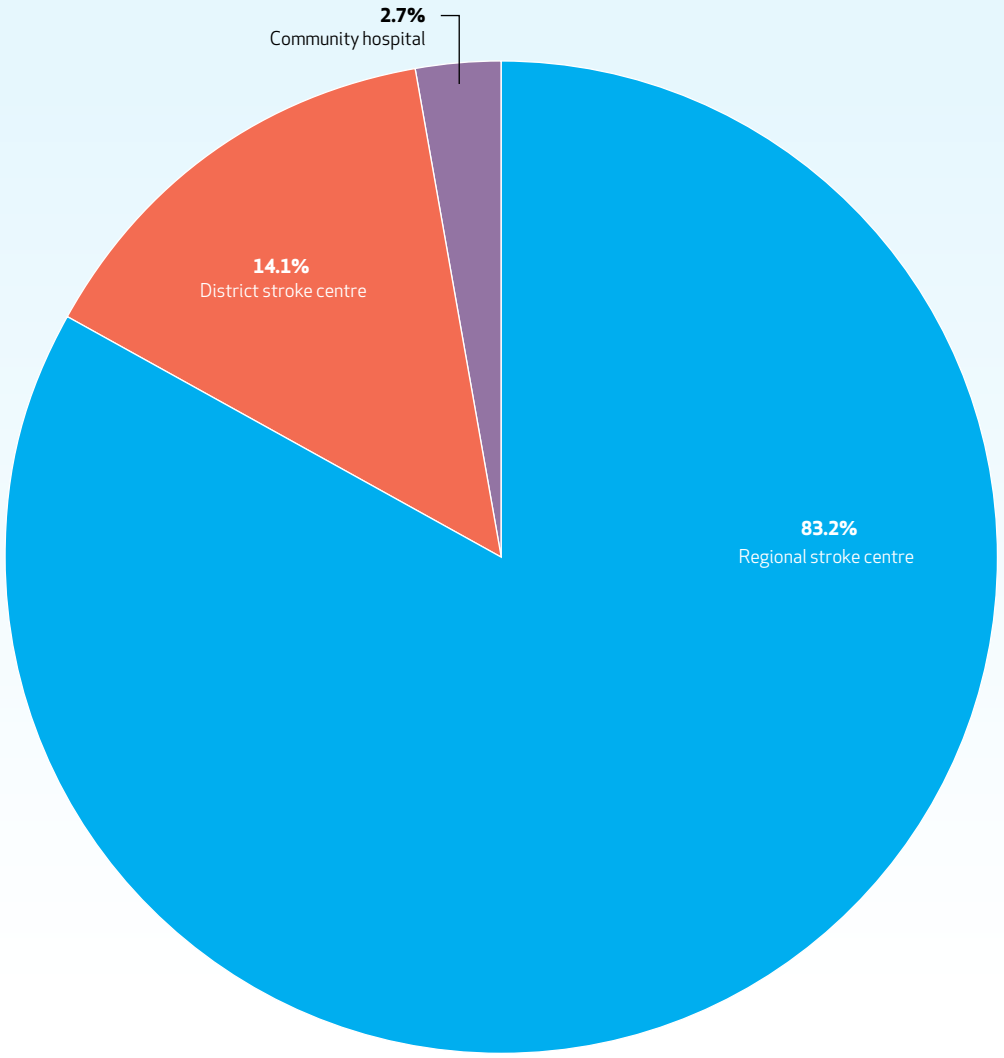


EXHIBIT 2.9 Final patient diagnosis at the initial visit to a secondary stroke prevention clinic, in Ontario and by sex, referral source, Ontario Stroke System designation and Local Health Integration Network, 2011/12

Key Findings

- Provincially, the most common diagnoses made at SPC visits were new or recent stroke/TIA (39.7%), non-stroke (32.5%) and query stroke/TIA (23.7%). Of the patients diagnosed with a new or recent stroke/TIA, 50.0% were ischemic stroke, 47.5% were TIA and 2.5% were hemorrhagic stroke.
- Considerable variation in final diagnoses was observed across LHINs, including a threefold variation in the prevalence of query stroke/TIA and non-stroke diagnoses. Rates of query stroke diagnoses ranged from 13.0% in the Waterloo Wellington LHIN to 48.5% in the Central East LHIN, and rates of non-stroke diagnoses ranged from 15.4% in the North East LHIN to 48.2% in the Mississauga Halton LHIN. Rates of stroke/TIA diagnoses varied from 22.9% in the Mississauga Halton LHIN to 62.3% in the Waterloo Wellington LHIN.
- Fewer changes were made to diagnoses during follow-up visits at designated centres than at community hospitals.

		New or recent stroke/TIA						
	Patients[1]	All stroke/TIA	TIA	Ischemic stroke	Hemorrhagic stroke	Query stroke/TIA	Non-stroke	Past stroke or high-risk patient
Group/Subgroup	**N**	**n (%)**						
Ontario	16,487	6,543 (39.7)	3,108 (47.5)	3,269 (50.0)	161 (2.5)	3,905 (23.7)	5,351 (32.5)	688 (4.2)
Female	8,522	3,000 (35.2)	1,516 (50.5)	1,404 (46.8)	77 (2.6)	2,113 (24.8)	3,099 (36.4)	310 (3.6)
Male	7,965	3,543 (44.5)	1,592 (44.9)	1,865 (52.6)	84 (2.4)	1,792 (22.5)	2,252 (28.3)	378 (4.7)
Referral Source								
Emergency physician	8,729	3,137 (35.9)	1,952 (62.2)	1,169 (37.3)	15 (0.5)	2,463 (28.2)	3,057 (35.0)	72 (0.8)
Family care provider[2]	4,449	1,277 (28.7)	683 (53.5)	567 (44.4)	26 (2.0)	1,052 (23.6)	1,772 (39.8)	348 (7.8)
Hospitalist/inpatient care	2,038	1,655 (81.2)	295 (17.8)	1,258 (76.0)	99 (6.0)	155 (7.6)	194 (9.5)	34 (1.7)
Other medical specialist[3]	1,271	474 (37.3)	178 (37.6)	275 (58.0)	21 (4.4)	235 (18.5)	328 (25.8)	234 (18.4)
Ontario Stroke System designation								
Regional stroke centre SPC	8,909	3,594 (40.3)	1,593 (44.3)	1,893 (52.7)	104 (2.9)	1,953 (21.9)	2,817 (31.6)	545 (6.1)
District stroke centre SPC	5,004	2,324 (46.4)	1,235 (53.1)	1,051 (45.2)	38 (1.6)	828 (16.5)	1,774 (35.5)	78 (1.6)
Community hospital SPC	2,574	625 (24.3)	280 (44.8)	325 (52.0)	19 (3.0)	1,124 (43.7)	760 (29.5)	65 (2.5)
Local Health Integration Network								
1. Erie St. Clair	1,413	607 (43.0)	415 (68.4)	191 (31.5)	**	227 (16.1)	570 (40.3)	9 (0.6)
2. South West	1,285	733 (57.0)	360 (49.1)	371 (50.6)	**	229 (17.8)	316 (24.6)	7 (0.5)
3. Waterloo Wellington	746	465 (62.3)	274 (58.9)	181 (38.9)	10 (2.2)	97 (13.0)	166 (22.3)	18 (2.4)
4. Hamilton Niagara Haldimand Brant	1,969	744 (37.8)	356 (47.8)	374 (50.3)	14 (1.9)	299 (15.2)	792 (40.2)	134 (6.8)
5. Central West	-	-	-	-	-	-	-	-
6. Mississauga Halton	1,684	386 (22.9)	194 (50.3)	183 (47.4)	9 (2.3)	442 (26.2)	811 (48.2)	45 (2.7)
7. Toronto Central	2,364	1,044 (44.2)	244 (23.4)	732 (70.1)	65 (6.2)	596 (25.2)	502 (21.2)	222 (9.4)
8. Central	849	229 (27.0)	102 (44.5)	118 (51.5)	9 (3.9)	326 (38.4)	280 (33.0)	14 (1.6)
9. Central East	1,552	359 (23.1)	155 (43.2)	197 (54.9)	7 (1.9)	752 (48.5)	414 (26.7)	27 (1.7)
10. South East	971	358 (36.9)	152 (42.5)	195 (54.5)	11 (3.1)	188 (19.4)	395 (40.7)	30 (3.1)
11. Champlain	1,853	792 (42.7)	462 (58.3)	324 (40.9)	6 (0.8)	309 (16.7)	608 (32.8)	144 (7.8)
12. North Simcoe Muskoka	499	160 (32.1)	79 (49.4)	80 (50.0)	**	129 (25.9)	204 (40.9)	6 (1.2)
13. North East	677	349 (51.6)	186 (53.3)	154 (44.1)	9 (2.6)	209 (30.9)	104 (15.4)	15 (2.2)
14. North West	625	317 (50.7)	129 (40.7)	169 (53.3)	17 (5.4)	102 (16.3)	189 (30.2)	17 (2.7)

Data source: Ontario Stroke Audit of Secondary Prevention Clinics (OSA-SPC), 2011/12.

Inclusion criteria: All patients aged ≥18 years who were referred and completed an initial clinic visit.

1 Based on multiple initial visits (i.e., includes patients who visited more than one SPC in the same fiscal year).

2 Includes other primary care worker.

3 Includes neurologist, surgeon and other medical specialist (e.g., cardiologist).

** Cell value suppressed for reasons of privacy and confidentiality.

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) See Appendix E for a list of clinics designated as regional and district stroke centres by the OSS.

(3) TIA, ischemic stroke and hemorrhagic stroke are subsets of all stroke/TIA. Sinovenous thrombosis stroke is not shown due to small number of diagnoses reported.

(4) Cells in which there were no reported/available data are marked with a hyphen (-).

EXHIBIT 2.9A Final patient diagnosis at the initial visit to a secondary stroke prevention clinic, in Ontario and by sex, 2011/12

Key Finding

- Women were more likely than men to be given a diagnosis of non-stroke (36.4% vs. 28.3%), query stroke/TIA (24.8% vs. 22.5%) or TIA (50.5% vs. 44.9%) and less likely to be diagnosed with a new or recent stroke/TIA (35.2% vs. 44.5%).

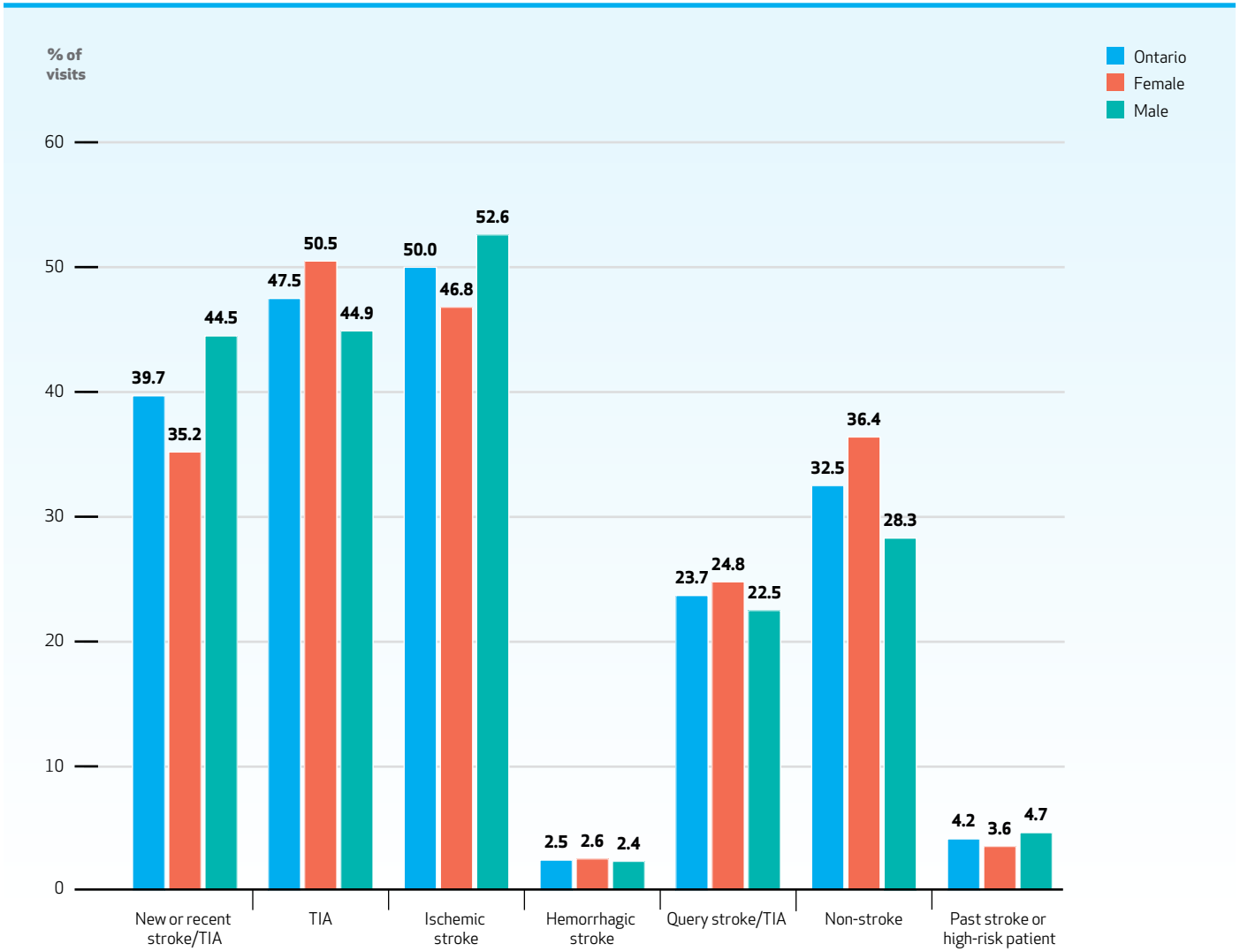


EXHIBIT 2.9B Final patient diagnosis at the initial visit to a secondary stroke prevention clinic, in Ontario and by Ontario Stroke System designation, 2011/12

Key Finding

- Confirmed new or recent stroke/TIA diagnoses were much more common at SPCs in designated centres (40.3% at regional stroke centres and 46.4% at district stroke centres) than at community hospitals (24.3%), whereas query stroke/TIA diagnoses were approximately twice as common at SPCs in community hospitals (43.7%) than at those in regional or district stroke centres (21.9% and 16.5%, respectively).

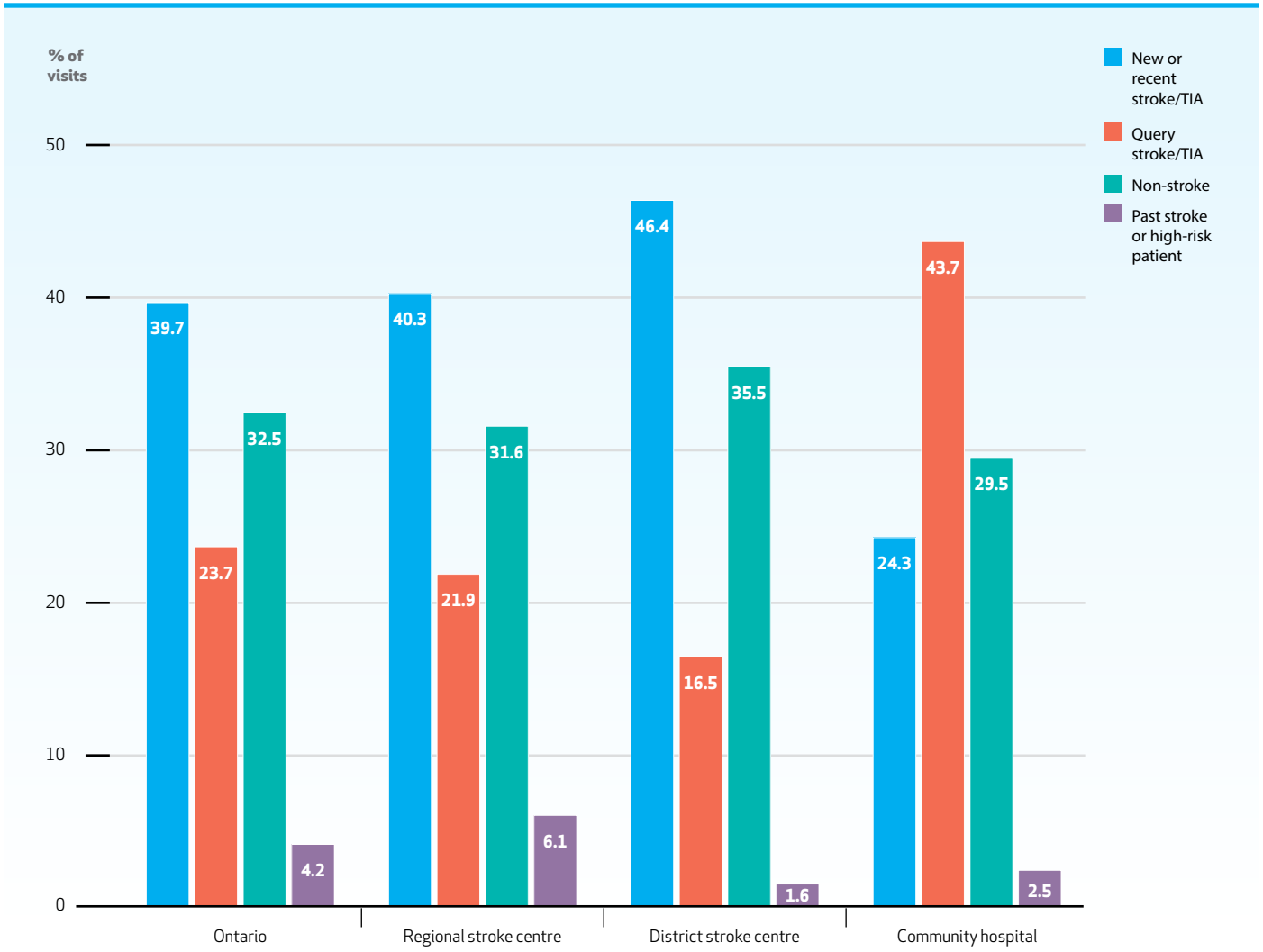


EXHIBIT 2.9C Final patient diagnosis at the initial visit to a secondary stroke prevention clinic, in Ontario and by referral source, 2011/12

Key Finding

- The majority (81.2%) of patients referred from inpatient care were diagnosed with stroke/TIA at the first SPC visit, while those referred by primary care physicians were more likely to be given a diagnosis of non-stroke (35.0%).

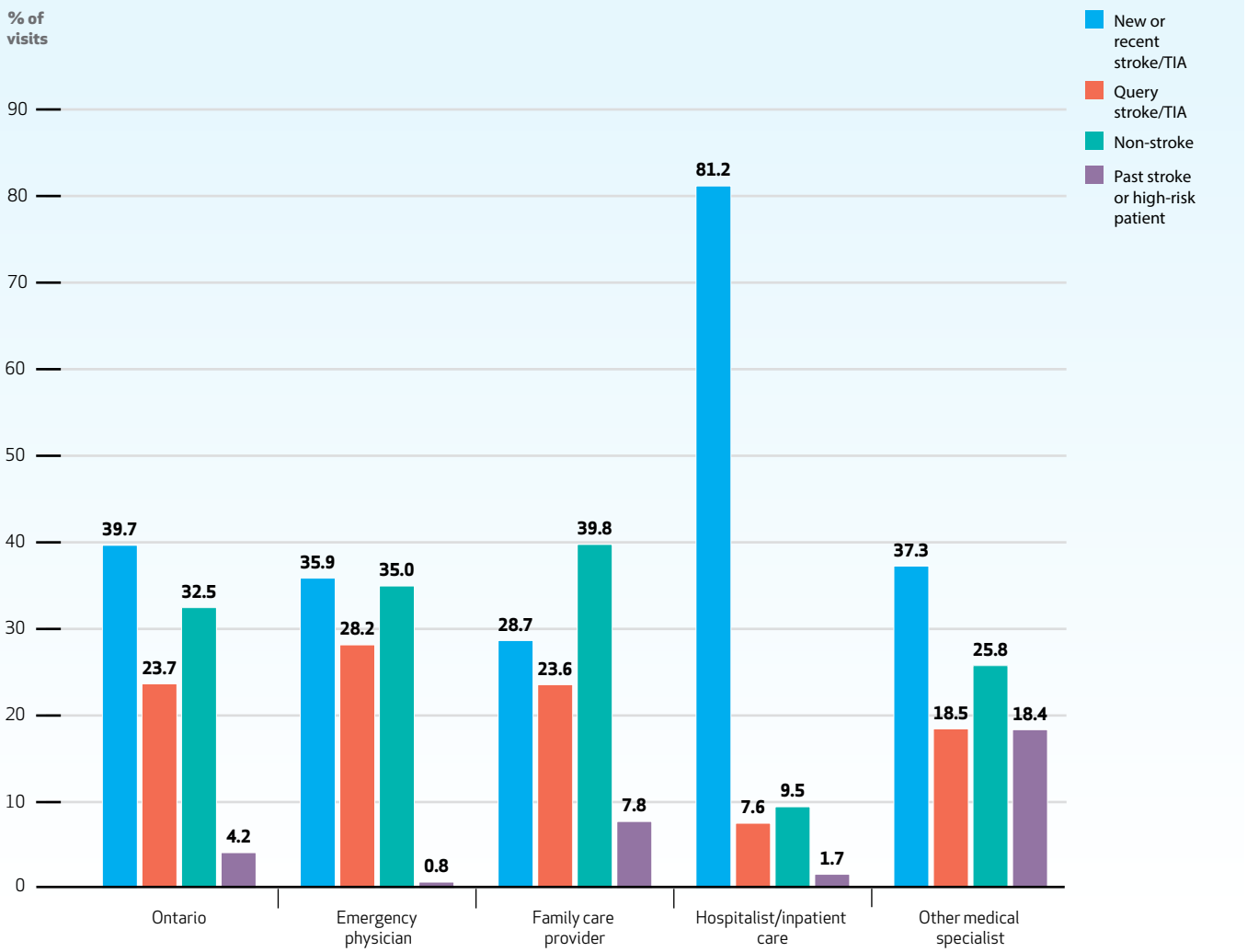


EXHIBIT 2.10 Characteristics of initial visits to secondary stroke prevention clinics that resulted in at least one follow-up visit, in Ontario and by sex, Ontario Stroke System designation and Local Health Integration Network, 2011/12

Key Findings

- In Ontario, 43.2% of initial SPC visits resulted in at least 1 follow-up SPC visit.
- Patients with initial visits at community hospital SPCs were more likely to return for a follow-up visit (69.4%) than patients at regional or district stroke centre SPCs (38.2% and 38.7%, respectively).
- The most common reasons for follow-up visits were to review the results of investigations or to monitor therapy (77.6%), or for lifestyle modification or education (22.4%). In 29.4% of cases, routine clinical practice was indicated as the reason for the follow-up visit. Note that these categories are not mutually exclusive, and patients could have had multiple reasons for follow-up visits.
- A higher proportion of follow-up visits at community hospital SPCs were because of routine clinical practice (48.8%), compared to designated centre SPCs (22.0% at regional stroke centres and 24.4% at district stroke centres).
- District stroke centre SPCs had the highest proportion of follow-up visits for patient education (43.1%), compared to community hospital SPCs (16.1%) and regional stroke centre SPCs (13.9%).
- In most follow-up visits (77.5%), there was no change in the diagnosis made at the initial clinic visit. In 12.9% of follow-up visits, a stroke diagnosis was changed to non-stroke, and in 9.6% of visits, a stroke/TIA diagnosis was confirmed (i.e., patients originally deemed query, non-stroke or high risk were diagnosed as having had a stroke/TIA).
- Fewer changes were made to diagnoses during follow-up visits at designated centres than at community hospitals.
- There was considerable variation across LHINs in the proportion of follow-up SPC visits resulting in no change to the initial diagnosis. This ranged from 42.6% in the Central East LHIN to 96.6% in the Erie St. Clair LHIN.

Group/Subgroup	Ontario	
Follow-up visits[1] N (%)	7,126 (43.2)	
Reason for Follow-Up Visit, n (%)		
Review results of investigations/ Monitor therapy	5,529 (77.6)	
Lifestyle modification/Education	1,596 (22.4)	
Study follow-up	79 (1.1)	
Routine clinic practice	2,093 (29.4)	
Suspected new event	129 (1.8)	
Other	288 (4.0)	
Change to Diagnosis at Follow-Up Visit, n (%)		
No change[2]	5,521 (77.5)	
Diagnosis changed to non-stroke	921 (12.9)	
Stroke/TIA diagnosis confirmed	684 (9.6)	

			Ontario Stroke System Designation			Local Health Integration Network													
	Female	Male	Regional Stroke Centre SPC	District Stroke Centre SPC	Community Hospital SPC	1. Erie St. Clair	2. South West	3. Waterloo Wellington	4. Hamilton Niagara Haldimand Brant	5. Central West	6. Mississauga Halton	7. Toronto Central	8. Central	9. Central East	10. South East	11. Champlain	12. North Simcoe Muskoka	13. North East	14. North West
	3,446 (40.4)	3,680 (46.2)	3,400 (38.2)	1,939 (38.7)	1,787 (69.4)	435 (30.8)	491 (38.2)	116 (15.5)	1,142 (58.0)	-	255 (15.1)	987 (41.8)	436 (51.4)	1,276 (82.2)	404 (41.6)	309 (16.7)	318 (63.7)	420 (62.0)	537 (85.9)
	2,664 (77.3)	2,865 (77.9)	3,189 (93.8)	1,372 (70.8)	968 (54.2)	130 (29.9)	468 (95.3)	97 (83.6)	963 (84.3)	-	246 (96.5)	949 (96.1)	433 (99.3)	497 (38.9)	373 (92.3)	290 (93.9)	311 (97.8)	363 (86.4)	409 (76.2)
	769 (22.3)	827 (22.5)	472 (13.9)	836 (43.1)	288 (16.1)	395 (90.8)	49 (10.0)	-	711 (62.3)	-	-	**	83 (19.0)	12 (0.9)	13 (3.2)	47 (15.2)	-	130 (31.0)	153 (28.5)
	43 (1.2)	36 (1.0)	36 (1.1)	17 (0.9)	26 (1.5)	**	**	-	**	-	-	20 (2.0)	-	26 (2.0)	10 (2.5)	6 (1.9)	7 (2.2)	**	**
	985 (28.6)	1,108 (30.1)	747 (22.0)	474 (24.4)	872 (48.8)	325 (74.7)	10 (2.0)	-	163 (14.3)	-	-	10 (1.0)	82 (18.8)	730 (57.2)	**	61 (19.7)	274 (86.2)	30 (7.1)	405 (75.4)
	64 (1.9)	65 (1.8)	75 (2.2)	40 (2.1)	14 (0.8)	18 (4.1)	17 (3.5)	6 (5.2)	**	-	7 (2.7)	32 (3.2)	6 (1.4)	7 (0.5)	11 (2.7)	7 (2.3)	**	6 (1.4)	**
	134 (3.9)	154 (4.2)	58 (1.7)	139 (7.2)	91 (5.1)	11 (2.5)	**	13 (11.2)	14 (1.2)	-	**	16 (1.6)	**	91 (7.1)	6 (1.5)	**	6 (1.9)	92 (21.9)	26 (4.8)
	2,621 (76.1)	2,900 (78.8)	2,806 (82.5)	1,760 (90.8)	955 (53.4)	420 (96.6)	425 (86.6)	109 (94.0)	988 (86.5)	-	191 (74.9)	877 (88.9)	349 (80.0)	544 (42.6)	378 (93.6)	244 (79.0)	274 (86.2)	252 (60.0)	470 (87.5)
	531 (15.4)	390 (10.6)	374 (11.0)	104 (5.4)	443 (24.8)	10 (2.3)	33 (6.7)	7 (6.0)	92 (8.1)	-	52 (20.4)	80 (8.1)	65 (14.9)	382 (29.9)	18 (4.5)	38 (12.3)	25 (7.9)	80 (19.0)	39 (7.3)
	294 (8.5)	390 (10.6)	220 (6.5)	75 (3.9)	389 (21.8)	**	33 (6.7)	-	62 (5.4)	-	12 (4.7)	30 (3.0)	22 (5.0)	350 (27.4)	8 (2.0)	27 (8.7)	19 (6.0)	88 (21.0)	28 (5.2)

Data source: Ontario Stroke Audit of Secondary Prevention Clinics (OSA-SPC), 2011/12.

Inclusion criteria: All patients aged ≥18 years who were referred and completed an initial clinic visit.

1 Based on multiple initial visits (i.e., includes patients who visited more than one SPC in the same fiscal year). Proportion shown is the number of initial visits that had at least one follow-up visit. Number shown is the number of follow-up visits that occurred within fiscal year 2011/12 (i.e., includes multiple follow-up visits per initial visit).

2 The diagnosis at the follow-up visit remained the same as the diagnosis made at the initial visit.

** Cell value suppressed for reasons of privacy and confidentiality.

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) See Appendix E for a list of clinics designated as regional and district stroke centres by the OSS.

(3) Cells in which there were no reported/available data are marked with a hyphen (-).

EXHIBIT 2.11 Proportion of visits to secondary stroke prevention clinics at which neuroimaging (CT or MRI) was ordered or completed prior to the visit, at the visit, both or neither, in Ontario and by sex, Ontario Stroke System designation and Local Health Integration Network, 2011/12

Key Findings

- Among SPC patients who had neuroimaging completed or ordered, the majority had CT scans rather than MRI scans (87.5% vs. 36.1%), with a higher proportion of MRIs performed at regional stroke centre SPCs (46.9%), compared to district stroke centre and community hospital SPCs (21.7% and 26.5%, respectively).
- There was modest variation in neuroimaging rates across LHINs, ranging from 81.1% of visits with a CT or MRI scan completed or ordered at any time in the Hamilton Niagara Haldimand Brant LHIN to 98.6% of visits in the Central East LHIN.

		CT or MRI				CT	MRI
	Patients[1]	Prior to SPC	At SPC	Both prior to and at SPC visit	None	At any time[2]	At any time[2]
Group/Subgroup	N	n (%)					
Ontario	16,487	10,748 (65.2)	1,643 (10.0)	3,100 (18.8)	996 (6.0)	14,420 (87.5)	5,945 (36.1)
Female	8,522	5,545 (65.1)	842 (9.9)	1,598 (18.8)	537 (6.3)	7,422 (87.1)	3,014 (35.4)
Male	7,965	5,203 (65.3)	801 (10.1)	1,502 (18.9)	459 (5.8)	6,998 (87.9)	2,931 (36.8)
Ontario Stroke System designation							
Regional stroke centre SPC	8,909	5,101 (57.3)	935 (10.5)	2,131 (23.9)	742 (8.3)	7,323 (82.2)	4,178 (46.9)
District stroke centre SPC	5,004	3,914 (78.2)	387 (7.7)	572 (11.4)	131 (2.6)	4,747 (94.9)	1,086 (21.7)
Community hospital SPC	2,574	1,733 (67.3)	321 (12.5)	397 (15.4)	123 (4.8)	2,350 (91.3)	681 (26.5)
Local Health Integration Network							
1. Erie St. Clair	1,413	904 (64.0)	263 (18.6)	207 (14.6)	39 (2.8)	1,345 (95.2)	281 (19.9)
2. South West	1,285	705 (54.9)	201 (15.6)	309 (24.0)	70 (5.4)	1,058 (82.3)	569 (44.3)
3. Waterloo Wellington	746	596 (79.9)	23 (3.1)	106 (14.2)	21 (2.8)	685 (91.8)	207 (27.7)
4. Hamilton Niagara Haldimand Brant	1,969	1,179 (59.9)	191 (9.7)	227 (11.5)	372 (18.9)	1,449 (73.6)	505 (25.6)
5. Central West	-	-	-	-	-	-	-
6. Mississauga Halton	1,684	935 (55.5)	281 (16.7)	344 (20.4)	124 (7.4)	1,367 (81.2)	628 (37.3)
7. Toronto Central	2,364	1,378 (58.3)	174 (7.4)	640 (27.1)	172 (7.3)	1,917 (81.1)	1,573 (66.5)
8. Central	849	604 (71.1)	50 (5.9)	172 (20.3)	23 (2.7)	790 (93.1)	292 (34.4)
9. Central East	1,552	1,071 (69.0)	242 (15.6)	218 (14.0)	21 (1.4)	1,492 (96.1)	398 (25.6)
10. South East	971	847 (87.2)	24 (2.5)	46 (4.7)	54 (5.6)	897 (92.4)	146 (15.0)
11. Champlain	1,853	1,268 (68.4)	86 (4.6)	453 (24.4)	46 (2.5)	1,739 (93.8)	628 (33.9)
12. North Simcoe Muskoka	499	320 (64.1)	33 (6.6)	123 (24.6)	23 (4.6)	459 (92.0)	157 (31.5)
13. North East	677	497 (73.4)	39 (5.8)	125 (18.5)	16 (2.4)	651 (96.2)	207 (30.6)
14. North West	625	444 (71.0)	36 (5.8)	130 (20.8)	15 (2.4)	571 (91.4)	354 (56.6)

Data source: Ontario Stroke Audit of Secondary Prevention Clinics (OSA-SPC), 2011/12.
Inclusion criteria: All patients aged ≥18 years who were referred and completed an initial clinic visit.
1 Based on multiple initial visits (i.e., includes patients who visited more than one SPC in the same fiscal year).
2 Includes imaging ordered or completed prior to SPC visit, at SPC, or both prior to and at SPC visit.

Notes:
(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).
(2) See Appendix E for a list of clinics designated as regional and district stroke centres by the OSS.
(3) Cells in which there were no reported/available data are marked with a hyphen (-).
CT = computed tomography
MRI = magnetic resonance imaging

EXHIBIT 2.11A Proportion of visits to secondary stroke prevention clinics at which neuroimaging (CT or MRI) was ordered or completed prior to the visit, at the visit, both or neither, in Ontario, 2011/12

Key Findings

- In Ontario, a neuroimaging procedure was completed in 94.0% of SPC visits, either prior to or at the visit or both.
- Overall, 65.2% of neuroimaging was done prior to the first SPC visit, and 18.8% of patients had two neuroimaging procedures completed or ordered.

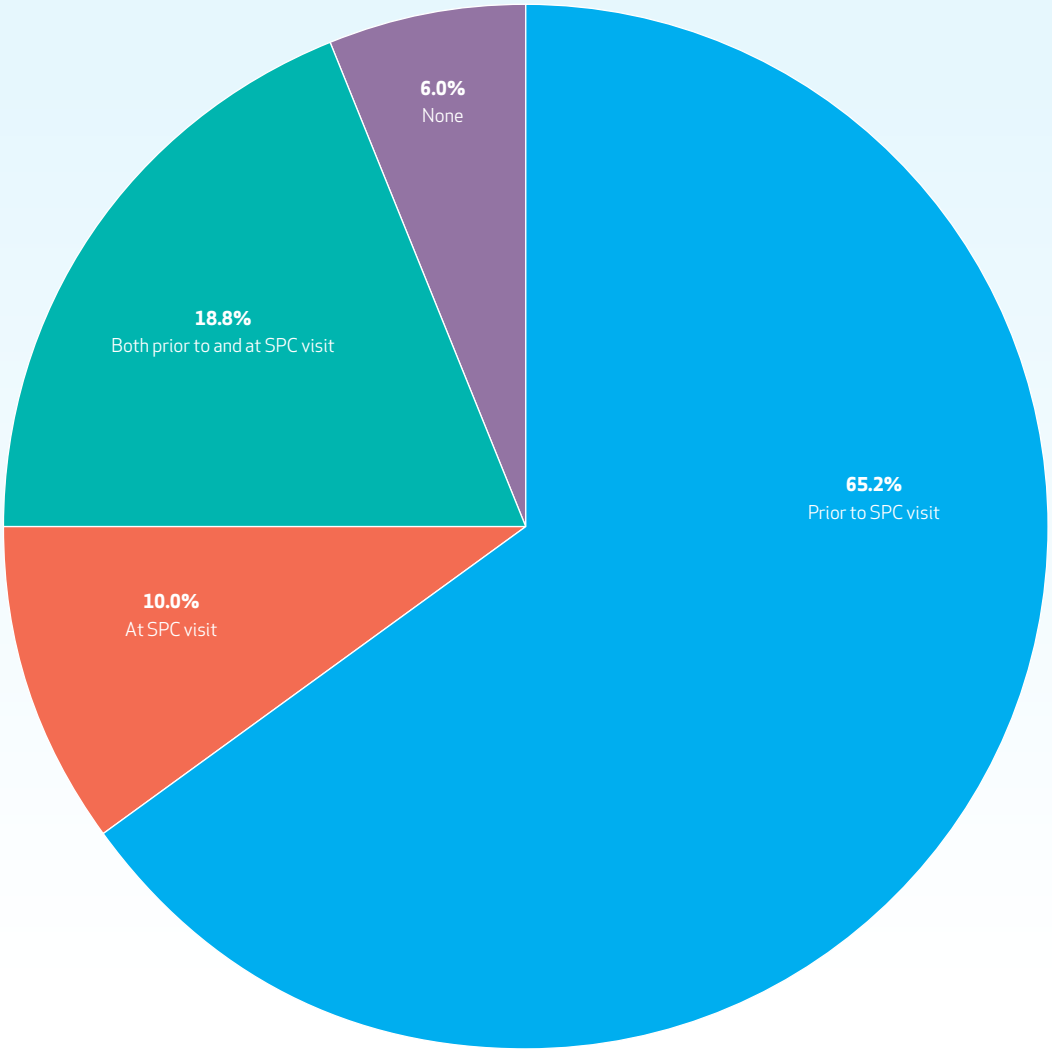


EXHIBIT 2.11B Proportion of visits to secondary stroke prevention clinics at which neuroimaging (CT or MRI) was ordered or completed prior to the visit, at the visit, both or neither, by Ontario Stroke System designation, 2011/12

Key Finding

- At regional stroke centres, 1 in 4 patients had two neuroimaging procedures completed or ordered, compared to 1 in 9 patients at SPCs in district stroke centres.

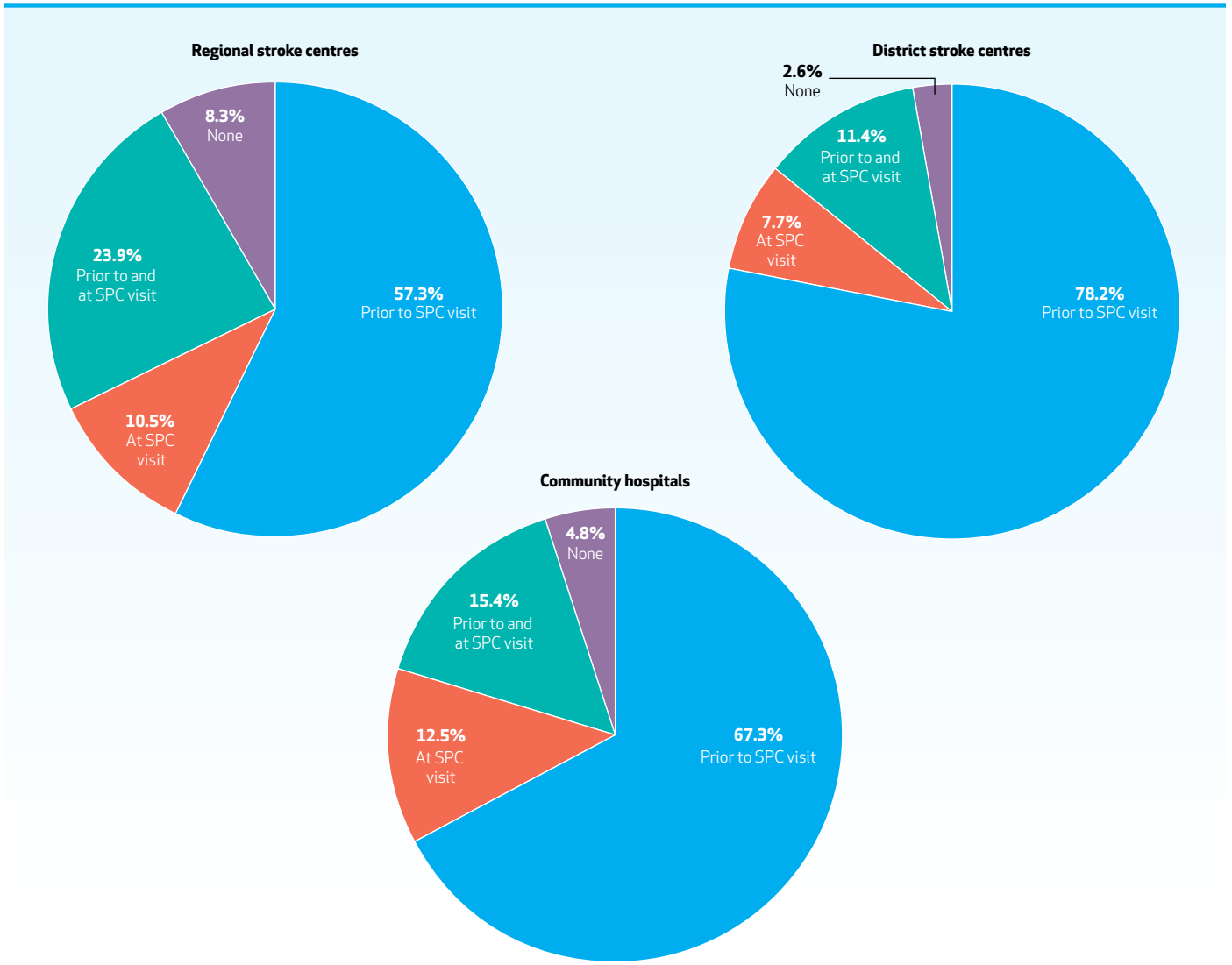


EXHIBIT 2.12 Proportion of visits to secondary stroke prevention clinics in which vascular imaging was ordered or completed prior to the visit, at the visit or neither, in Ontario and by sex, Ontario Stroke System designation and Local Health Integration Network, 2011/12

Key Findings

- Overall, 83.9% of all patients and 92.7% of those with ischemic stroke/TIA seen at SPCs underwent vascular imaging.
- In half of SPC visits (50.3%), vascular imaging was completed prior to the initial visit.
- Modest regional variations were observed in vascular imaging rates among ischemic stroke/TIA patients, ranging from 85.0% in the Erie St. Clair LHIN to 99.5% in the Champlain LHIN.

	Imaging prior to SPC		Imaging at SPC or after initial visit		Imaging at unknown time		No imaging	
	n (%)							
Group/Subgroup	All (N=16,487)	Ischemic/TIA (N=6,377)	All (N=16,487)	Ischemic/TIA (N=6,377)	All (N=16,487)	Ischemic/TIA (N=6,377)	All (N=16,487)	Ischemic/TIA (N=6,377)
Ontario[1]	8,295 (50.3)	3,613 (56.7)	4,387 (26.6)	1,814 (28.4)	1,153 (7.0)	487 (7.6)	2,652 (16.1)	463 (7.3)
Female	4,191 (49.2)	1,618 (55.4)	2,248 (26.4)	842 (28.8)	561 (6.6)	226 (7.7)	1,522 (17.9)	234 (8.0)
Male	4,104 (51.5)	1,995 (57.7)	2,139 (26.9)	972 (28.1)	592 (7.4)	261 (7.5)	1,130 (14.2)	229 (6.6)
Ontario Stroke System designation								
Regional stroke centre SPC	3,943 (44.3)	1,924 (55.2)	2,634 (29.6)	963 (27.6)	797 (8.9)	351 (10.1)	1,535 (17.2)	248 (7.1)
District stroke centre SPC	2,758 (55.1)	1,275 (55.8)	1,390 (27.8)	767 (33.6)	149 (3.0)	77 (3.4)	707 (14.1)	167 (7.3)
Community hospital SPC	1,594 (61.9)	414 (68.4)	363 (14.1)	84 (13.9)	207 (8.0)	59 (9.8)	410 (15.9)	48 (7.9)
Local Health Integration Network								
1. Erie St. Clair	449 (31.8)	200 (33.0)	567 (40.1)	315 (52.0)	**	**	396 (28.0)	90 (14.9)
2. South West	554 (43.1)	339 (46.4)	575 (44.7)	356 (48.7)	16 (1.2)	10 (1.4)	140 (10.9)	26 (3.6)
3. Waterloo Wellington	261 (35.0)	162 (35.6)	372 (49.9)	258 (56.7)	**	**	113 (15.1)	35 (7.7)
4. Hamilton Niagara Haldimand Brant	703 (35.7)	312 (42.7)	221 (11.2)	112 (15.3)	461 (23.4)	225 (30.8)	584 (29.7)	81 (11.1)
5. Central West	-	-	-	-	-	-	-	-
6. Mississauga Halton	293 (17.4)	83 (22.0)	1,072 (63.7)	259 (68.7)	48 (2.9)	8 (2.1)	271 (16.1)	27 (7.2)
7. Toronto Central	1,064 (45.0)	578 (59.2)	444 (18.8)	142 (14.5)	280 (11.8)	134 (13.7)	576 (24.4)	122 (12.5)
8. Central	494 (58.2)	166 (75.5)	201 (23.7)	45 (20.5)	12 (1.4)	**	142 (16.7)	7 (3.2)
9. Central East	1,161 (74.8)	268 (76.1)	98 (6.3)	14 (4.0)	217 (14.0)	63 (17.9)	76 (4.9)	7 (2.0)
10. South East	725 (74.7)	281 (81.0)	110 (11.3)	29 (8.4)	21 (2.2)	7 (2.0)	115 (11.8)	30 (8.6)
11. Champlain	1,609 (86.8)	691 (87.9)	170 (9.2)	80 (10.2)	24 (1.3)	11 (1.4)	50 (2.7)	**
12. North Simcoe Muskoka	151 (30.3)	69 (43.4)	212 (42.5)	62 (39.0)	53 (10.6)	18 (11.3)	83 (16.6)	10 (6.3)
13. North East	366 (54.1)	218 (64.1)	249 (36.8)	102 (30.0)	16 (2.4)	7 (2.1)	46 (6.8)	13 (3.8)
14. North West	465 (74.4)	246 (82.6)	96 (15.4)	40 (13.4)	**	**	60 (9.6)	11 (3.7)

Data source: Ontario Stroke Audit of Secondary Prevention Clinics (OSA-SPC), 2011/12.

Inclusion criteria: All patients aged ≥18 years who were referred and completed an initial clinic visit.

1 Based on multiple initial visits (i.e., includes patients who visited more than one SPC in the same fiscal year).

** Cell value suppressed for reasons of privacy and confidentiality.

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) See Appendix E for a list of clinics designated as regional and district stroke centres by the OSS.

(3) Cells in which there were no reported/available data are marked with a hyphen (-).

Key Findings

EXHIBITS 2.12A–2.12D

- Similar vascular imaging rates were observed across hospital designations for all initial visits (82.8%, 85.9% and 84.1% at regional stroke centres, district stroke centres and community hospital SPCs, respectively) and for patients with ischemic stroke/TIA (92.9%, 92.7% and 92.1% at regional stroke centres, district stroke centres and community hospital SPCs, respectively).
- Overall, vascular imaging rates were slightly lower for women than for men (82.1% vs. 85.8%); however, among ischemic stroke/TIA patients, there was minimal difference between women and men (92.0% vs. 93.4%).

EXHIBIT 2.12A Proportion of visits to a secondary stroke prevention clinic by all patients that included vascular imaging at any time, in Ontario and by sex, 2011/12

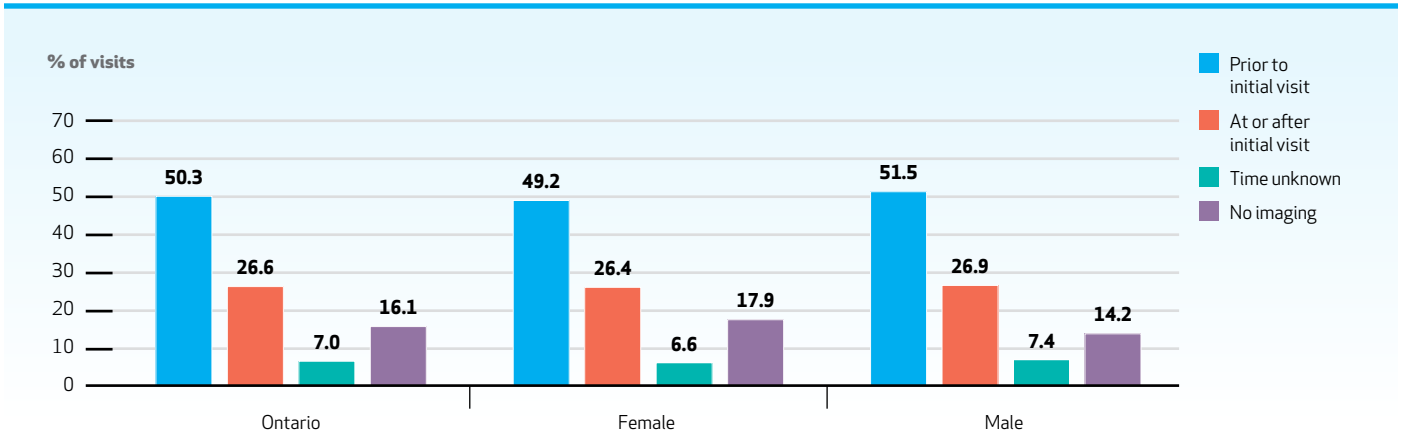


EXHIBIT 2.12B Proportion of visits to a secondary stroke prevention clinic by all patients that included vascular imaging at any time, in Ontario and by Ontario Stroke System designation, 2011/12

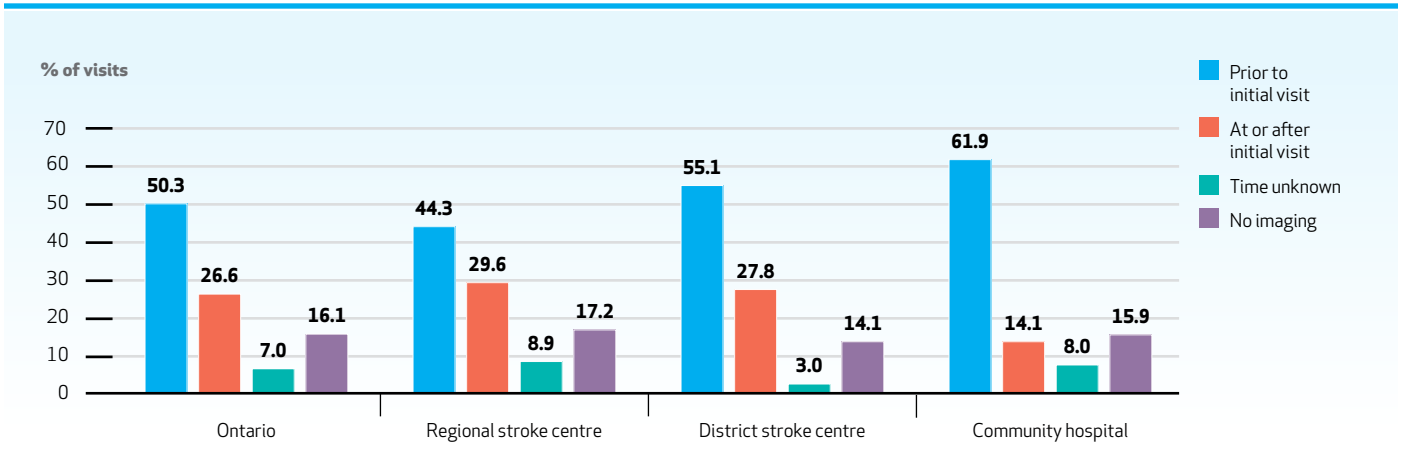


EXHIBIT 2.12C Proportion of visits to a secondary stroke prevention clinic by ischemic stroke/TIA patients that included vascular imaging at any time, in Ontario and by sex, 2011/12

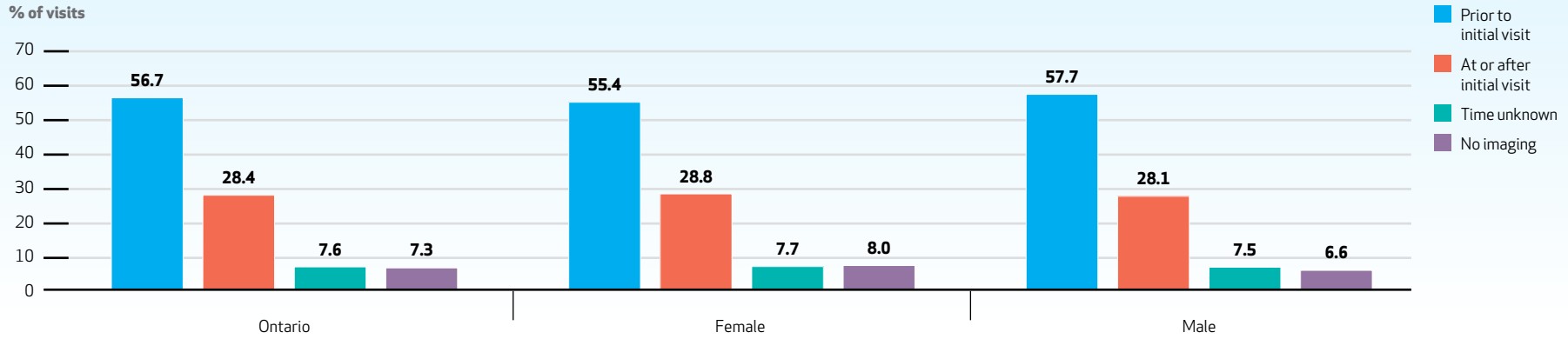


EXHIBIT 2.12D Proportion of visits to a secondary stroke prevention clinic by ischemic stroke/TIA patients that included vascular imaging at any time, in Ontario and by Ontario Stroke System designation, 2011/12

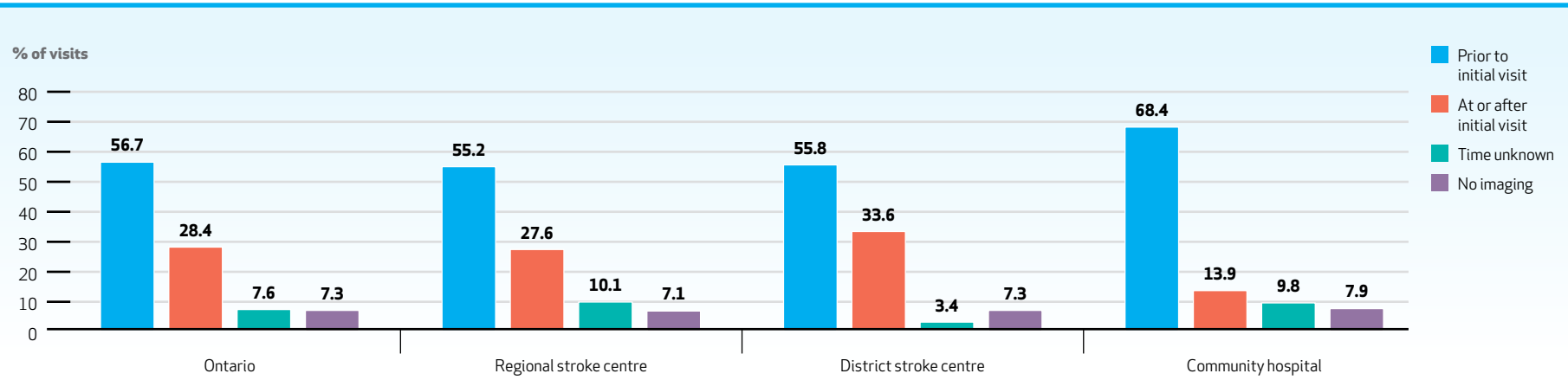


EXHIBIT 2.13 Proportion of patients visiting secondary stroke prevention clinics who received a carotid intervention and the time to procedure, in Ontario and by sex, Ontario Stroke System designation and Local Health Integration Network, 2011/12

Key Findings

- In 2011/12, 1.5% of patients received a carotid intervention (carotid endarterectomy (CEA) or carotid artery stenting (CAS)) after their initial SPC visit.
- The CEA/CAS rate for women was half that for men (1.0% vs. 2.1%); however, the median time from index event to carotid surgery was shorter for women than for men (44 days vs. 55 days).
- The CEA/CAS rate was highest at regional stroke centres (1.6%), followed by district stroke centres (1.4%) and community hospitals (1.2%).
- Among the 199 patients with complete data, the median time from the index event to a CEA/CAS was 50 days. The median time from the initial SPC visit to a CEA/CAS was 28 days.
- Across the province, 9.0% of patients seen at SPCs underwent a CEA/CAS within 2 weeks of their index event.
- The median time from an SPC visit to a CEA/CAS was 19 days at community hospitals, 25.5 days at district stroke centres and 30 days at regional stroke centres.
- The timeliness of coronary intervention varied greatly among LHINs. For the 199 SPC patients with complete data, the median time to a CEA/CAS from the index event ranged from 35 days in the Central and Central East LHINs to 107.5 days in the North Simcoe Muskoka LHIN. The median time from an SPC visit to a CEA/CAS varied from 11 days in the Central LHIN to 90 days in the North Simcoe Muskoka LHIN.

Group/Subgroup	Patients[1] N
Ontario	15,534
Female	7,999
Male	7,535
Ontario Stroke System designation	
Regional stroke centre SPC	8,297
District stroke centre SPC	4,748
Community hospital SPC	2,489
Local Health Integration Network	
1. Erie St. Clair	1,223
2. South West	1,266
3. Waterloo Wellington	731
4. Hamilton Niagara Haldimand Brant	1,865
5. Central West	-
6. Mississauga Halton	1,493
7. Toronto Central	2,193
8. Central	820
9. Central East	1,531
10. South East	939
11. Champlain	1,733
12. North Simcoe Muskoka	488
13. North East	667
14. North West	585

	CEA done after SPC visit	Patients with CEA done after SPC visit[1,2]	CEA/CAS done within 2 weeks of index event	Time from index event to CEA/CAS	Time from initial SPC visit to CEA/CAS
	n (%)	N	n (%)	Days, mean, median (IQR)	Days, mean, median (IQR)
	235 (1.5)	199	18 (9.0)	67.0, 50.0 (27.0, 93.0)	41.3, 28.0 (14.0, 57.0)
	76 (1.0)	64	**	65.1, 44.0 (27.0, 79.0)	37.3, 21.0 (13.0, 51.5)
	159 (2.1)	135	15 (11.1)	67.9, 55.0 (26.0, 94.0)	43.2, 30.0 (14.0, 61.0)
	136 (1.6)	112	8 (7.1)	70.3, 55.5 (29.5, 101.0)	43.1, 30.0 (14.0, 62.0)
	68 (1.4)	61	6 (9.8)	69.3, 49.0 (28.0, 87.0)	43.0, 25.5 (13.0, 52.0)
	31 (1.2)	26	**	47.3, 36.5 (23.0, 59.0)	29.5, 19.0 (8.0, 41.0)
	22 (1.8)	21	**	57.6, 43.0 (17.0, 87.0)	45.4, 30.5 (13.0, 57.0)
	23 (1.8)	23	**	61.0, 61.0 (44.0, 78.0)	39.5, 36.0 (30.0, 46.0)
	6 (0.8)	6	-	81.0, 77.0 (54.0, 122.0)	62.0, 64.0 (36.0, 96.0)
	31 (1.7)	20	**	59.4, 41.0 (24.0, 76.0)	26.9, 21.0 (11.0, 34.0)
	-	-	-	-	-
	19 (1.3)	17	**	54.4, 37.0 (27.0, 63.0)	30.8, 23.0 (14.0, 42.0)
	19 (0.9)	17	**	88.3, 85.0 (44.0, 123.0)	45.7, 44.0 (14.0, 70.0)
	9 (1.1)	9	-	35.6, 35.0 (27.0, 39.0)	18.1, 11.0 (7.0, 30.0)
	27 (1.8)	20	**	73.2, 35.0 (21.0, 63.0)	36.8, 20.0 (8.0, 50.0)
	11 (1.2)	7	-	84.6, 83.0 (51.0, 90.0)	28.8, 17.0 (11.0, 52.0)
	36 (2.1)	28	**	68.0, 35.5 (24.0, 62.5)	43.2, 20.0 (12.0, 37.0)
	10 (2.0)	10	-	103.5, 107.5 (89.0, 131.0)	77.8, 90.0 (34.0, 107.0)
	14 (2.1)	13	-	68.5, 59.0 (39.0, 103.0)	60.5, 54.0 (21.0, 102.0)
	8 (1.4)	8	-	50.9, 46.0 (23.5, 66.0)	35.5, 19.5 (11.0, 65.0)

Data sources: Ontario Stroke Audit of Secondary Prevention Clinics (OSA-SPC), 2011/12; CIHI Discharge Abstract Database (CIHI-DAD), 2011/12.

Inclusion criteria: All patients aged ≥18 years with a valid Ontario health card who completed an initial SPC visit, who were referred for new or recent stroke/TIA or had an index event,[3] and who either had carotid imaging done at any time or had a history of carotid artery stenosis (>50%).

1 Based on unique patients.

2 Excludes patients with missing index event date, SPC referral date or carotid imaging date.

3 An index event is defined as an acute neurological event that led to the SPC referral (e.g., sudden onset of weakness, dizziness) and was noted in the SPC patient's chart.

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) See Appendix E for a list of clinics designated as regional and district stroke centres by the OSS.

(3) Includes ICD-10 codes 1JE.50 or 1JE.57 or 1JE.87.

(4) Indication of symptomatic/asymptotic carotid artery stenosis is unavailable in OSA-SPC database.

(5) CEA/CAS rates may be under-reported as patients with visits in the latter part of 2011/12 did not have a complete lookout period beyond March 31, 2012.

(6) Cells in which there were no reported/available data are marked with a hyphen (-).

IQR = interquartile range (25th–75th percentile).

EXHIBIT 2.14 Proportion of visits to secondary stroke prevention clinics at which medications were prescribed or recommended at any time, in Ontario and by sex, Ontario Stroke System designation and Local Health Integration Network, 2011/12

Key Findings

- For those with ischemic stroke or TIA, antiplatelet therapy was prescribed or recommended in 94.4% of SPC visits, with no difference for women and men (p=0.32) and little regional variation (from 89.8% in the Toronto Central LHIN to 98.5% in the North Simcoe Muskoka LHIN).
- Among patients with atrial fibrillation, anticoagulant therapy was prescribed or recommended in 80.1% of SPC visits, with no difference in the rate of prescribing for women and men (p=0.62) but with regional variation (from a low of 57.4% in the Waterloo Wellington LHIN to a high of 89.3% in the Central East LHIN).
- Among patients with hypertension, antihypertensive agents were prescribed or recommended in 68.0% of SPC visits, and among patients with hyperlipidemia, lipid-lowering agents were prescribed or recommended in 65.7% of visits. There were slightly lower rates of prescribing of both classes of medications for women than for men (p<0.0001), with some regional variations in prescribing rates.
- Among current smokers, approximately 1 in 5 received interventions to encourage smoking cessation, with higher rates at regional stroke centre SPCs (24.5%) than at community hospital SPCs (18.3%) or district stroke centre SPCs (14.8%).
- Prescription/recommendation rates for smoking interventions were similar in women and men; however, variations were observed across LHINs, ranging from a low of 6.3% in the Waterloo Wellington LHIN to a high of 49.8% in the Champlain LHIN.

Group/Subgroup	Antiplatelet therapy[1,2] (N=5,466)	Anticoagulant therapy[1,3] (N=981)	Antihypertensive agents[1,4] (N=10,498)	Lipid-lowering agents[1,5] (N=9,182)	Smoking cessation medication/ program[1,6,7] (N=2,717)
	n (%)				
Ontario	5,160 (94.4)	786 (80.1)	7,134 (68.0)	6,037 (65.7)	550 (20.2)
Female	2,345 (94.7)	384 (80.5)	3,446 (65.4)	2,743 (62.8)	239 (19.0)
Male	2,815 (94.1)	402 (79.8)	3,688 (70.5)	3,294 (68.4)	311 (21.4)
Ontario Stroke System designation					
Regional stroke centre SPC	2,747 (93.6)	476 (80.8)	3,865 (69.3)	3,184 (65.7)	335 (24.5)
District stroke centre SPC	1,912 (95.0)	235 (78.9)	2,119 (65.2)	1,725 (64.0)	133 (14.8)
Community hospital SPC	501 (96.5)	75 (79.8)	1,150 (68.9)	1,128 (68.9)	82 (18.3)
Local Health Integration Network					
1. Erie St. Clair	521 (95.6)	55 (79.7)	521 (59.7)	384 (57.3)	57 (21.7)
2. South West	625 (95.0)	66 (79.5)	590 (73.3)	473 (66.3)	26 (12.1)
3. Waterloo Wellington	378 (93.1)	31 (57.4)	386 (75.2)	340 (71.1)	8 (6.3)
4. Hamilton Niagara Haldimand Brant	582 (93.0)	77 (69.4)	815 (65.7)	715 (62.2)	82 (23.7)
5. Central West	-	-	-	-	-
6. Mississauga Halton	318 (95.8)	38 (82.6)	542 (52.8)	416 (48.4)	**
7. Toronto Central	687 (89.8)	189 (85.9)	1,122 (75.5)	930 (75.3)	31 (11.2)
8. Central	177 (96.7)	34 (82.9)	355 (64.5)	302 (64.1)	16 (15.8)
9. Central East	285 (95.3)	50 (89.3)	691 (70.4)	721 (74.1)	25 (9.5)
10. South East	282 (92.5)	38 (88.4)	392 (63.6)	298 (63.1)	46 (21.6)
11. Champlain	664 (97.4)	93 (84.5)	791 (68.1)	661 (64.9)	159 (49.8)
12. North Simcoe Muskoka	131 (98.5)	24 (85.7)	206 (65.2)	173 (56.4)	**
13. North East	278 (95.5)	41 (75.9)	421 (84.2)	365 (78.2)	29 (19.7)
14. North West	232 (96.3)	50 (75.8)	302 (70.4)	259 (70.4)	68 (49.3)

Data source: Ontario Stroke Audit of Secondary Prevention Clinics (OSA-SPC), 2011/12.

Inclusion criteria: All patients aged ≥18 years who were referred and completed an initial clinic visit.

1 Based on multiple initial visits (i.e., includes patients who visited more than one SPC in the same fiscal year).

2 Among ischemic stroke or transient ischemic attack patients excluding those with a past history or new diagnosis of atrial fibrillation during a follow-up visit that occurred within a week of initial visit (Female N=2,476; Male N=2,990).

3 Among ischemic stroke or transient ischemic attack patients and with a past history or new diagnosis of atrial fibrillation during a follow-up visit that occurred within a week of the initial visit (Female N=477; Male N=504).

4 Among patients with a past history or new diagnosis of hypertension during a follow-up visit that occurred within a week of the initial visit (Female N=5,269; Male N=5,229).

5 Among patients with a past history or new diagnosis of hyperlipidemia during a follow-up visit that occurred within a week of the initial visit (Female N=4,365; Male N=4,817).

6 Among patients who were current smokers at their initial visit (Female N=1,261; Male N=1,456).

7 Includes referrals to smoking cessation program at initial clinic visit.

** Cell value suppressed for reasons of privacy and confidentiality.

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) See Appendix E for a list of clinics designated as regional and district stroke centres by the OSS.

(3) Cells in which there were no reported/available data are marked with a hyphen (-).

(4) Includes medications that were prescribed or recommended at follow-up visits that occurred within a week of initial visit.

EXHIBIT 2.14A Medications prescribed or recommended prior to or at secondary stroke prevention clinic visits, in Ontario and by sex, 2011/12

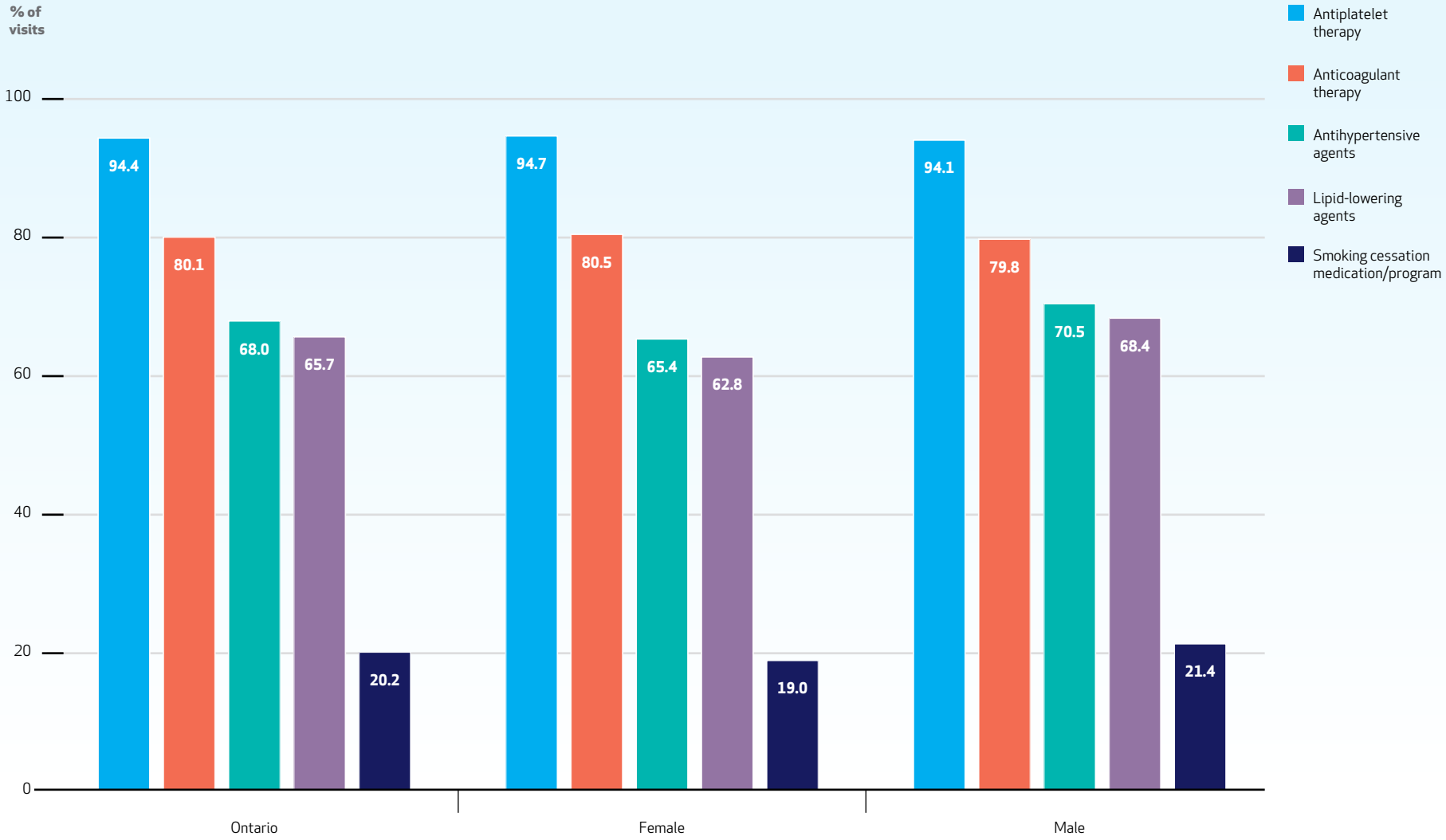


EXHIBIT 2.14B Medications prescribed or recommended prior to or at secondary stroke prevention clinic visits, in Ontario and by Ontario Stroke System designation, 2011/12

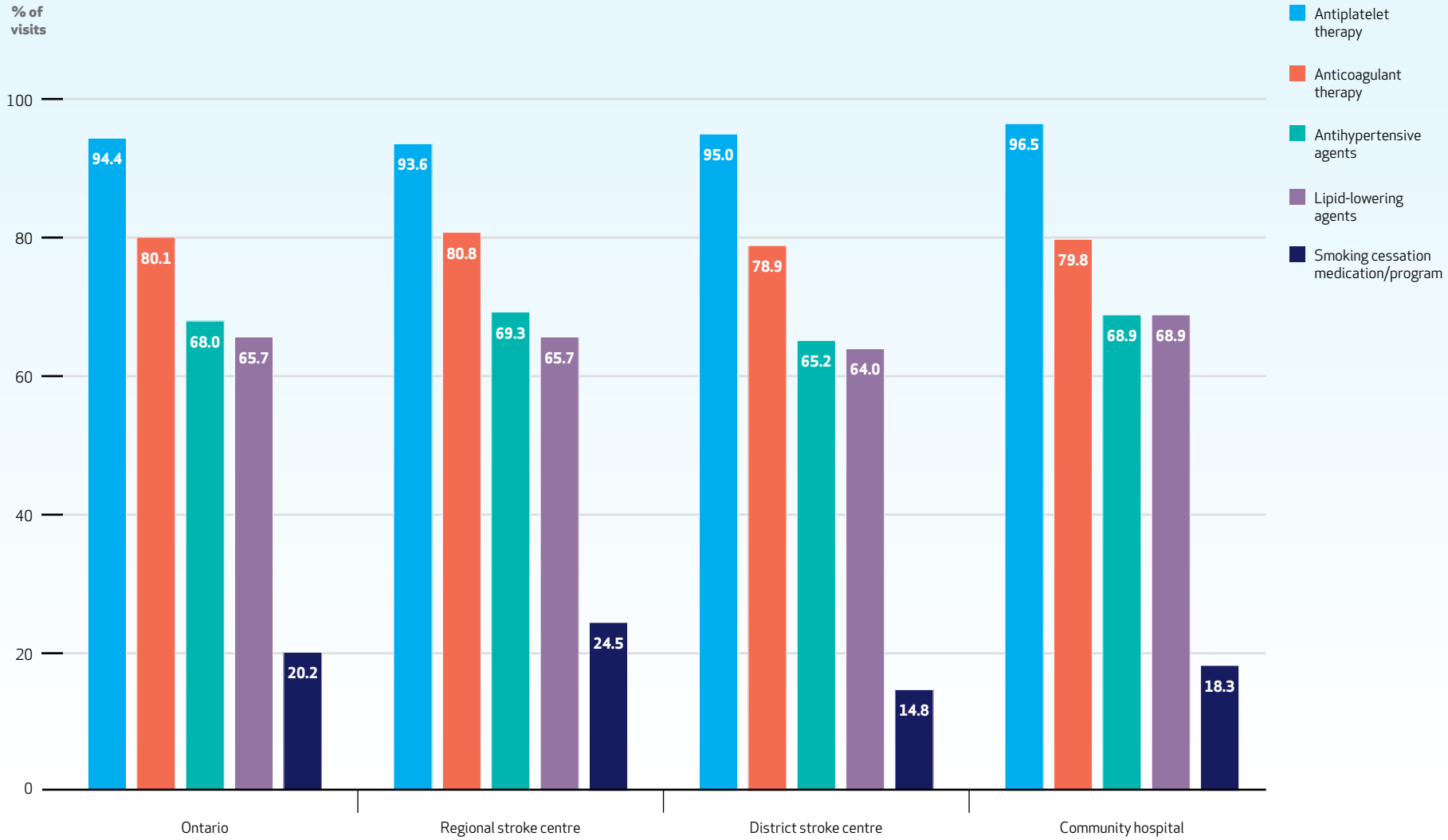


EXHIBIT 2.15 Age- and sex-adjusted readmission or revisit rates within 30 days of referral to a secondary stroke prevention clinic, in Ontario and by triage level, Ontario Stroke System designation and Local Health Integration Network, 2011/12

Key Findings

- Among patients who were referred to and seen at an Ontario SPC, 3.5% had a recurrent stroke/TIA revisit or readmission and 1.1% experienced a recurrent stroke/TIA that resulted in hospitalization within 30 days of the SPC referral. Among patients with confirmed ischemic stroke/TIA, 4.7% had a recurrent stroke/TIA revisit or readmission and 1.8% experienced a recurrent stroke/TIA that resulted in hospitalization within 30 days of the SPC referral, of which 69.0% occurred prior to the initial SPC visit (data not shown).
- Ischemic stroke/TIA patients triaged as emergent had the highest 30-day age- and sex-adjusted stroke/TIA readmission rate: 2.9%, compared to 1.0%, 1.0% and 2.1% for urgent, semi-urgent and elective patients, respectively.
- Patients seen at community hospital SPCs with ischemic stroke/TIA had the highest 30-day age- and sex-adjusted stroke/TIA readmission rate (2.7%), compared to those seen at SPCs in district and regional stroke centres (1.6% and 1.7%, respectively). Among patients with ischemic stroke/TIA, rates of stroke/TIA readmission varied across LHINs , ranging from 0% for patients in the Central LHIN to 4.2% for patients in the Mississauga Halton LHIN.

Group	Age- and sex-adjusted[1] readmission rate, % (CI)		Age- and sex-adjusted[1] revisit rate, % (CI)		Age- and sex-adjusted[1] readmission or revisit rate, % (CI)	
	All patients (N=13,132)	Ischemic/TIA (N=5,780)	All patients (N=13,132)	Ischemic/TIA (N=5,780)	All patients (N=13,132)	Ischemic/TIA (N=5,780)
Ontario[2]	1.1 (0.9-1.2)	1.8 (1.4-2.1)	3.2 (2.9-3.5)	4.3 (3.8-4.8)	3.5 (3.1-3.8)	4.7 (4.1-5.2)
Triage Level						
Emergent	1.8 (1.2-2.4)	2.9 (1.8-3.9)	7.0 (6.0-7.9)	9.6 (8.0-11.2)	7.3 (6.3-8.3)	10.1 (8.4-11.8)
Urgent	0.7 (0.2-1.3)	1.0 (0.0-2.0)	2.5 (1.5-3.5)	2.9 (1.3-4.4)	2.6 (1.6-3.6)	3.0 (1.4-4.7)
Semi-urgent	0.5 (0.2-0.8)	1.0 (0.4-1.7)	2.5 (2.1-3.0)	3.6 (2.6-4.6)	2.7 (2.2-3.2)	3.9 (2.8-4.9)
Elective	1.4 (1.2-1.7)	2.1 (1.7-2.6)	3.2 (2.7-3.6)	3.8 (3.1-4.6)	3.6 (3.1-4.1)	4.3 (3.5-5.1)
Ontario Stroke System designation						
Regional stroke centre SPC	1.1 (0.8-1.3)	1.7 (1.3-2.2)	2.8 (2.3-3.2)	3.4 (2.7-4.1)	3.1 (2.7-3.5)	3.9 (3.2-4.7)
District stroke centre SPC	1.1 (0.8-1.4)	1.6 (1.0-2.2)	3.9 (3.3-4.4)	5.1 (4.2-6.0)	4.1 (3.5-4.6)	5.3 (4.4-6.2)
Community hospital SPC	0.9 (0.5-1.4)	2.7 (1.6-3.9)	3.3 (2.6-4.0)	6.2 (4.5-7.9)	3.5 (2.7-4.2)	6.6 (4.8-8.3)
Local Health Integration Network						
1. Erie St. Clair	1.2 (0.6-1.8)	2.1 (1.0-3.2)	3.4 (2.3-4.4)	5.2 (3.5-6.9)	3.5 (2.4-4.5)	5.4 (3.6-7.1)
2. South West	1.2 (0.6-1.7)	1.8 (0.8-2.8)	3.4 (2.4-4.5)	3.9 (2.4-5.5)	3.6 (2.6-4.7)	4.2 (2.6-5.8)
3. Waterloo Wellington	1.1 (0.4-1.9)	0.7 (0.0-1.9)	2.6 (1.3-3.9)	3.3 (1.5-5.2)	3.0 (1.6-4.4)	3.3 (1.4-5.3)
4. Hamilton Niagara Haldimand Brant	0.7 (0.2-1.2)	1.3 (0.3-2.3)	3.8 (2.9-4.6)	5.7 (4.2-7.2)	3.9 (3.1-4.8)	6.0 (4.4-7.5)
5. Central West	-	-	-	-	-	-
6. Mississauga Halton	1.8 (1.1-2.5)	4.2 (2.8-5.7)	3.9 (2.7-5.1)	5.4 (3.2-7.6)	4.8 (3.6-6.1)	7.5 (5.3-9.8)
7. Toronto Central	0.8 (0.4-1.3)	1.1 (0.3-2.0)	1.9 (1.1-2.7)	2.1 (0.8-3.4)	2.1 (1.3-2.9)	2.3 (0.9-3.7)
8. Central	0.3 (0.0-1.0)	0.0 (0.0-1.8)	2.6 (1.4-3.9)	3.0 (0.2-5.8)	2.6 (1.3-3.9)	3.0 (0.1-5.9)
9. Central East	0.4 (0.0-1.0)	1.2 (0.0-2.7)	3.2 (2.3-4.1)	4.9 (2.7-7.1)	3.3 (2.3-4.2)	4.9 (2.6-7.2)
10. South East	1.5 (0.7-2.4)	2.6 (0.9-4.3)	3.7 (2.3-5.2)	4.7 (2.1-7.3)	4.1 (2.6-5.6)	5.2 (2.5-7.9)
11. Champlain	1.0 (0.5-1.5)	1.9 (0.9-2.9)	3.5 (2.6-4.4)	5.2 (3.7-6.7)	3.8 (2.8-4.7)	5.7 (4.1-7.2)
12. North Simcoe Muskoka	1.6 (0.7-2.6)	2.0 (0.0-4.2)	4.2 (2.5-5.9)	4.7 (1.4-7.9)	4.4 (2.7-6.2)	4.6 (1.3-8.0)
13. North East	2.0 (1.2-2.8)	3.1 (1.7-4.6)	2.9 (1.6-4.3)	4.1 (1.9-6.3)	3.3 (1.8-4.7)	4.7 (2.4-7.1)
14. North West	2.0 (1.1-2.9)	2.6 (1.0-4.2)	4.1 (2.5-5.6)	4.8 (2.4-7.2)	4.9 (3.3-6.5)	5.5 (3.0-8.0)

Data sources: Ontario Stroke Audit of Secondary Prevention Clinics (OSA-SPC), 2011/12; CIHI Discharge Abstract Database (CIHI-DAD), 2011/12 and NACRS, 2011/12.

Inclusion criteria: All patients aged ≥18 years with a valid Ontario health card who completed an initial SPC visit that occurred between April 1, 2011 and February 29, 2012 and had an index event.[3]

Exclusion criteria: Patients with missing referral dates, elective or planned visits/admissions.

1 Indirect standardization determined by using an age-sex regression model to calculate rates.

2 Based on unique patients.

3 An index event is defined as an acute neurological event that led to the SPC referral (e.g., sudden onset of weakness, dizziness) and was noted in the SPC patient's chart.

Notes:

(1) Includes NACRS records with ICD codes that include the prefix "Q" (suspected, questionable diagnoses)

(2) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(3) See Appendix E for a list of clinics designated as regional and district stroke centres by the OSS.

(4) Cells in which there were no reported/available data are marked with a hyphen (-).

CI = confidence interval (5th–95th percentile).

EXHIBIT 2.16 Age- and sex-adjusted readmission or revisit rates within 90 days of referral to a secondary stroke prevention clinic, in Ontario and by triage level, Ontario Stroke System designation and Local Health Integration Network, 2011/12

Key Findings

- Among patients seen in Ontario SPCs, 4.8% had a recurrent stroke/TIA revisit or readmission and 1.7% experienced a stroke/TIA that resulted in hospitalization within 90 days of the SPC referral. Among patients with confirmed ischemic stroke/TIA, 6.6% had a recurrent stroke/TIA revisit or readmission and 2.9% experienced a recurrent stroke/TIA that resulted in hospitalization within 90 days of the SPC referral. Half of readmissions occurred prior to the initial SPC visit (data not shown).
- Patients with confirmed ischemic stroke/TIA and triaged as emergent had the highest 90-day age- and sex-adjusted stroke/TIA readmission rate (4.7%), compared to 1.3%, 1.9% and 3.3% for urgent, semi-urgent and elective patients, respectively.
- Patients seen at community hospital SPCs with a confirmed ischemic stroke/TIA had the highest 90-day age- and sex-adjusted stroke/TIA readmission rate (5.0%), compared to 2.7% of patients seen at SPCs within district and regional stroke centres. Among patients with confirmed ischemic stroke/TIA, rates of readmission for stroke/TIA varied across LHINs, ranging from 0% in the Central LHIN to 5.1% in the Mississauga Halton LHIN.

Group	Age- and sex-adjusted[1] readmission rate, % (CI)		Age- and sex-adjusted[1] revisit rate, % (CI)		Age- and sex-adjusted[1] readmission or revisit rate, % (CI)	
	All patients (N=11,050)	Ischemic/TIA (N=4,894)	All patients (N=11,050)	Ischemic/TIA (N=4,894)	All patients (N=11,050)	Ischemic/TIA (N=4,894)
Ontario[2]	1.7 (1.5-2.0)	2.9 (2.4-3.4)	4.4 (4.1-4.8)	6.0 (5.4-6.7)	4.8 (4.4-5.2)	6.6 (5.9-7.3)
Triage Level						
Emergent	2.9 (2.1-3.7)	4.7 (3.2-6.1)	8.3 (7.1-9.6)	11.1 (9.0-13.1)	8.9 (7.6-10.2)	12.0 (9.9-14.1)
Urgent	1.0 (0.2-1.8)	1.3 (0.0-2.8)	3.0 (1.8-4.3)	3.5 (1.4-5.5)	3.2 (1.9-4.5)	3.9 (1.7-6.0)
Semi-urgent	1.0 (0.6-1.4)	1.9 (1.0-2.8)	3.5 (2.8-4.1)	5.5 (4.3-6.8)	3.6 (3.0-4.3)	5.8 (4.5-7.2)
Elective	2.2 (1.9-2.6)	3.3 (2.7-4.0)	4.8 (4.2-5.4)	5.8 (4.8-6.8)	5.4 (4.7-6.0)	6.6 (5.6-7.6)
Ontario Stroke System designation						
Regional stroke centre SPC	1.6 (1.2-1.9)	2.7 (2.0-3.3)	3.9 (3.4-4.5)	5.0 (4.1-5.9)	4.4 (3.8-4.9)	5.8 (4.9-6.7)
District stroke centre SPC	1.9 (1.5-2.4)	2.7 (1.9-3.5)	5.1 (4.5-5.8)	6.9 (5.8-8.1)	5.5 (4.7-6.2)	7.3 (6.1-8.5)
Community hospital SPC	1.8 (1.2-2.4)	5.0 (3.4-6.5)	4.6 (3.7-5.5)	8.4 (6.3-10.6)	4.9 (4.0-5.9)	9.1 (6.8-11.3)
Local Health Integration Network						
1. Erie St. Clair	1.8 (1.0-2.7)	3.1 (1.5-4.6)	4.3 (3.0-5.7)	6.8 (4.6-9.0)	4.6 (3.2-6.0)	7.3 (5.0-9.6)
2. South West	1.6 (0.8-2.4)	2.5 (1.1-3.9)	4.8 (3.5-6.1)	5.6 (3.6-7.6)	5.1 (3.7-6.4)	6.1 (4.1-8.2)
3. Waterloo Wellington	1.9 (0.9-3.0)	2.0 (0.4-3.7)	4.4 (2.7-6.0)	5.5 (3.2-7.9)	4.7 (3.0-6.4)	5.5 (3.1-8.0)
4. Hamilton Niagara Haldimand Brant	1.5 (0.8-2.2)	2.4 (1.0-3.8)	4.8 (3.8-5.9)	7.2 (5.3-9.1)	5.0 (3.9-6.1)	7.4 (5.3-9.4)
5. Central West	-	-	-	-	-	-
6. Mississauga Halton	2.3 (1.3-3.2)	5.1 (3.2-7.1)	4.7 (3.1-6.2)	5.9 (3.1-8.7)	5.8 (4.2-7.5)	8.8 (5.8-11.7)
7. Toronto Central	1.6 (1.0-2.2)	2.5 (1.4-3.7)	3.4 (2.4-4.4)	4.2 (2.5-5.8)	3.7 (2.7-4.8)	4.8 (3.0-6.5)
8. Central	0.3 (0.0-1.4)	0.0 (0.0-2.6)	3.1 (1.5-4.7)	4.5 (0.7-8.2)	3.1 (1.4-4.8)	4.4 (0.6-8.3)
9. Central East	1.3 (0.6-2.1)	3.4 (1.4-5.4)	4.4 (3.2-5.6)	6.7 (3.9-9.6)	4.5 (3.2-5.7)	6.7 (3.7-9.7)
10. South East	2.5 (1.4-3.7)	4.5 (2.2-6.9)	4.7 (2.9-6.5)	6.5 (3.2-9.8)	5.3 (3.4-7.1)	7.5 (4.1-11.0)
11. Champlain	1.4 (0.7-2.1)	2.6 (1.2-4.0)	4.5 (3.3-5.6)	6.3 (4.3-8.2)	4.8 (3.6-6.0)	6.8 (4.8-8.8)
12. North Simcoe Muskoka	2.8 (1.4-4.1)	4.7 (1.8-7.6)	6.2 (4.0-8.3)	8.5 (4.4-12.6)	6.1 (3.9-8.4)	8.5 (4.2-12.7)
13. North East	3.1 (2.0-4.2)	3.9 (2.0-5.9)	4.4 (2.7-6.2)	6.1 (3.3-8.9)	5.4 (3.6-7.2)	7.2 (4.2-10.1)
14. North West	2.7 (1.4-3.9)	3.6 (1.4-5.8)	7.0 (5.0-9.0)	8.1 (4.9-11.2)	8.0 (5.9-10.0)	9.4 (6.1-12.6)

Data sources: Ontario Stroke Audit of Secondary Prevention Clinics (OSA-SPC), 2011/12; CIHI Discharge Abstract Database (CIHI-DAD), 2011/12 and NACRS, 2011/12.

Inclusion criteria: All patients aged ≥18 years with a valid Ontario health card who completed an initial SPC visit that occurred between April 1, 2011 and December 31, 2011 and had an index event.[3]

Exclusion criteria: Patients with missing referral dates, or elective or planned visits/admissions.

1 Indirect standardization determined by using an age-sex regression model to calculate rates.

2 Based on unique patients.

3 An index event is defined as an acute neurological event that led to the SPC referral (e.g., sudden onset of weakness, dizziness) and was noted in the SPC patient's chart.

Notes:

(1) Includes NACRS records with ICD codes that include the prefix "Q" (suspected, questionable diagnoses).

(2) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(3) See Appendix E for a list of clinics designated as regional and district stroke centres by the OSS.

(4) Cells in which there were no reported/available data are marked with a hyphen (-).

CI = confidence interval (5th–95th percentile).

Secondary Prevention Care

CONCLUSIONS

The majority of clinic referrals were hospital-based, which is to be expected because the focus of SPCs is on immediate follow-up post-stroke event. These patients are more likely to present in a timely manner to an ED than to a primary care setting.

There was a lower than expected referral rate to SPCs from EDs. The 2012 Stroke Evaluation Report[26] found that 72.4% of stroke/TIA patients discharged home from the ED were referred to secondary prevention services, including SPCs, and TIA clinics but also cardiovascular clinics, neurology clinics, neurologists and general internists. Despite the inclusiveness of the definition of secondary prevention services, our findings appear low.

Of the relatively few patients referred to SPCs who remained emergent or urgent, at the highest risk of a recurrent stroke or other vascular event, most were not being seen within the best practice time frame guidelines. However, many SPCs work with their partnering ED to establish TIA algorithms to ensure best practice preventative care is initiated in the ED, and therefore the referral to the SPC has less urgency. In addition, SPCs are not available in every area of the province, and limited base funding support ($100,000 to $200,000 per clinic) may limit the ability of a clinic to provide urgent/emergent services. Additionally, there may be a lack of awareness of TIA as an emergency condition among patients and health care professionals, which may delay referrals. The fact that there is considerable variation in the hours of operation for Ontario SPCs (only 32.5% are open five days per week) may also explain the long wait times observed.

Almost two in three patients seen in an Ontario SPC had hypertension, the leading, and a preventable, cause of stroke. Compared to the self-reported prevalence of hypertension among adult Ontarians,[2] patients seen in SPCs had a higher prevalence of hypertension, smoking and diabetes. Hypertension is a unique condition, being both a signifier of broader underlying risks (tobacco use, poor diet, lack of physical activity, excessive alcohol consumption, etc.) and a major sentinel condition and risk factor in its own right.[14] One in five patients seen in an SPC had diabetes, highlighting the need for a chronic disease management approach.

Approximately 10% of patients developed new dementia soon after the first stroke and approximately 30% developed it after a recurrent stroke.[31,32] Given the connection between stroke/TIA and vascular dementia, it seems there is significant room for improvement in cognitive screening, where early signs of dementia can be identified and follow-up can be provided accordingly. A new Stroke Best Practice update[33] highlights the need to screen stroke patients for cognitive decline, since approximately two-thirds of patients experience some cognitive impairment post-stroke.

It is notable that approximately one in three patients referred to an Ontario SPC was found to have had a non-stroke. Previous studies have found that 19% and 31% of patients arriving at the ED with stroke symptoms are ultimately given a diagnosis of non-stroke or stroke mimic, respectively.[15,16]

Overall, the rate of diagnostic imaging at SPCs was high. In comparison to the results of an Ontario study on four acute tertiary care centres (regional stroke centres) over the past decade, access to diagnostic assessment has dramatically improved.[26,34] The higher rates of additional imaging performed at regional stroke centres may reflect access to more sophisticated diagnostics.

Patients admitted into a hospital had much more timely carotid intervention than those seen in an SPC. The median wait time for inpatients is now close to the best practice target of 14 days, while the wait time for patients seen at SPCs is double, 28 median days.

Rates of prescribing/recommending antiplatelet and anticoagulant therapy at an SPC were much better than upon discharge from acute care (72% in 2011/12[26]) and were much better than outcomes from an ED visit alone.[7] However, the results for antihypertensive and lipid-lowering therapy were lower than expected. Only one in five current smokers was prescribed or recommended smoking cessation medications/programs. This is a significant missed opportunity to address a major risk factor for stroke and other chronic diseases.

The rate of 30-day acute care readmission in Ontario after an ED visit for ischemic stroke was previously reported (prior to the establishment of SPCs) to be 5% for ischemic stroke.[7] In 2011/12, the readmission rate following an SPC referral from the ED was 1.8% for patients with confirmed ischemic stroke/TIA, a marked improvement in hospitalization outcomes. The rate at 90 days was 2.9% for confirmed ischemic stroke/TIA following an SPC referral, previously reported at 6.0% for TIA patients after an ED visit.[19] Almost two in three 30-day readmissions occurred prior to the SPC visit.

While the decrease in recurrent stroke/TIA rates reflects the success of Ontario's stroke program in advancing access, initiatives observed in the Erie St. Clair LHIN illustrate the impact SPCs can have on reducing inpatient admissions.

RECOMMENDATIONS

1. The results and recommendations from the OSN-funded research project Optimal TIA Management should be used to assess the impact of SPCs on recurrent events and leading practices.

2. Future research should focus on understanding the overall rates and gender differences in prescribing of antihypertensive and lipid-lowering medications.

3. The OSN should continue its efforts to understand the reasons for delays in carotid revascularization and to promote monitoring of wait times through the provincial Wait Time Strategy.[35]

4. The OSN should work with Health Quality Ontario and the MOHLTC to establish a quality-based funding model for TIA and minor stroke and to develop a mechanism to monitor its impact and outcomes.

5. The Vascular Health Strategy for Ontario, led by the Cardiac Care Network, Heart and Stroke Foundation and OSN, should continue to pursue its goal of reducing the burden of all vascular risk factors through a focus on an integrated chronic disease prevention and management approach.

6. The OSN commitment to the Hypertension Management Program is relevant given the high prevalence of hypertension among adults 45 years of age and older visiting SPCs and given that hypertension is the leading risk factor for stroke. This program and other approaches should be reviewed and evaluated to determine effective approaches for improved hypertension and vascular risk factor control.

7. All Ontario SPCs should adopt a standard triage algorithm/protocol to achieve the best practice targets for time to assessment of patients classified as urgent and emergent.

8. SPCs should ensure that they provide access to relevant and ongoing lifestyle modification and prevention programs.

9. SPCs should review their processes of care to ensure timely access to carotid revascularization.

10. The geographical distribution of SPCs is worthy of further discussion and review to ensure appropriate province-wide access to clinics.

3 Emergency Department Care

EXHIBIT 3.1 Number and proportion of adult patients arriving at the emergency department with a stroke or transient ischemic attack, in Ontario and by sex and age group, 2003/04 and 2009/10–2011/12

Key Findings

- In 2011/12, 20,034 adults with a median age of 75 years visited Ontario emergency departments (EDs) with the main issue considered to be a stroke or TIA.
- Women represented 50.9% of ED visits and were on average 6 years older than men at the time of presentation (78 vs. 72 median years).
- More than half (56.0%) of women with stroke/TIA-related ED visits were over 75 years of age, compared to 40.1% of men.

Group/Subgroup	2003/04	2009/10	2010/2011	2011/2012
Ontario[1], N	18,961	20,003	19,703	20,034
Sex, n (%)				
Female	9,600 (50.6)	10,238 (51.2)	9,990 (50.7)	10,194 (50.9)
Male	9,361 (49.4)	9,765 (48.8)	9,713 (49.3)	9,840 (49.1)
Age				
Mean ± SD	72.6 ± 13.3	72.3 ± 14.0	72.2 ± 14.0	72.4 ± 13.9
Median (IQR)	75 (65–82)	75 (63–83)	75 (63–83)	75 (63–83)
Age Group, n (%)				
18–45	793 (4.2)	872 (4.4)	851 (4.3)	806 (4.0)
46–65	4,139 (21.8)	4,976 (24.9)	5,028 (25.5)	5,159 (25.8)
66–75	4,825 (25.4)	4,446 (22.2)	4,432 (22.5)	4,417 (22.0)
76–85	6,449 (34.0)	6,265 (31.3)	6,011 (30.5)	6,089 (30.4)
>85	2,755 (14.5)	3,444 (17.2)	3,381 (17.2)	3,563 (17.8)
Female Age				
Mean ± SD	74.6 ± 13.4	74.2 ± 14.3	74.1 ± 14.2	74.4 ± 14.3
Median (IQR)	77 (68–84)	78 (66–85)	77 (65–85)	78 (65–85)
Female Age Group, n (%)				
18–45	379 (3.9)	459 (4.5)	420 (4.2)	420 (4.1)
46–65	1,686 (17.6)	2,045 (20.0)	2,105 (21.1)	2,134 (20.9)
66–75	2,124 (22.1)	2,025 (19.8)	2,028 (20.3)	1,932 (19.0)
76–85	3,523 (36.7)	3,391 (33.1)	3,170 (31.7)	3,264 (32.0)
>85	1,888 (19.7)	2,318 (22.6)	2,267 (22.7)	2,444 (24.0)
Male Age				
Mean ± SD	70.5 ± 12.9	70.3 ± 13.4	70.2 ± 13.6	70.3 ± 13.3
Median (IQR)	73 (63–80)	72 (61–80)	72 (61–81)	72 (61–81)
Male Age Group, n (%)				
18–45	414 (4.4)	413 (4.2)	431 (4.4)	386 (3.9)
46–65	2,453 (26.2)	2,931 (30.0)	2,923 (30.1)	3,025 (30.7)
66–75	2,701 (28.9)	2,421 (24.8)	2,404 (24.8)	2,485 (25.3)
76–85	2,926 (31.3)	2,874 (29.4)	2,841 (29.2)	2,825 (28.7)
>85	867 (9.3)	1,126 (11.5)	1,114 (11.5)	1,119 (11.4)

Data source: Canadian Institute for Health Information, National Ambulatory Care Reporting System (NACRS), 2003/04–2011/12.

Inclusion criteria: All patients aged ≥18 years discharged from an emergency department with a diagnosis of stroke (ischemic or hemorrhagic) or transient ischemic attack.

Exclusion criteria: Patients with a scheduled emergency department visit.

1 Based on unique patients (i.e., does not include multiple patient-visits).

Note:

Excludes all NACRS records with ICD codes that include the prefix "Q" (suspected, questionable diagnoses) starting in 2008/09.

SD = standard deviation.

IQR = interquartile range (25th–75th percentile).

EXHIBIT 3.1A Proportion of adult patients arriving at the emergency department with a stroke or transient ischemic attack in Ontario, by age group, 2003/04 and 2009/10–2011/12

Key Findings

- The proportion of stroke/TIA ED visits by patients aged 46–65 increased 4.0% over the study period, rising from 21.8% in 2003/04 to 25.8% in 2011/12 (p<0.0001).
- From 2003/04 to 2011/12, there was a 3.3% increase in stroke/TIA-related ED visits among those aged 85 and older and a 7.0% decrease among those aged 66–85 (p<0.0001).

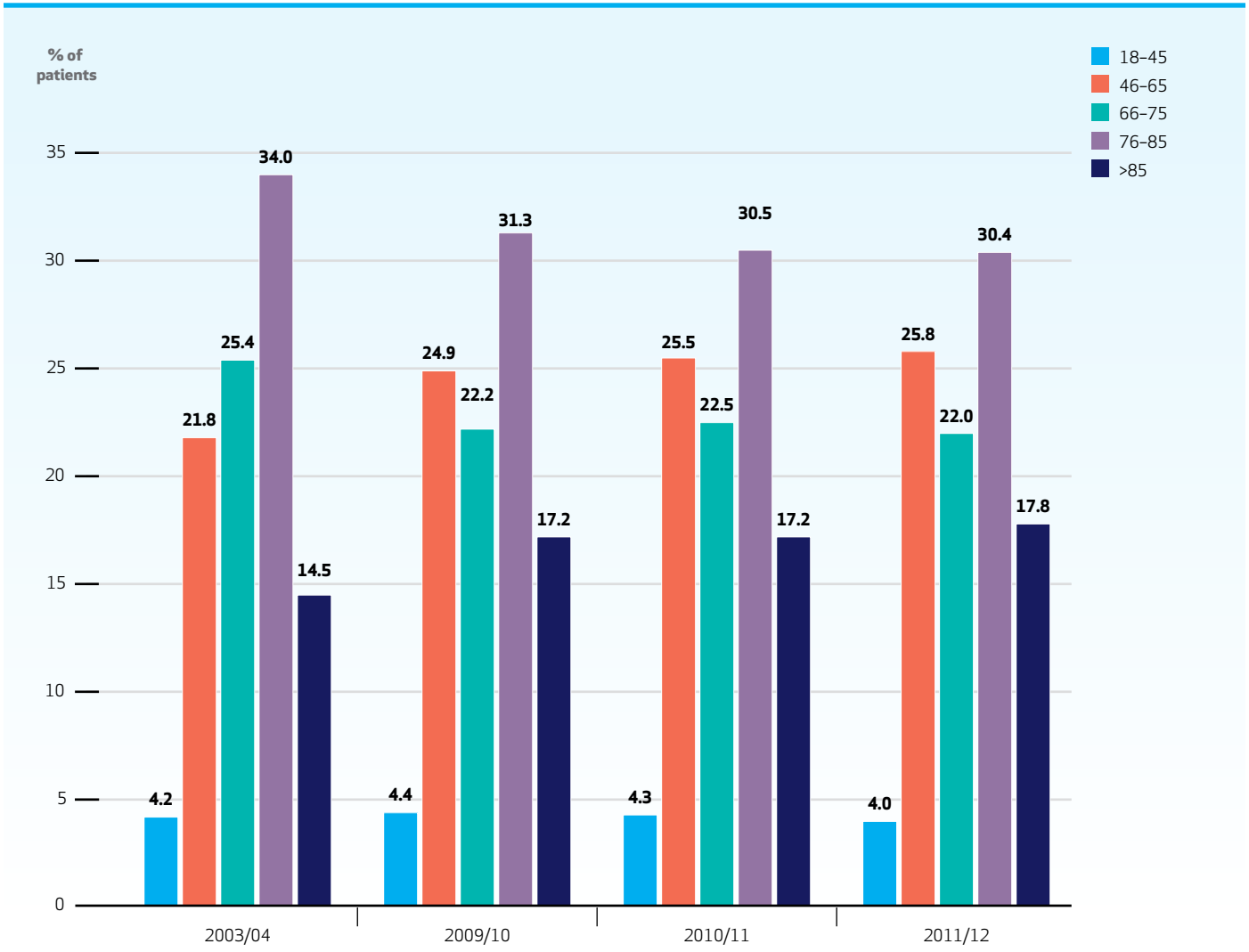


EXHIBIT 3.2 Age- and sex-adjusted rates of emergency department visits by adult patients with stroke or transient ischemic attack per 1,000 LHIN population, in Ontario and by Local Health Integration Network, 2003/04 and 2009/10–2011/12

Key Findings

- When standardized by age and sex to the 2003/04 Ontario population, the provincial incidence rate of stroke-related ED visits per 1,000 population declined from 2.0 in 2003/04 to 1.7 in 2011/12 ($p<0.0001$).
- The rate of ED visits for stroke/TIA remained at 1.7 per 1,000 population in 2010/11 and 2011/12.
- There was modest variation in rates of stroke/TIA-related ED visits across Ontario, ranging from 1.3 to 2.1 per 1,000 population in 2011/12.
- The Mississauga Halton LHIN experienced a consistent and dramatic decline in the rate of stroke/TIA-related ED visits (from 1.8 to 1.3 per 1,000 population between 2003/04 and 2011/12; $p<0.0001$), earning it the lowest rate among the LHINs in 2011/12.
- The Erie St. Clair and North West LHINs consistently had the highest rates of stroke/TIA-related ED visits.

Group/Subgroup	2003/04	2009/10	2010/11	2011/12
	Emergency department visit rates, % (n)			
Provincial Rate[1,2]	2.0 (18,935)	1.9 (19,981)	1.9 (19,688)	1.9 (20,013)
Standardized Rate[1,3]	2.0 (18,935)	1.8 (19,981)	1.7 (19,688)	1.7 (20,013)
Local Health Integration Network[3]				
1. Erie St. Clair	2.4 (1,236)	2.3 (1,361)	2.1 (1,275)	2.1 (1,315)
2. South West	1.7 (1,348)	1.9 (1,708)	1.8 (1,610)	1.8 (1,696)
3. Waterloo Wellington	1.9 (921)	1.8 (1,051)	1.8 (1,052)	1.9 (1,150)
4. Hamilton Niagara Haldimand Brant	2.0 (2,409)	1.8 (2,426)	1.8 (2,502)	1.7 (2,396)
5. Central West	2.0 (812)	1.7 (890)	1.8 (938)	1.8 (1,007)
6. Mississauga Halton	1.8 (1,067)	1.6 (1,243)	1.4 (1,183)	1.3 (1,157)
7. Toronto Central	1.8 (1,604)	1.7 (1,664)	1.6 (1,542)	1.5 (1,503)
8. Central	1.9 (1,877)	1.5 (1,986)	1.5 (2,083)	1.5 (2,142)
9. Central East	2.0 (2,234)	1.8 (2,414)	1.7 (2,327)	1.6 (2,310)
10. South East	2.2 (1,014)	1.9 (938)	1.8 (929)	1.7 (926)
11. Champlain	2.2 (1,973)	1.8 (1,906)	1.8 (1,923)	1.9 (2,053)
12. North Simcoe Muskoka	2.3 (787)	1.9 (787)	1.8 (804)	1.8 (821)
13. North East	2.4 (1,174)	2.0 (1,124)	1.8 (1,050)	1.9 (1,096)
14. North West	2.4 (479)	2.2 (483)	2.1 (470)	2.0 (441)

Data sources: Canadian Institute for Health Information, National Ambulatory Care Reporting System (NACRS), 2003/04–2011/12; Statistics Canada, Ontario intercensal population estimate, 2003.

Inclusion criteria: All patients aged ≥18 years with a diagnosis of stroke (ischemic or hemorrhagic) or transient ischemic attack.

Exclusion criteria: Patients with a scheduled emergency department visit.

1 Based on unique patients (i.e., does not include multiple patient-visits).

2 Age- and sex-adjusted rates determined by using each year's Ontario population as the standard.

3 Age- and sex-adjusted standardized rates determined by using the 2003/04 Ontario population as the standard.

Notes:

(1) Population-based analysis (i.e., the location of the patient's residence is used to report regional performance).

(2) Excludes patients with missing postal codes.

(3) Excludes all NACRS records with ICD codes that include the prefix "Q" (suspected, questionable diagnoses) starting in 2008/09.

(4) Indicates significant difference from standardized rate.

(5) LHIN/sub-LHIN populations were determined using POPLHIN 2003–2010, POPLHIN_PROJECTED 2011 and POPSUBLHIN VERSION 9 2006–2008 files from Ontario Ministry of Health and Long-Term Care: IntelliHealth Ontario.

EXHIBIT 3.3 Number and proportion of adult patients with stroke or transient ischemic attack arriving at the emergency department of regional stroke centres, district stroke centres and non-designated hospitals, in Ontario and by stroke type and Local Health Integration Network, 2003/04 and 2009/10–2011/12

Key Findings

- In 2011/12, there were more than 20,000 stroke/TIA-related ED visits in Ontario.
- Between 2003/04 and 2011/12, the proportion of stroke/TIA-related ED visits at designated stroke centres increased by 10% (from 39.8% to 49.7%; p<0.0001). A corresponding decline was observed in non-designated hospitals (from 60.1% to 50.3%; p<0.0001).

	2003/04				
Group/Subgroup	All	Regional stroke centre	District stroke centre	Non-designated	
Ontario[1]	18,961	4,212 (22.2)	3,344 (17.6)	11,405 (60.1)	
Stroke Type, n (%)					
Intracerebral hemorrhage	1,121 (5.9)	367 (8.7)	173 (5.2)	581 (5.1)	
Ischemic stroke	968 (5.1)	306 (7.3)	172 (5.1)	490 (4.3)	
Subarachnoid hemorrhage	604 (3.2)	210 (5.0)	91 (2.7)	303 (2.7)	
Transient ischemic attack	6,597 (34.8)	1,314 (31.2)	1,175 (35.1)	4,108 (36.0)	
Unable to determine[2]	9,671 (51.0)	2,015 (47.8)	1,733 (51.8)	5,923 (51.9)	
Local Health Integration Network					
1. Erie St. Clair	1,185 (6.2)	n/a	809 (24.2)	376 (3.3)	
2. South West	1,395 (7.4)	466 (11.1)	212 (6.3)	717 (6.3)	
3. Waterloo Wellington	876 (4.6)	n/a	257 (7.7)	619 (5.4)	
4. Hamilton Niagara Haldimand Brant	2,418 (12.8)	460 (10.9)	406 (12.1)	1,552 (13.6)	
5. Central West	784 (4.1)	n/a	n/a	784 (6.9)	
6. Mississauga Halton	1,119 (5.9)	591 (14.0)	n/a	528 (4.6)	
7. Toronto Central	1,806 (9.5)	997 (23.7)	n/a	809 (7.1)	
8. Central	1,699 (9.0)	n/a	266 (8.0)	1,433 (12.6)	
9. Central East	2,175 (11.5)	n/a	625 (18.7)	1,550 (13.6)	
10. South East	1,009 (5.3)	389 (9.2)	143 (4.3)	477 (4.2)	
11. Champlain	2,016 (10.6)	432 (10.3)	115 (3.4)	1,469 (12.9)	
12. North Simcoe Muskoka	850 (4.5)	252 (6.0)	75 (2.2)	523 (4.6)	
13. North East	1,149 (6.1)	320 (7.6)	436 (13.0)	393 (3.4)	
14. North West	480 (2.5)	305 (7.2)	n/a	175 (1.5)	

Data source: Canadian Institute for Health Information, National Ambulatory Care Reporting System (NACRS), 2003/04–2011/12.

Inclusion criteria: All patients aged ≥18 years discharged from an emergency department with a diagnosis of stroke (ischemic or hemorrhagic) or transient ischemic attack.

Exclusion criteria: Patients with a scheduled emergency department visit.

1 Based on unique patients (i.e., does not include multiple patient-visits).

2 Includes stroke not specified as hemorrhagic or infarction.

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) Excludes all NACRS records with ICD codes that include the prefix "Q" (suspected, questionable diagnoses) starting in 2008/09.

(3) See Appendix E for a list of hospitals designated as regional and district stroke centres by the OSS.

n/a = not applicable

	2009/10				2010/11				2011/12			
	All	Regional stroke centre	District stroke centre	Non-designated	All	Regional stroke centre	District stroke centre	Non-designated	All	Regional stroke centre	District stroke centre	Non-designated
	Patients, n (%)											
	20,003	5,408 (27.0)	4,228 (21.1)	10,367 (51.8)	19,703	5,397 (27.4)	4,168 (21.2)	10,138 (51.5)	20,034	5,625 (28.1)	4,323 (21.6)	10,086 (50.3)
	1,382 (6.9)	476 (8.8)	332 (7.9)	574 (5.5)	1,343 (6.8)	417 (7.7)	308 (7.4)	618 (6.1)	1,317 (6.6)	399 (7.1)	297 (6.9)	621 (6.2)
	1,890 (9.4)	589 (10.9)	622 (14.7)	679 (6.5)	2,245 (11.4)	715 (13.2)	679 (16.3)	851 (8.4)	2,981 (14.9)	1,111 (19.8)	842 (19.5)	1,028 (10.2)
	677 (3.4)	232 (4.3)	113 (2.7)	332 (3.2)	714 (3.6)	211 (3.9)	136 (3.3)	367 (3.6)	734 (3.7)	242 (4.3)	123 (2.8)	369 (3.7)
	7,380 (36.9)	1,770 (32.7)	1,456 (34.4)	4,154 (40.1)	6,917 (35.1)	1,616 (29.9)	1,505 (36.1)	3,796 (37.4)	7,370 (36.8)	1,722 (30.6)	1,635 (37.8)	4,013 (39.8)
	8,674 (43.4)	2,341 (43.3)	1,705 (40.3)	4,628 (44.6)	8,484 (43.1)	2,438 (45.2)	1,540 (36.9)	4,506 (44.4)	7,632 (38.1)	2,151 (38.2)	1,426 (33.0)	4,055 (40.2)
	1,312 (6.6)	n/a	931 (22.0)	381 (3.7)	1,235 (6.3)	n/a	894 (21.4)	341 (3.4)	1,289 (6.4)	n/a	938 (21.7)	351 (3.5)
	1,781 (8.9)	698 (12.9)	241 (5.7)	842 (8.1)	1,654 (8.4)	614 (11.4)	214 (5.1)	826 (8.1)	1,728 (8.6)	688 (12.2)	252 (5.8)	788 (7.8)
	1,021 (5.1)	n/a	467 (11.0)	554 (5.3)	1,011 (5.1)	n/a	490 (11.8)	521 (5.1)	1,119 (5.6)	n/a	521 (12.1)	598 (5.9)
	2,405 (12)	474 (8.8)	587 (13.9)	1,344 (13.0)	2,483 (12.6)	511 (9.5)	638 (15.3)	1,334 (13.2)	2,379 (11.9)	541 (9.6)	685 (15.8)	1,153 (11.4)
	725 (3.6)	n/a	n/a	725 (7.0)	799 (4.1)	n/a	n/a	799 (7.9)	801 (4.0)	n/a	n/a	801 (7.9)
	1,365 (6.8)	699 (12.9)	n/a	666 (6.4)	1,336 (6.8)	741 (13.7)	n/a	595 (5.9)	1,316 (6.6)	754 (13.4)	n/a	562 (5.6)
	2,274 (11.4)	1,556 (28.8)	n/a	718 (6.9)	2,122 (10.8)	1,515 (28.1)	n/a	607 (6.0)	2,196 (11.0)	1,607 (28.6)	n/a	589 (5.8)
	1,712 (8.6)	n/a	407 (9.6)	1,305 (12.6)	1,812 (9.2)	n/a	431 (10.3)	1,381 (13.6)	1,746 (8.7)	n/a	427 (9.9)	1,319 (13.1)
	2,144 (10.7)	n/a	812 (19.2)	1,332 (12.8)	2,065 (10.5)	n/a	770 (18.5)	1,295 (12.8)	2,081 (10.4)	n/a	795 (18.4)	1,286 (12.8)
	921 (4.6)	349 (6.5)	135 (3.2)	437 (4.2)	887 (4.5)	360 (6.7)	133 (3.2)	394 (3.9)	887 (4.4)	315 (5.6)	178 (4.1)	394 (3.9)
	1,950 (9.7)	735 (13.6)	126 (3.0)	1,089 (10.5)	1,955 (9.9)	733 (13.6)	129 (3.1)	1,093 (10.8)	2,086 (10.4)	744 (13.2)	151 (3.5)	1,191 (11.8)
	821 (4.1)	321 (5.9)	81 (1.9)	419 (4.0)	849 (4.3)	323 (6.0)	83 (2.0)	443 (4.4)	870 (4.3)	357 (6.3)	84 (1.9)	429 (4.3)
	1,092 (5.5)	280 (5.2)	441 (10.4)	371 (3.6)	1,021 (5.2)	278 (5.2)	386 (9.3)	357 (3.5)	1,088 (5.4)	306 (5.4)	292 (6.8)	490 (4.9)
	480 (2.4)	296 (5.5)	n/a	184 (1.8)	474 (2.4)	322 (6.0)	n/a	152 (1.5)	448 (2.2)	313 (5.6)	n/a	135 (1.3)

EXHIBIT 3.3A Proportion of adult patients with stroke or transient ischemic attack arriving at the emergency department in Ontario, by stroke type, 2003/04 and 2009/10–2011/12

Key Findings

- The proportion of stroke/TIA-related ED visits with the stroke type diagnosed as 'unable to determine' decreased dramatically from 51.0% in 2003/04 to 38.1% in 2011/12 ($p<0.0001$). This pattern was observed across all designations, and particularly at district stroke centres and non-designated hospitals.
- The proportion of stroke/TIA-related ED visits diagnosed as ischemic stroke increased from 5.1% in 2003/04 to 14.9% in 2011/12.

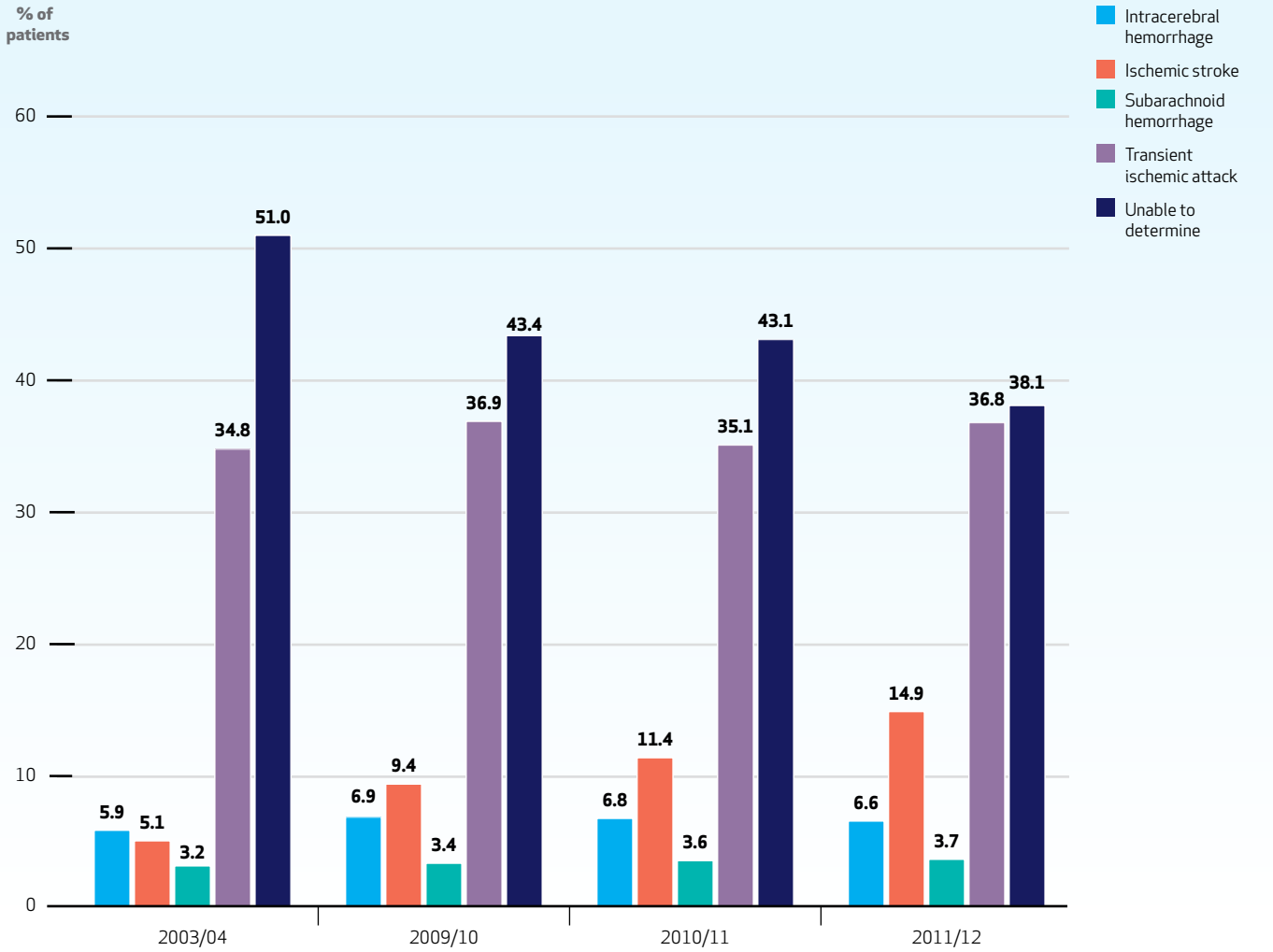


EXHIBIT 3.4 Number and proportion of adult patients with stroke or transient ischemic attack transported to hospital by ambulance, in Ontario and by sex, Ontario Stroke System designation and Local Health Integration Network, 2003/04 and 2009/10–2011/12

Key Findings

- The percentage of stroke/TIA patients transported to hospital by ambulance increased from 52.8% in 2003/04 to 57.2% in 2011/12 ($p<0.0001$), with almost no change from 2010/11 (57.1%).
- In 2011/12, almost 60% of female stroke/TIA patients were transported to hospital by ambulance, compared to 55% of male patients.
- Although the number of patients transported to hospital by ambulance increased from 2003/04 to 2011/12, the proportion was still below 60%.
- Regional and district stroke centres continued to have the highest rates of patient arrival by ambulance (67.5% and 65.4% , respectively) in 2011/12, compared to non-designated hospitals (47.9%).
- Among LHINs, the variation in the rate of patients arriving by ambulance was reduced by almost half between 2003/04 and 2011/12 (from 15.9% to 8.5%). In 2011/12, the South East LHIN had the highest percentage of patients arriving by ambulance (60.1%).

Group/Subgroup	2003/04 (N=18,961)	2009/10 (N=20,003)	2010/11 (N=19,703)	2011/12 (N=20,034)
	Patients, n (%)			
Ontario[1]	10,006 (52.8)	11,110 (55.5)	11,244 (57.1)	11,460 (57.2)
Female	5,250 (54.7)	5,965 (58.3)	5,962 (59.7)	6,073 (59.6)
Male	4,756 (50.8)	5,145 (52.7)	5,282 (54.4)	5,387 (54.7)
Ontario Stroke System designation				
Regional stroke centre	2,419 (57.4)	3,558 (65.8)	3,582 (66.4)	3,799 (67.5)
District stroke centre	1,798 (53.6)	2,615 (61.8)	2,651 (63.6)	2,828 (65.4)
Non-designated	5,789 (50.8)	4,937 (47.6)	5,011 (49.4)	4,833 (47.9)
Local Health Integration Network				
1. Erie St. Clair	651 (54.9)	726 (55.3)	708 (57.3)	758 (58.8)
2. South West	719 (51.5)	882 (49.5)	846 (51.1)	901 (52.1)
3. Waterloo Wellington	477 (54.5)	584 (57.2)	599 (59.2)	638 (57.0)
4. Hamilton Niagara Haldimand Brant	1,313 (54.3)	1,421 (59.1)	1,487 (59.9)	1,407 (59.1)
5. Central West	428 (54.6)	375 (51.7)	408 (51.1)	418 (52.2)
6. Mississauga Halton	541 (48.3)	746 (54.7)	778 (58.2)	774 (58.8)
7. Toronto Central	959 (53.1)	1,268 (55.8)	1,226 (57.8)	1,299 (59.2)
8. Central	942 (55.4)	937 (54.7)	1,022 (56.4)	975 (55.8)
9. Central East	1,139 (52.4)	1,188 (55.4)	1,181 (57.2)	1,179 (56.7)
10. South East	577 (57.2)	513 (55.7)	540 (60.9)	533 (60.1)
11. Champlain	1,064 (52.8)	1,141 (58.5)	1,162 (59.4)	1,212 (58.1)
12. North Simcoe Muskoka	411 (48.4)	459 (55.9)	492 (58.0)	510 (58.6)
13. North East	587 (51.1)	603 (55.2)	552 (54.1)	625 (57.4)
14. North West	198 (41.3)	267 (55.6)	243 (51.3)	231 (51.6)

Data source: Canadian Institute for Health Information, National Ambulatory Care Reporting System (NACRS), 2003/04–2011/12.

Inclusion criteria: All patients aged ≥18 years discharged from an emergency department with a diagnosis of stroke (ischemic or hemorrhagic) or transient ischemic attack.

1 Based on unique patients (i.e., does not include multiple patient-visits).

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) Excludes all NACRS records with ICD codes that include the prefix "Q" (suspected, questionable diagnoses) starting in 2008/09.

(3) See Appendix E for a list of hospitals designated as regional and district stroke centres by the OSS.

Emergency Department Care

CONCLUSIONS

Annual incidence rates of stroke-related visits to EDs have declined from 2.0 per 1,000 population in 2003/04 to 1.7 per 1,000 in 2011/12, equivalent to approximately 3,300 ED visits avoided annually in Ontario. ED visit rates have decreased in all LHINs. The proportion of ED visits represented by the 46–65 year age group (referred to as the baby boomers, the largest segment of the Ontario population) continues to increase, emphasizing the need to address modifiable risk factors such as obesity, smoking, hypertension, diabetes and hyperlipidemia in this cohort. The prevalence of undetermined stroke type coding has been steadily decreasing over time across all hospital designations. Improvements in adherence to best practices in diagnosis strategies and health records data-capture procedures have occurred and should continue as the Stroke-QBP initiative is implemented. Stroke/TIA ED visits at designated stroke centres have increased from 39.8% in 2003/04 to 49.7% in 2011/12, a 10% increase in nine years. The proportion of stroke/TIA patients arriving at the ED by ambulance has remained steady at 57% over the past two years despite the Heart and Stroke Foundation warning signs campaign that appeared between March and July 2011.

RECOMMENDATIONS

1. The Vascular Health Strategy for Ontario, led by the Cardiac Care Network, the Heart and Stroke Foundation and the OSN, should continue to pursue its goal of reducing the burden of all vascular risk factors through a focus on an integrated chronic disease prevention and management approach.

2. The OSN commitment to the Hypertension Management Program is relevant given the high prevalence of hypertension among adults 45 years of age and older visiting SPCs and because hypertension is the leading risk factor for stroke. This program and other approaches should be reviewed and evaluated to determine effective approaches for improved hypertension and vascular risk factor control.

3. The OSN target for stroke/TIA-related ED visits is 1.65 per 1,000 population, but the rate has remained at 1.7 per 1,000 population in 2010/11 and 2011/12. If the target is to be achieved over the next five years, greater attention to prevention strategies is required.

4. The OSN should continue to monitor the "unable to determine" stroke type diagnosis code as the Stroke-QBP is implemented.

5. Regions should confirm that local Emergency Medical Services are familiar with recent revisions to the bypass protocol to ensure that all eligible patients are arriving at the appropriate specialized stroke centres.

6. Specific analyses of the arrival by ambulance during the airing period of the stroke warning signs campaign would help to determine its effectiveness in raising public awareness of the need to call 911.

4 Acute Inpatient Care

EXHIBIT 4.1 Number and proportion of adult patients admitted to acute care hospitals for stroke or transient ischemic attack, in Ontario and by sex and age group, 2003/04 and 2009/10–2011/12

Key Findings

- Ontario has more than 15,000 annual inpatient stays for stroke or TIA each year.
- The average age of stroke/TIA patients admitted to acute care hospitals remained stable at 73 years (76 median years) in 2011/12.
- Women were consistently older than men at the time of admission (79 vs. 73 median years in 2011/12).
- There was minimal difference in the proportions of men and women admitted to acute care for stroke/TIA.
- Stroke/TIA inpatient admissions among patients 46–65 years of age increased from 19.2% in 2003/04 to 23.9% in 2011/12.
- Among adults over 85 years of age, the proportion of women admitted to acute care with stroke/TIA was more than twice that of men in 2011/12 (26.6% vs. 12.4%).

Group/Subgroup		2003/04	
Ontario		15,731	
Ontario	Female	8,010 (50.9)	
	Male	7,721 (49.1)	
Age	Mean ± SD	73.7 ± 13.0	
	Median (IQR)	76 (67–83)	
Age Group	18–45	549 (3.5)	
	46–65	3,022 (19.2)	
	66–75	3,840 (24.4)	
	76–85	5,708 (36.3)	
	>85	2,612 (16.6)	
Female Age	Mean ± SD	75.8 ± 13.0	
	Median (IQR)	79 (70–85)	
Female Age Group	18–45	264 (3.3)	
	46–65	1,196 (14.9)	
	66–75	1,681 (21.0)	
	76–85	3,076 (38.4)	
	>85	1,793 (22.4)	
Male Age	Mean ± SD	71.6 ± 12.7	
	Median (IQR)	74 (64–81)	
Male Age Group	18–45	285 (3.7)	
	46–65	1,826 (23.6)	
	66–75	2,159 (28.0)	
	76–85	2,632 (34.1)	
	>85	819 (10.6)	

	Patients[1], n (%)		
	2009/10	**2010/11**	**2011/12**
	15,347	15,524	15,224
	7,816 (50.9)	7,881 (50.8)	7,669 (50.4)
	7,531 (49.1)	7,643 (49.2)	7,555 (49.6)
	73.2 ± 13.9	73.1 ± 13.9	73.1 ± 13.8
	76 (64–84)	76 (64–84)	76 (64–84)
	611 (4.0)	612 (3.9)	560 (3.7)
	3,534 (23.0)	3,639 (23.4)	3,643 (23.9)
	3,265 (21.3)	3,364 (21.7)	3,279 (21.5)
	5,016 (32.7)	4,983 (32.1)	4,767 (31.3)
	2,921 (19.0)	2.926 (18.8)	2,975 (19.5)
	75.4 ± 14.0	75.3 ± 13.9	75.5 ± 13.9
	79 (68–86)	79 (67–85)	79 (68–86)
	301 (3.9)	291 (3.7)	266 (3.5)
	1,391 (17.8)	1,460 (18.5)	1,426 (18.6)
	1,474 (18.9)	1,511 (19.2)	1,421 (18.5)
	2,680 (34.3)	2,653 (33.7)	2,516 (32.8)
	1,970 (25.2)	1,966 (24.9)	2,040 (26.6)
	70.9 ± 13.5	70.8 ± 13.5	70.8 ± 13.4
	73 (62–81)	73 (62–81)	73 (62–81)
	310 (4.1)	321 (4.2)	294 (3.9)
	2,143 (28.5)	2,179 (28.5)	2,217 (29.3)
	1,791 (23.8)	1,853 (24.2)	1,858 (24.6)
	2,336 (31.0)	2,330 (30.5)	2,251 (29.8)
	951 (12.6)	960 (12.6)	935 (12.4)

Data source: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), 2003/04–2011/12.

Inclusion criteria: All patients aged ≥18 years.

Exclusion criteria: Patients with elective admissions.

1 Based on unique patients (i.e., does not include multiple patient-visits).

SD = standard deviation.

IQR = interquartile range (25th–75th percentile).

EXHIBIT 4.2 Number and proportion of adult patients admitted to acute care hospitals for stroke or transient ischemic attack, in Ontario and by stroke type, Ontario Stroke System designation and Local Health Integration Network, 2003/04 and 2009/10–2011/12

Key Findings

- In 2011/12, almost 1 in 5 inpatient admissions (18.0%) was for TIA, a stable trend since 2003/04.
- District stroke centres had the highest rate of ischemic stroke admissions (60.7%), followed by regional stroke centres (57.9%) and non-designated hospitals (51.4%) in 2011/12.
- Subarachnoid hemorrhagic stroke remained the least prevalent stroke type, yet women accounted for 61.1% of all such strokes. This may be because women tend to be older than men at the time of admission and the risk of subarachnoid hemorrhage increases with age. For all other stroke types, prevalence was similar between women and men.
- Over the 9 years examined, there was a steady increase in the proportion of patients admitted to designated stroke centres, from 44.1% in 2003/04 to 54.5% in 2011/12. However, in 2011/12, more than 70% of stroke/TIA patients in the Central and Central East LHINs were admitted to non-designated hospitals. Central West is the only LHIN that does not have any designated stroke centres.
- A higher proportion of patients at non-designated hospitals (18.0%) had an "unable to determine" stroke diagnosis code than patients at designated centres (8.6% and 5.9% at district and regional stroke centres, respectively).

		2003/04			
Group/Subgroup		**All**	**Regional stroke centre**	**District stroke centre**	
Ontario		15,731	4,009	2,925	
Stroke Type					
Intracerebral hemorrhage	All	1,691 (10.7)	579 (14.4)	293 (10.0)	
	Female	839 (49.6)	260 (44.9)	151 (51.5)	
Ischemic stroke	All	5,640 (35.9)	1,720 (42.9)	1,047 (35.8)	
	Female	2,756 (48.9)	806 (46.9)	534 (51.0)	
Subarachnoid hemorrhage	All	584 (3.7)	434 (10.8)	50 (1.7)	
	Female	357 (61.1)	272 (62.7)	27 (54.0)	
Transient ischemic attack	All	2,670 (17.0)	494 (12.3)	525 (17.9)	
	Female	1,382 (51.8)	249 (50.4)	262 (49.9)	
Unable to determine[2]	All	5,146 (32.7)	782 (19.5)	1,010 (34.5)	
	Female	2,676 (52.0)	385 (49.2)	528 (52.3)	
Local Health Integration Network					
1. Erie St. Clair		1,092 (6.9)	n/a	728 (24.9)	
2. South West		1,399 (8.9)	467 (11.6)	198 (6.8)	
3. Waterloo Wellington		721 (4.6)	n/a	199 (6.8)	
4. Hamilton Niagara Haldimand Brant		2,103 (13.4)	427 (10.7)	359 (12.3)	
5. Central West		559 (3.6)	n/a	n/a	
6. Mississauga Halton		1,018 (6.5)	581 (14.5)	n/a	
7. Toronto Central		1,674 (10.6)	1,070 (26.7)	n/a	
8. Central		1,376 (8.7)	n/a	249 (8.5)	
9. Central East		1,612 (10.2)	n/a	473 (16.2)	
10. South East		756 (4.8)	283 (7.1)	144 (4.9)	
11. Champlain		1,265 (8.0)	362 (9.0)	110 (3.8)	
12. North Simcoe Muskoka		702 (4.5)	207 (5.2)	60 (2.1)	
13. North East		1,054 (6.7)	335 (8.4)	405 (13.8)	
14. North West		400 (2.5)	277 (6.9)	n/a	

Patients[1], n (%)													
	2009/10				2010/11				2011/12				
	Non-designated	All	Regional stroke centre	District stroke centre	Non-designated	All	Regional stroke centre	District stroke centre	Non-designated	All	Regional stroke centre	District stroke centre	Non-designated
	8,797	15,347	4,883	3,215	7,249	15,524	5,076	3,283	7,165	15,224	5,002	3,302	6,920
	819 (9.3)	1,629 (10.6)	723 (14.8)	294 (9.1)	612 (8.4)	1,524 (9.8)	635 (12.5)	282 (8.6)	607 (8.5)	1,520 (10.0)	662 (13.2)	291 (8.8)	567 (8.2)
	428 (52.3)	787 (48.3)	327 (45.2)	148 (50.3)	312 (51.0)	712 (46.7)	296 (46.6)	132 (46.8)	284 (46.8)	742 (48.8)	324 (48.9)	137 (47.1)	281 (49.6)
	2,873 (32.7)	6,816 (44.4)	2,467 (50.5)	1,420 (44.2)	2,929 (40.4)	7,880 (50.8)	2,778 (54.7)	1,798 (54.8)	3,304 (46.1)	8,457 (55.6)	2,898 (57.9)	2,004 (60.7)	3,555 (51.4)
	1,416 (49.3)	3,407 (50.0)	1,189 (48.2)	713 (50.2)	1,505 (51.4)	3,937 (50.0)	1,286 (46.3)	926 (51.5)	1,725 (52.2)	4,170 (54.4)	1,386 (47.8)	999 (49.9)	1,785 (50.2)
	100 (1.1)	690 (4.5)	537 (11.0)	53 (1.6)	100 (1.4)	738 (4.8)	563 (11.1)	59 (1.8)	116 (1.6)	681 (4.5)	544 (10.9)	51 (1.5)	86 (1.2)
	58 (58.0)	406 (58.8)	318 (59.2)	31 (58.5)	57 (57.0)	456 (61.8)	359 (63.8)	32 (54.2)	65 (56.0)	416 (61.1)	334 (61.4)	32 (62.7)	50 (58.1)
	1,651 (18.8)	2,720 (17.7)	633 (13.0)	630 (19.6)	1,457 (20.1)	2,763 (17.8)	697 (13.7)	676 (20.6)	1,390 (19.4)	2,744 (18.0)	602 (12.0)	673 (20.4)	1,469 (21.2)
	871 (52.8)	1,438 (52.9)	331 (52.3)	333 (52.9)	774 (53.1)	1,458 (52.8)	370 (53.1)	350 (51.8)	738 (53.1)	1,424 (51.9)	327 (54.3)	335 (49.8)	762 (51.9)
	3,354 (38.1)	3,492 (22.8)	523 (10.7)	818 (25.4)	2,151 (29.7)	2,619 (16.9)	403 (7.9)	468 (14.3)	1,748 (24.4)	1,822 (12.0)	296 (5.9)	283 (8.6)	1,243 (18.0)
	1,763 (52.6)	1,778 (50.9)	266 (50.9)	390 (47.7)	1,122 (52.2)	1,318 (50.3)	189 (46.9)	248 (53.0)	881 (50.4)	917 (50.3)	140 (47.3)	153 (54.1)	624 (50.2)
	364 (4.1)	992 (6.5)	n/a	738 (23.0)	254 (3.5)	893 (5.8)	n/a	703 (21.4)	190 (2.7)	836 (5.5)	n/a	663 (20.1)	173 (2.5)
	734 (8.3)	1,370 (8.9)	605 (12.4)	206 (6.4)	559 (7.7)	1,341 (8.6)	608 (12.0)	206 (6.3)	527 (7.4)	1,325 (8.7)	599 (12.0)	203 (6.1)	523 (7.6)
	522 (5.9)	709 (4.6)	n/a	362 (11.3)	347 (4.8)	726 (4.7)	n/a	383 (11.7)	343 (4.8)	761 (5.0)	n/a	398 (12.1)	363 (5.2)
	1,317 (15.0)	1,978 (12.9)	503 (10.3)	453 (14.1)	1,022 (14.1)	2,009 (12.9)	570 (11.2)	471 (14.3)	968 (13.5)	1,845 (12.1)	587 (11.7)	431 (13.1)	827 (12.0)
	559 (6.4)	573 (3.7)	n/a	n/a	573 (7.9)	616 (4.0)	n/a	n/a	616 (8.6)	596 (3.9)	n/a	n/a	596 (8.6)
	437 (5.0)	1,135 (7.4)	653 (13.4)	n/a	482 (6.6)	1,153 (7.4)	664 (13.1)	n/a	489 (6.8)	1,099 (7.2)	593 (11.9)	n/a	506 (7.3)
	604 (6.9)	1,911 (12.5)	1,412 (28.9)	n/a	499 (6.9)	1,950 (12.6)	1,498 (29.5)	n/a	452 (6.3)	1,912 (12.6)	1,443 (28.8)	n/a	469 (6.8)
	1,127 (12.8)	1,289 (8.4)	n/a	261 (8.1)	1,028 (14.2)	1,361 (8.8)	n/a	286 (8.7)	1,075 (15.0)	1,324 (8.7)	n/a	274 (8.3)	1,050 (15.2)
	1,139 (12.9)	1,449 (9.4)	n/a	508 (15.8)	941 (13.0)	1,458 (9.4)	n/a	470 (14.3)	988 (13.8)	1,400 (9.2)	n/a	504 (15.3)	896 (12.9)
	329 (3.7)	624 (4.1)	278 (5.7)	106 (3.3)	240 (3.3)	673 (4.3)	305 (6.0)	132 (4.0)	236 (3.3)	678 (4.5)	280 (5.6)	174 (5.3)	224 (3.2)
	793 (9.0)	1,221 (8.0)	559 (11.4)	113 (3.5)	549 (7.6)	1,269 (8.2)	581 (11.4)	159 (4.8)	529 (7.4)	1,299 (8.5)	599 (12.0)	153 (4.6)	547 (7.9)
	435 (4.9)	621 (4.0)	228 (4.7)	53 (1.6)	340 (4.7)	629 (4.1)	227 (4.5)	48 (1.5)	354 (4.9)	648 (4.3)	258 (5.2)	50 (1.5)	340 (4.9)
	314 (3.6)	1,033 (6.7)	311 (6.4)	415 (12.9)	307 (4.2)	1,010 (6.5)	305 (6.0)	425 (12.9)	280 (3.9)	1,066 (7.0)	312 (6.2)	452 (13.7)	302 (4.4)
	123 (1.4)	442 (2.9)	334 (6.8)	n/a	108 (1.5)	436 (2.8)	318 (6.3)	n/a	118 (1.6)	435 (2.9)	331 (6.6)	n/a	104 (1.5)

Data source: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), 2003/04–2011/12.

Inclusion criteria: Patients aged ≥18 years.

Exclusion criteria: Patients with elective admissions.

1 Based on unique patients (i.e., does not include multiple patient-visits).

2 Includes stroke not specified as hemorrhagic or infarction.

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) Female rows display the proportion of females relative to "All" for the given subgroup.

(3) See Appendix E for a list of hospitals designated as regional and district stroke centres by the OSS.

n/a = not applicable

EXHIBIT 4.2A Proportion of adult patients admitted to acute care hospitals in Ontario, by stroke type, 2003/04 and 2009/10–2011/12

Key Finding

- Provincially, the number and proportion of patients discharged from an inpatient stay with an "unable to determine" stroke type decreased from 32.7% in 2003/04 to 12.0% in 2011/12 ($p<0.0001$). The proportion of patients discharged with a diagnosis of ischemic stroke in this period increased from 35.9% to 55.6%.

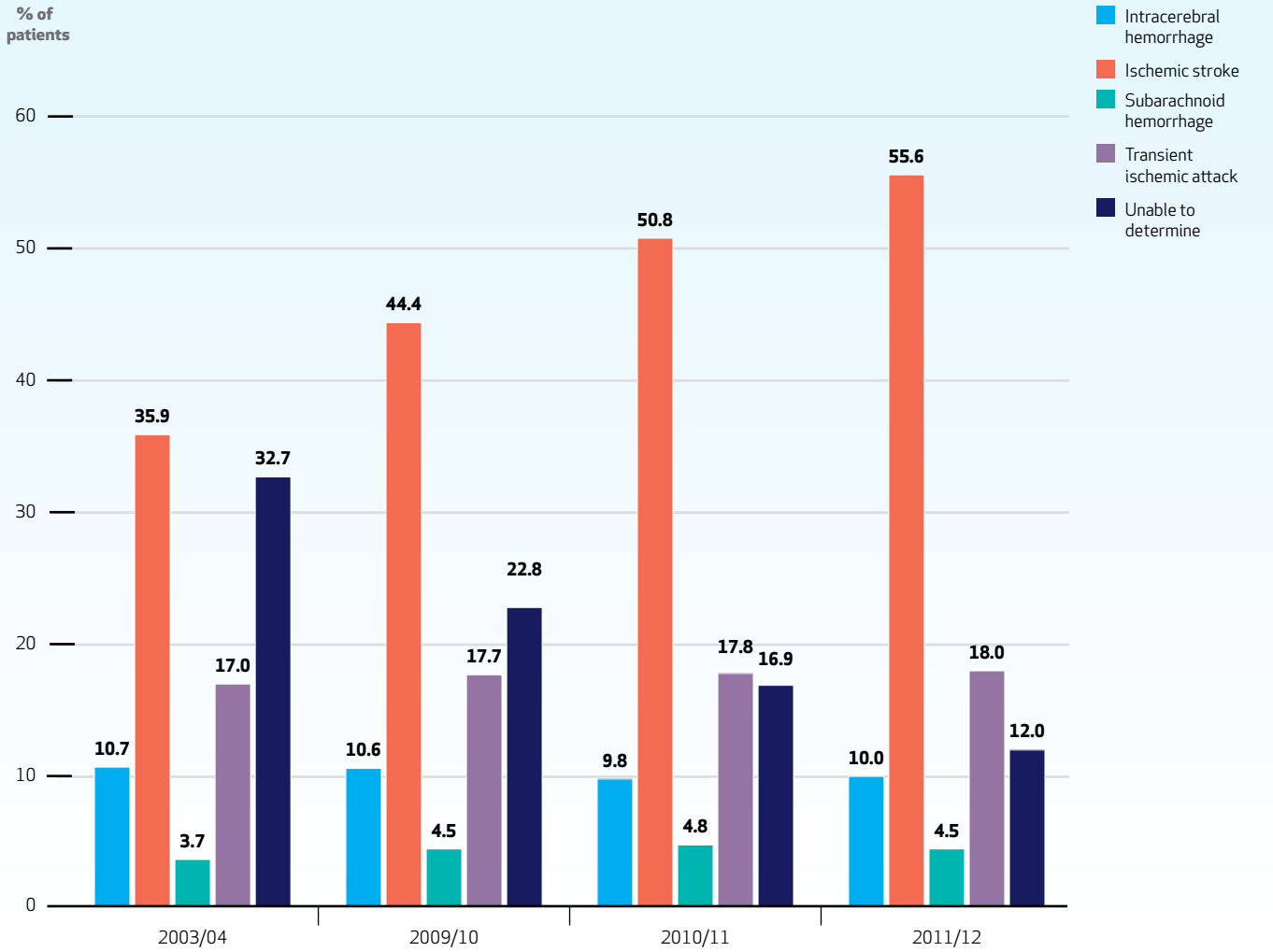


EXHIBIT 4.3 Age- and sex-adjusted inpatient admission rates for adults[1] with stroke or transient ischemic attack per 1,000 LHIN population 18 years and older, in Ontario and by Local Health Integration Network, 2003/04 and 2009/10–2011/12

Key Findings

- Provincially, the annual incidence rate of admission for stroke/TIA per 1,000 population, when standardized to the 2003/04 Ontario age-sex population, declined from 1.7 in 2003/04 to 1.3 in 2011/12 ($p<0.0001$). This decline was observed across all LHINs.
- Inpatient stroke/TIA admission rates per 1,000 population were consistently highest in Northern Ontario (1.8 in the North East LHIN and 1.9 in the North West LHIN in 2011/12). All other LHINs declined in 2011/12, with the Mississauga Halton, Central East and Champlain LHINs having the lowest rates of inpatient stroke/TIA admissions (1.1 per 1,000 population).
- In the Erie St. Clair LHIN, the rate of inpatient stroke/TIA admissions per 1,000 population dropped dramatically from 2.2 in 2003/04 to 1.4 in 2011/12.

Group/Subgroup	Inpatient admission rates, % (n)			
	2003/04	2009/10	2010/11	2011/12
Provincial Rate[2]	1.7 (15,713)	1.5 (15,337)	1.5 (15,514)	1.4 (15,208)
Standardized Rate[3]	1.7 (15,713)	1.4 (15,337)	1.3 (15,514)	1.3 (15,208)
Local Health Integration Network[3]				
1. Erie St. Clair	2.2 (1,152)	1.7 (1,043)	1.5 (939)	1.4 (881)
2. South West	1.7 (1,321)	1.4 (1,310)	1.4 (1,265)	1.4 (1,269)
3. Waterloo Wellington	1.6 (783)	1.3 (765)	1.3 (790)	1.4 (849)
4. Hamilton Niagara Haldimand Brant	1.8 (2,088)	1.4 (1,938)	1.5 (2,016)	1.3 (1,812)
5. Central West	1.7 (659)	1.5 (749)	1.5 (782)	1.4 (752)
6. Mississauga Halton	1.6 (933)	1.3 (996)	1.2 (1,016)	1.1 (977)
7. Toronto Central	1.5 (1,360)	1.3 (1,307)	1.3 (1,294)	1.3 (1,275)
8. Central	1.5 (1,496)	1.2 (1,558)	1.2 (1,650)	1.2 (1,667)
9. Central East	1.6 (1,778)	1.2 (1,693)	1.2 (1,705)	1.1 (1,604)
10. South East	1.6 (736)	1.3 (651)	1.4 (717)	1.3 (708)
11. Champlain	1.4 (1,251)	1.1 (1,182)	1.2 (1,244)	1.1 (1,265)
12. North Simcoe Muskoka	2.0 (693)	1.5 (626)	1.4 (625)	1.4 (639)
13. North East	2.1 (1,068)	1.9 (1,071)	1.8 (1,039)	1.8 (1,077)
14. North West	2.0 (395)	2.0 (448)	1.9 (432)	1.9 (433)

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), 2003/04–2011/12; Statistics Canada, Ontario intercensal population estimate, 2003.

Inclusion criteria: All patients aged ≥18 years with a diagnosis of stroke (ischemic or hemorrhagic) or transient ischemic attack.

Exclusion criteria: Patients with elective admissions.

1 Based on unique patients (i.e., does not include multiple patient-visits).

2 Age- and sex-adjusted rates determined by using each year's Ontario population as the standard.

3 Age- and sex-adjusted standardized rates determined by using the 2003/04 Ontario population as the standard.

Notes:

(1) Population-based analysis (i.e., the location of the patient's residence is used to report regional performance).

(2) Excludes patients with missing postal codes.

(3) Indicates significant difference from standardized rate.

(4) LHIN/sub-LHIN populations were determined using POPLHIN 2003–2010, POPLHIN_PROJECTED 2011 and POPSUBLHIN VERSION 9 2006–2008 files from Ontario Ministry of Health and Long-Term Care: IntelliHealth Ontario.

Inpatient Admissions

CONCLUSIONS

The median age of women admitted to acute inpatient care was higher than that of men (79 vs. 73 years). This may have implications for admission to long-term care facilities and readmission to hospital.

The proportion of admitted patients considered to have an "unable to determine" stroke type has decreased dramatically over the past nine years, which is likely attributable to more patients being admitted to specialized stroke centres where diagnostic imaging and specialist care is available. Designated stroke centres discharge fewer than one in 10 patients without a definitive diagnosis, reinforcing the importance of having patients arrive at designated stroke centres. Regional stroke centres were also more likely to classify TIA as stroke, which may account for the substantial difference in TIA rates among hospital designations.

More stroke/TIA patients are being cared for at specialized stroke centres; in 2011/12, 54.5% of stroke patients were cared for in specialized stroke centres compared to 44.1% in 2003/04. TIAs continue to account for almost one in five admitted patients.

Inpatient stroke/TIA admissions have decreased from 1.7 to 1.3 per 1,000 adult population since 2003/04, equivalent to 400 fewer stroke patients per 1,000,000 adult population admitted to Ontario hospitals, or an estimated 4,400 fewer adult stroke/TIA hospitalizations annually.

Using the 2010/11 rate as the baseline (1.3 per 1,000), there has been no change observed in one year. The OSN target rate for stroke/TIA inpatient admission is 1.14 per 1,000 population.

Admission of TIA patients to hospital continues to occur in Ontario, and the proportion has been steadily above 17% since 2003/04, despite an increase in the number of SPCs across the province since then. This may represent better awareness of the signs of TIA and stroke, although only a small percentage of TIA patients require an inpatient admission.

RECOMMENDATIONS

The OSS regions should continue efforts to have more stroke patients admitted to designated stroke centres within each region, where the expertise for stroke care exists and patients are more likely to be discharged to inpatient rehabilitation in order to achieve optimal functional outcomes.

As a member of the Vascular Health Initiative, the OSN can bring forward OSN targets to drive population-based vascular risk factor reduction strategies.

1. Patients with TIA or mild stroke should be treated on an outpatient basis to alleviate the demand for acute care beds, and secondary prevention clinics should review their practice patterns in an effort to reduce TIA inpatient admissions. Also, rapid response cardiovascular clinics should be enabled to treat TIAs and mild strokes and alleviate demands on acute care hospital beds. Annually, this represents over 2,700 potentially avoidable inpatient stays.

2. The OSN-funded research project Optimal TIA Management should help explain the shift toward TIA inpatient admissions in the province. The OSN should investigate patient outcomes following inpatient stays for TIA to gain a better understanding of this observed pattern of care.

   The results and recommendations should be used to assess the need to admit TIA patients and the impact of SPCs.

3. The prevalence of the "unable to determine" stroke type code assigned to admitted stroke/TIA patients was lower in comparison to stroke-related ED visits; however, both inpatient and ED coders in hospital health records departments should participate in the CIHI online course in stroke coding.

EXHIBIT 4.4 Inpatient length of stay for adults with stroke or transient ischemic attack, in Ontario and by sex, stroke type, Ontario Stroke System designation and Local Health Integration Network, 2003/04 and 2009/10–2011/12

Key Findings

- The median total inpatient length of stay (LOS) decreased from 7 days in 2003/04 to 6 days in 2011/12.
- Regional stroke centres consistently had longer LOS than district stroke centres and non-designated hospitals; this is likely attributable to the fact that hemorrhagic stroke patients are more often admitted to regional stroke centres. However, in 2011/12, regional stroke centres had the lowest proportion of Alternate Level of Care (ALC) days to total length of stay (22.0%), compared to district stroke centres (25.7%) and non-designated hospitals (32.1%).
- Across LHINs, the median total LOS varied from 4 days in the North Simcoe Muskoka LHIN to 8 days in the Champlain LHIN.

	2003/04			2009/10						
		Total length of stay			Total length of stay		Acute care length of stay		ALC[2] length of stay	
Group/Subgroup	No. of patients[1]	Mean (days)	Median (days)	No. of patients[1]	Mean (days)	Median (days)	Mean (days)	Median (days)	Mean (days)	Median (days)
Ontario	15,731	13	7	15,347	13	6	8	5	4.1	0
Female	8,010	13	7	7,816	13	7	9	6	4.2	0
Male	7,721	12	6	7,531	12	6	8	5	4.0	0
Stroke Type										
Intracerebral hemorrhage	1,691	13.8	6	1,629	14.3	7	9.7	6	4.6	0
Ischemic stroke	10,786	14.2	8	10,308	14.3	7	9.2	6	5.1	0
Subarachnoid hemorrhage	584	15.0	9	690	14.0	10	12.7	9	1.4	0
Transient ischemic attack	2,670	4.7	3	2,720	4.7	3	4.0	3	0.7	0
Ontario Stroke System designation										
Regional stroke centre	4,009	14.3	7	4,883	13.8	7	10.0	7	3.8	0
District stroke centre	2,925	10.6	6	3,215	10.8	6	7.2	5	3.7	0
Non-designated	8,797	12.4	7	7,249	12.5	6	8.0	5	4.5	0
Local Health Integration Network										
1. Erie St. Clair	1,092	8.5	6	992	9.1	6	7.4	6	1.7	0
2. South West	1,399	10.3	6	1,370	11.1	5	8.2	5	2.9	0
3. Waterloo Wellington	721	11.5	6	709	10.3	5	6.1	5	4.3	0
4. Hamilton Niagara Haldimand Brant	2,103	13.3	7	1,978	12.6	6	7.8	5	4.8	0
5. Central West	559	14.0	8	573	11.4	6	7.5	5	3.9	0
6. Mississauga Halton	1,018	11.0	6.5	1,135	11.0	6	8.7	6	2.3	0
7. Toronto Central	1,674	15.7	9	1,911	12.9	7	9.6	6	3.3	0
8. Central	1,376	15.6	9	1,289	14.3	7	9.4	6	4.9	0
9. Central East	1,612	11.8	7	1,449	13.1	6	8.4	6	4.7	0
10. South East	756	12.4	6	624	14.2	6	8.0	5	6.2	0
11. Champlain	1,265	13.3	7	1,221	17.5	8	10.8	7	6.7	0
12. North Simcoe Muskoka	702	11.1	5	621	12.7	6	9.0	5	3.6	0
13. North East	1,054	12.7	6	1,033	12.7	5	7.5	5	5.1	0
14. North West	400	10.9	6	442	9.8	7	7.5	6	2.3	0

	2010/11								2011/12							
	Proportion of ALC[2] days to total LOS (%)	No. of patients[1]	Total length of stay		Acute care length of stay		ALC[2] length of stay		Proportion of ALC[2] days to total LOS (%)	No. of patients[1]	Total length of stay		Acute care length of stay		ALC[2] length of stay		Proportion of ALC[2] days to total LOS (%)
			Mean (days)	Median (days)	Mean (days)	Median (days)	Mean (days)	Median (days)			Mean (days)	Median (days)	Mean (days)	Median (days)	Mean (days)	Median (days)	
	32.7	15,524	12.1	6	8.2	5	4.0	0	32.5	15,224	11.3	6	8.2	5	3.1	0	27.3
	32.7	7,881	12.2	6	8.3	6	3.9	0	32.1	7,669	11.8	6	8.4	5	3.4	0	28.9
	32.7	7,643	12.1	6	8.1	5	4.0	0	33.0	7,555	10.8	6	8.0	5	2.7	0	25.5
	32.1	1,524	16.8	7	10.3	6	6.4	0	38.3	1,520	15.0	7	10.5	6	4.5	0	29.9
	35.8	10,499	13.3	7	8.7	6	4.6	0	34.4	10,279	12.4	7	8.7	6	3.7	0	29.6
	9.7	738	14.8	10	12.9	9.5	1.8	0	12.3	681	15.4	10	13.5	10	1.9	0	12.2
	15.0	2,763	4.6	3	3.8	3	0.8	0	17.9	2,744	4.2	3	3.8	3	0.4	0	10.0
	27.4	5,076	12.9	7	9.5	6	3.4	0	26.4	5,002	12.7	7	9.9	6	2.8	0	22.0
	33.9	3,283	9.5	5	6.8	5	2.7	0	28.5	3,302	8.8	5	6.5	5	2.3	0	25.7
	36.2	7,165	12.8	6	7.9	5	4.9	0	38.3	6,920	11.5	6	7.8	5	3.7	0	32.1
	19.0	893	11.3	7	8.2	6	3.1	0	27.3	836	11.0	6	8.5	6	2.6	0	23.4
	26.2	1,341	9.2	5	7.4	4	1.7	0	19.0	1,325	9.5	4	7.3	4	2.2	0	23.3
	41.1	726	9.4	5	5.9	4	3.5	0	36.9	761	8.8	5	6.0	4	2.8	0	31.8
	38.2	2,009	12.0	6	7.7	5	4.3	0	35.9	1,845	11.8	6	8.6	6	3.2	0	27.4
	34.0	616	9.3	6	6.5	5	2.8	0	29.9	596	10.2	6	7.2	5	3.0	0	29.3
	20.8	1,153	12.0	7	9.0	6	3.0	0	24.6	1,099	11.6	7	9.3	6	2.3	0	19.7
	25.8	1,950	13.8	7	9.8	6	4.0	0	28.8	1,912	12.5	7	9.5	6	3.0	0	24.0
	34.5	1,361	15.9	7	9.8	6	6.1	0	38.1	1,324	13.6	7	8.9	6	4.7	0	34.5
	35.6	1,458	11.4	6	7.7	5	3.7	0	32.5	1,400	9.9	5	7.6	5	2.3	0	23.5
	43.5	673	12.6	6	8.3	5	4.3	0	34.1	678	11.0	6	8.7	5	2.2	0	20.3
	38.2	1,269	14.6	7	9.2	6	5.4	0	36.7	1,299	13.9	8	10.0	7	3.9	0	28.1
	28.7	629	9.9	5	6.5	4	3.4	0	34.0	648	7.8	4	5.6	4	2.2	0	28.6
	40.6	1,010	11.5	5	7.2	4	4.3	0	37.4	1,066	11.6	5	7.1	4	4.5	0	39.1
	23.1	436	12.5	7	7.1	5	5.3	0	42.8	435	9.4	5	6.4	5	3.0	0	32.2

Data source: Canadian Institute for Health Information, Discharge Abstract Database (CIHI-DAD), 2003/04–2011/12.

Inclusion criteria: All stroke and transient ischemic attack patients aged ≥18 years admitted to an acute care facility in Ontario for stroke management.

Exclusion criteria: Patients with elective admissions.

1 Based on unique patients (i.e., does not include multiple patient-visits).

2 A patient is designated Alternate Level of Care (ALC) by a physician or his/her delegate when the patient is occupying a bed in a hospital and does not require the intensity of resources/services provided in the current care setting (acute, complex continuing care, mental health or rehabilitation). The ALC wait period starts at the time of designation and ends at the time of discharge/transfer to a discharge destination (or when the patient's needs or condition changes and the ALC designation no longer applies). The standardized provincial ALC definition was implemented across all acute care facilities in Ontario on July 1, 2009.

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) See Appendix E for a list of hospitals designated as regional and district stroke centres by the OSS.

EXHIBIT 4.4A Proportion of total inpatient length of stay spent in Alternate Level of Care for adults with stroke or transient ischemic attack, in Ontario and by sex, 2009/10–2011/12

Key Findings

- Between 2009/10 and 2011/12, the proportion of total inpatient length of stay designated as Alternate Level of Care declined from 32.7% to 27.3% ($p<0.0001$).
- In 2011/12, women had 28.9% of their total length of stay designated as Alternate Level of Care, compared to 25.5% for men.

EXHIBIT 4.4B Mean length of stay in acute care and Alternate Level of Care for adults with stroke or transient ischemic attack, in Ontario and by Local Health Integration Network, 2011/12

Key Findings

- Among the LHINs, there was wide variation in the proportion of total length of stay designated as Alternate Level of Care, with the lowest proportion observed in the Mississauga Halton LHIN (19.7%) and the highest in the North East LHIN (39.1%).
- Among the LHINs, there was wide variation in the mean number of ALC days, from a low of 2.2 days in the South West, South East and North Simcoe Muskoka LHINs to a high of 4.7 days in the Central LHIN.

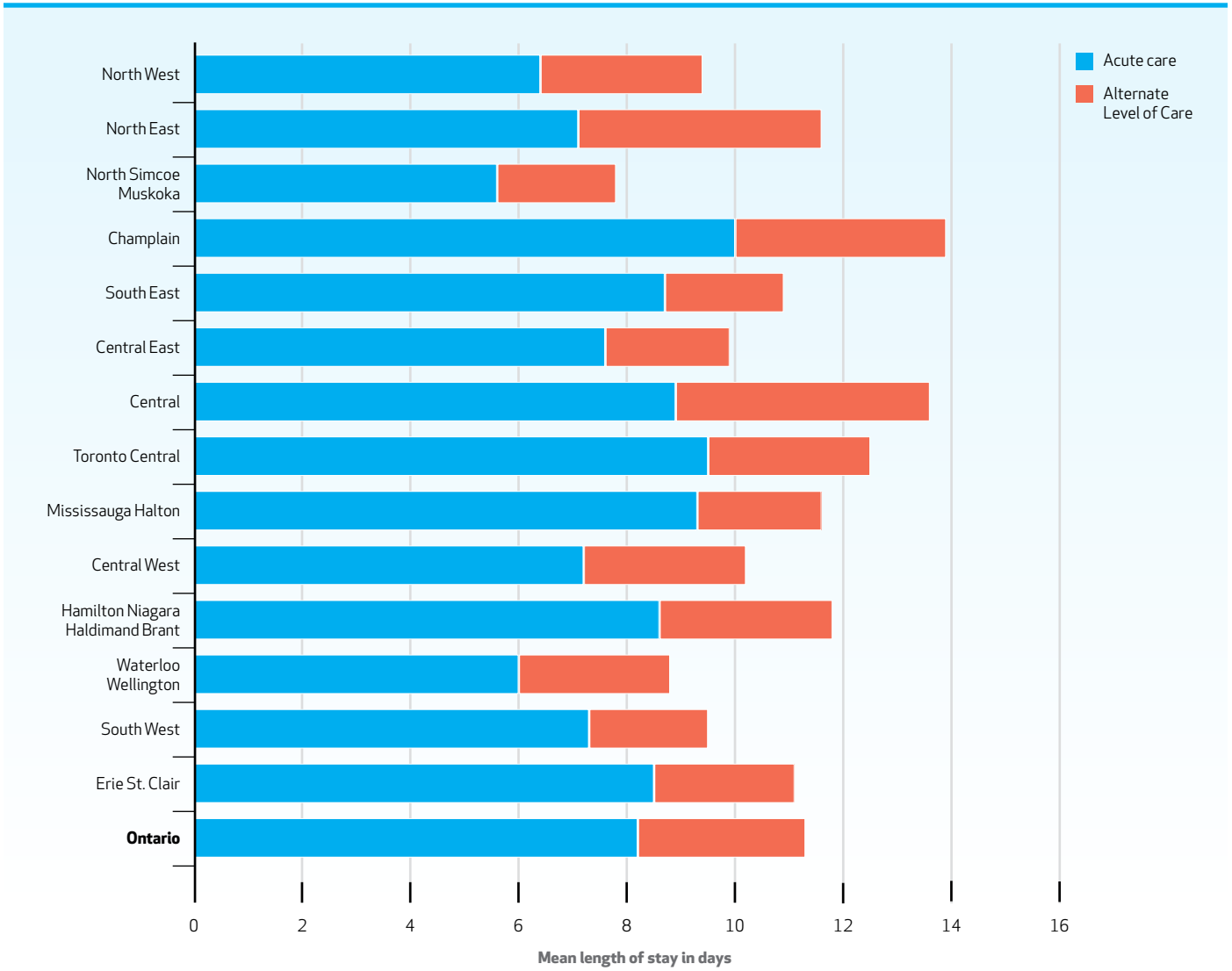


EXHIBIT 4.5 Inpatient length of stay for adults with stroke or transient ischemic attack who had at least one Alternate Level of Care day, in Ontario and by sex, stroke type, Ontario Stroke System designation, discharge destination and Local Health Integration Network, 2009/10–2011/12

Key Findings

- In 2011/12, there were 3,323 admitted stroke/TIA patients with at least one Alternate Level of Care (ALC) day in Ontario and 53.4% of these were women.
- The median ALC length of stay for these patients decreased from 7 days in 2009/10 to 6 days in 2011/12, comprising half of their total stay (51.6%).
- In 2011/12, women had a higher proportion of ALC days to total length of stay than men (53.3% vs. 49.7%).

	2009/10							
		Total length of stay		Acute care length of stay		ALC[2] length of stay		
Group/Subgroup	No. of patients[1]	Mean (days)	Median (days)	Mean (days)	Median (days)	Mean (days)	Median (days)	Proportion of ALC[2] days to total length of stay (%)
Ontario	3,665	30.0	17	12.8	8	17.2	7	57.3
Female	1,971	29.5	17	12.6	9	16.8	7	57.1
Male	1,694	30.7	16	13.1	8	17.6	6	57.4
Stroke Type								
Intracerebral hemorrhage	438	33.2	21	16.1	11	17.1	7	51.5
Ischemic stroke	2,990	29.9	16	12.3	8	17.6	7	59.0
Subarachnoid hemorrhage	88	34.7	24.5	24.1	18	10.6	6	30.6
Transient ischemic attack	149	20.9	13	8.1	6	12.9	6	61.4
Ontario Stroke System designation								
Regional stroke centre	992	35.2	22	16.6	12	18.6	7	52.8
District stroke centre	841	24.8	13	10.8	7	14.0	6	56.4
Non-designated	1,832	29.6	16	11.7	8	17.9	7	60.4
Discharge destination for ALC patients								
Acute care	98	25.6	19.5	14.3	10	11.3	6	44.2
Complex continuing care	679	32.1	20	14.6	10	17.5	7	54.5
Home with services	378	30.7	18	11.8	8	18.9	8	61.5
Home without services	229	21.2	13	9.7	7	11.5	5	54.4
Long-term care	383	72.5	54	18.5	13	54.0	34	74.5
Rehabilitation	1,525	18.0	13	10.3	7	7.7	5	42.6
Palliative/other	36	32.8	20	13.4	9	19.4	8	59.2
Dead	337	38.6	21	17.2	10	21.4	8	55.4

	2010/11							2011/12							
		Total length of stay		Acute care length of stay		ALC[2] length of stay				Total length of stay		Acute care length of stay		ALC[2] length of stay		
	No. of patients[1]	Mean (days)	Median (days)	Mean (days)	Median (days)	Mean (days)	Median (days)	Proportion of ALC[2] days to total length of stay (%)	No. of patients[1]	Mean (days)	Median (days)	Mean (days)	Median (days)	Mean (days)	Median (days)	Proportion of ALC[2] days to total length of stay (%)
	3,584	30.3	17	13.2	9	17.1	6	56.5	3,323	27.3	16	13.2	9	14.1	6	51.6
	1,913	28.6	17	12.5	9	16.1	7	56.3	1,775	27.6	17	12.9	9	14.7	6	53.3
	1,671	32.2	17	14.0	9	18.3	6	56.6	1,548	27.0	16	13.6	8	13.4	6	49.7
	412	41.9	24	18.1	12	23.8	7	56.7	385	34.6	22	16.9	11	17.8	8	51.3
	2,945	28.6	16	12.3	8	16.2	6	56.9	2,735	26.3	16	12.5	8	13.8	6	52.4
	93	39.0	28	24.6	21	14.4	6	36.8	81	42.3	26	26.4	19	15.9	5	37.6
	134	25.9	12	8.8	6	17.1	6	66.2	122	18.5	11	9.2	6	9.3	5	50.5
	1,010	33.1	20	16.0	11	17.2	6	51.8	876	33.4	19	17.4	11	16.0	6	47.8
	735	22.6	14	10.5	8	12.2	6	53.7	753	19.8	13	10.0	7	9.9	5	49.8
	1,839	31.8	17	12.7	8	19.0	7	59.9	1,694	27.5	16	12.5	8	15.0	7	54.6
	84	26.5	19	17.1	10	9.4	6	35.6	61	36.2	24	21.4	11	14.9	7	41.0
	627	30.2	19	14.3	10	15.9	7	52.6	575	28.0	19	14.5	10	13.5	7	48.3
	392	26.1	15	11.0	8	15.2	7	58.1	345	28.9	18	14.5	10	14.5	7	50.0
	179	28.1	15	12.1	8	16.0	6	57.0	190	22.0	15	11.5	7	10.5	5.5	47.7
	395	79.3	54	20.4	16	58.9	35	74.3	326	67.3	51	20.2	13	47.1	32	69.9
	1,550	17.6	13	10.2	7	7.4	5	42.0	1,554	17.5	13	10.2	7	7.3	5	41.6
	33	18.9	12	10.3	7	8.6	3	45.5	26	36.9	26	20.4	11	16.5	7	44.8
	324	39.5	23	18.9	11	20.6	8	52.2	246	33.5	20	16.8	11	16.8	7.5	50.0

EXHIBIT 4.5 *continued*

- In 2011/12, non-designated hospitals had the highest proportion of their total length of stay recorded as ALC days (54.6%), compared to 49.8% and 47.8% at district and regional stroke centres, respectively.
- Across LHINs, the median ALC length of stay in 2011/12 varied from 3 days in the South East LHIN to 8 days in the Champlain LHIN.
- Additionally across LHINs, the variation in the proportion of total length of stay recorded as ALC in 2011/12 ranged from a high of 68.4% in the North East LHIN to a low of 43.8% in the Toronto Central LHIN.

	2009/10							
		Total length of stay		Acute care length of stay		ALC[2] length of stay		
Group/Subgroup	No. of patients[1]	Mean (days)	Median (days)	Mean (days)	Median (days)	Mean (days)	Median (days)	Proportion of ALC[2] days to total length of stay (%)
Local Health Integration Network								
1. Erie St. Clair	201	18.1	15	9.6	7	8.6	6	47.3
2. South West	220	31.6	19	13.5	9	18.1	7.5	57.2
3. Waterloo Wellington	212	23.2	15	9.0	7	14.2	7	61.3
4. Hamilton Niagara Haldimand Brant	531	27.8	14	10.0	7	17.8	7	64.2
5. Central West	192	23.0	15	11.5	7	11.6	7	50.3
6. Mississauga Halton	164	30.7	18	14.9	9	15.8	6	51.4
7. Toronto Central	508	26.2	18	13.7	9	12.5	6	47.7
8. Central	402	30.0	15.5	14.2	9	15.8	5	52.7
9. Central East	332	34.0	16.5	13.8	8	20.3	7	59.6
10. South East	131	42.6	20	13.2	9	29.4	6	69.1
11. Champlain	283	47.8	30	19.1	14	28.8	12	60.2
12. North Simcoe Muskoka	161	26.8	17	12.8	8	14.0	7	52.3
13. North East	201	40.1	17	13.7	8	26.4	7	65.8
14. North West	127	16.8	15	8.9	8	7.9	5	46.9

	2010/11							2011/12							
	No. of patients[1]	Total length of stay		Acute care length of stay		ALC[2] length of stay		Proportion of ALC[2] days to total length of stay (%)	No. of patients[1]	Total length of stay		Acute care length of stay		ALC[2] length of stay		Proportion of ALC[2] days to total length of stay (%)
		Mean (days)	Median (days)	Mean (days)	Median (days)	Mean (days)	Median (days)			Mean (days)	Median (days)	Mean (days)	Median (days)	Mean (days)	Median (days)	
	189	27.3	21	12.7	9	14.6	8	53.5	181	24.1	18	12.1	9	11.9	7	49.5
	163	26.9	19	12.6	8	14.3	8	53.1	166	34.5	20.5	16.8	11	17.7	7	51.3
	201	21.8	14	9.3	8	12.5	6	57.3	210	19.6	12	9.4	7	10.1	5	51.8
	531	27.3	15	11.0	8	16.4	6	59.9	417	27.4	15	13.1	8	14.3	6	52.2
	206	17.5	13	9.2	6	8.3	5	47.4	173	20.5	14	10.2	6	10.3	7	50.3
	204	29.7	15	13.1	8	16.7	6	56.0	195	27.2	16	14.3	10	12.9	5	47.4
	544	29.3	17	15.1	9	14.2	5	48.6	514	25.5	16	14.3	9	11.2	6	43.8
	441	35.2	20	16.6	11	18.7	7	53.0	432	29.4	18	15.0	10	14.4	6	49.0
	236	36.6	19	13.7	10	22.9	7	62.7	203	31.5	20	15.4	11	16.1	7	51.0
	150	32.2	15	12.9	8.5	19.3	6	59.9	137	24.5	12	13.5	6	11.0	3	45.0
	258	43.0	25.5	16.6	13	26.4	9	61.3	273	33.2	21	14.7	11	18.6	8	55.9
	128	28.9	18.5	12.4	9	16.5	8	57.1	113	21.6	14	8.8	7	12.9	6	59.5
	190	35.9	15.5	13.0	8	22.9	7	63.8	196	36.1	15.5	11.4	7	24.7	7	68.4
	143	26.9	16	10.6	8	16.3	7	60.6	113	19.7	11	8.1	6	11.6	4	58.8

Data source: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), 2009/10–2011/12.

Inclusion criteria: All stroke and transient ischemic attack patients aged >18 years admitted to an acute care facility in Ontario for stroke management with at least one Alternate Level of Care (ALC) day during admission for an index stroke/TIA event.

Exclusion criteria: Patients with elective admissions.

1 Based on unique patients (i.e., does not include multiple patient-visits).

2 A patient is designated ALC by a physician or his/her delegate when the patient is occupying a bed in a hospital and does not require the intensity of resources/services provided in the current care setting (acute, complex continuing care, mental health or rehabilitation). The ALC wait period starts at the time of designation and ends at the time of discharge/transfer to a discharge destination (or when the patient's needs or condition changes and the ALC designation no longer applies). The standardized provincial ALC definition was implemented across all acute care facilities in Ontario on July 1, 2009.

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) See Appendix E for a list of hospitals designated as regional and district stroke centres by the OSS.

Key Findings

- Of stroke patients with at least one ALC day, 82.3% had ischemic stroke, 11.6% had intracerebral hemorrhage, 3.7% had TIA and 2.4% had subarachnoid hemorrhage (data from exhibit 4.5).
- In 2011/12, patients with subarachnoid hemorrhage had the lowest proportion of their total length of stay recorded as ALC (37.6%), compared to 50.5%, 51.3% and 52.4%, respectively, for patients with TIA, intracerebral hemorrhage and ischemic stroke.

EXHIBIT 4.5A Proportion of ALC days to total length of stay for patients with at least one ALC day in Ontario, by stroke type, 2009/10–2011/12

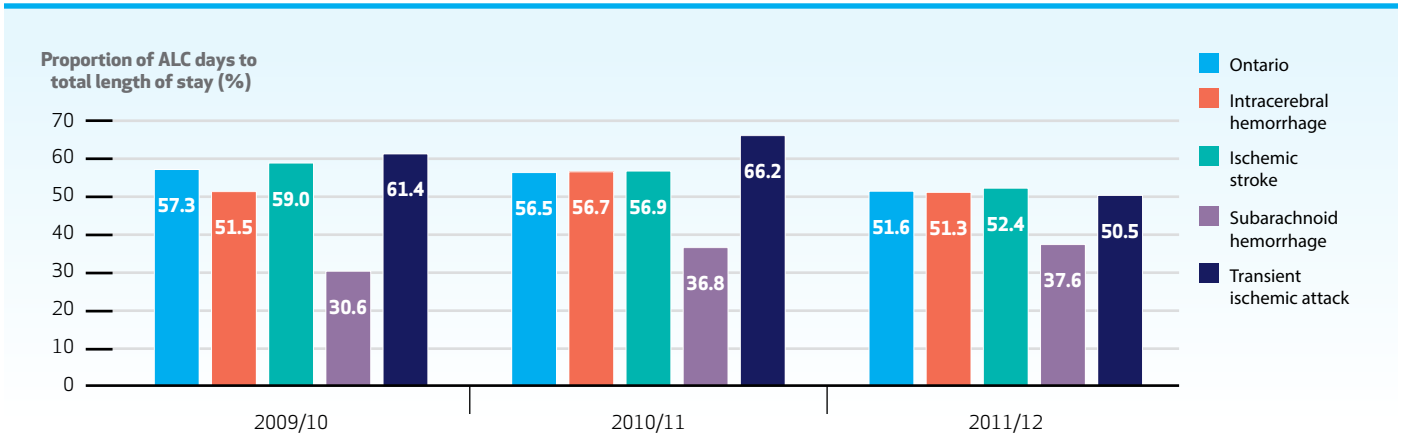


EXHIBIT 4.5B Median inpatient total length of stay for patients with at least one ALC day in Ontario, by stroke type, 2009/10–2011/12

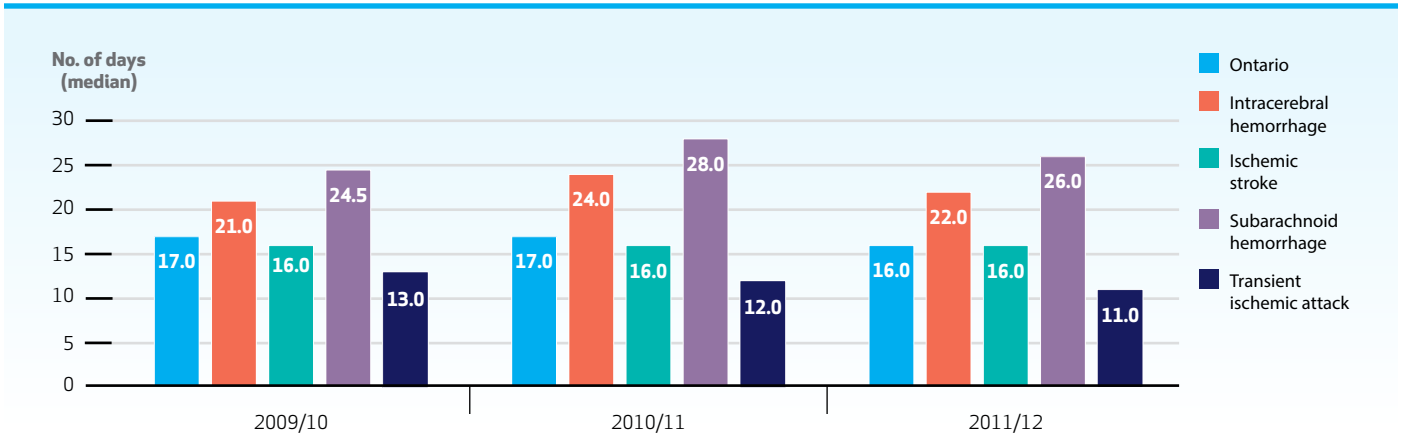


EXHIBIT 4.5C Proportion of ALC days to total length of stay in Ontario, by discharge destination, 2010/11–2011/12

Key Findings

- Among patients with at least one ALC day who were discharged to long-term care, home with services, or to complex continuing care in 2011/12, ALC LOS accounted for 69.9%, 50.0% and 48.3% of their total inpatient LOS, respectively.
- Among stroke/TIA patients who died in 2011/12, half of their total inpatient LOS was considered ALC.
- Among patients with a discharge destination of inpatient rehabilitation in 2011/12, ALC accounted for 41.6% of their total inpatient LOS.

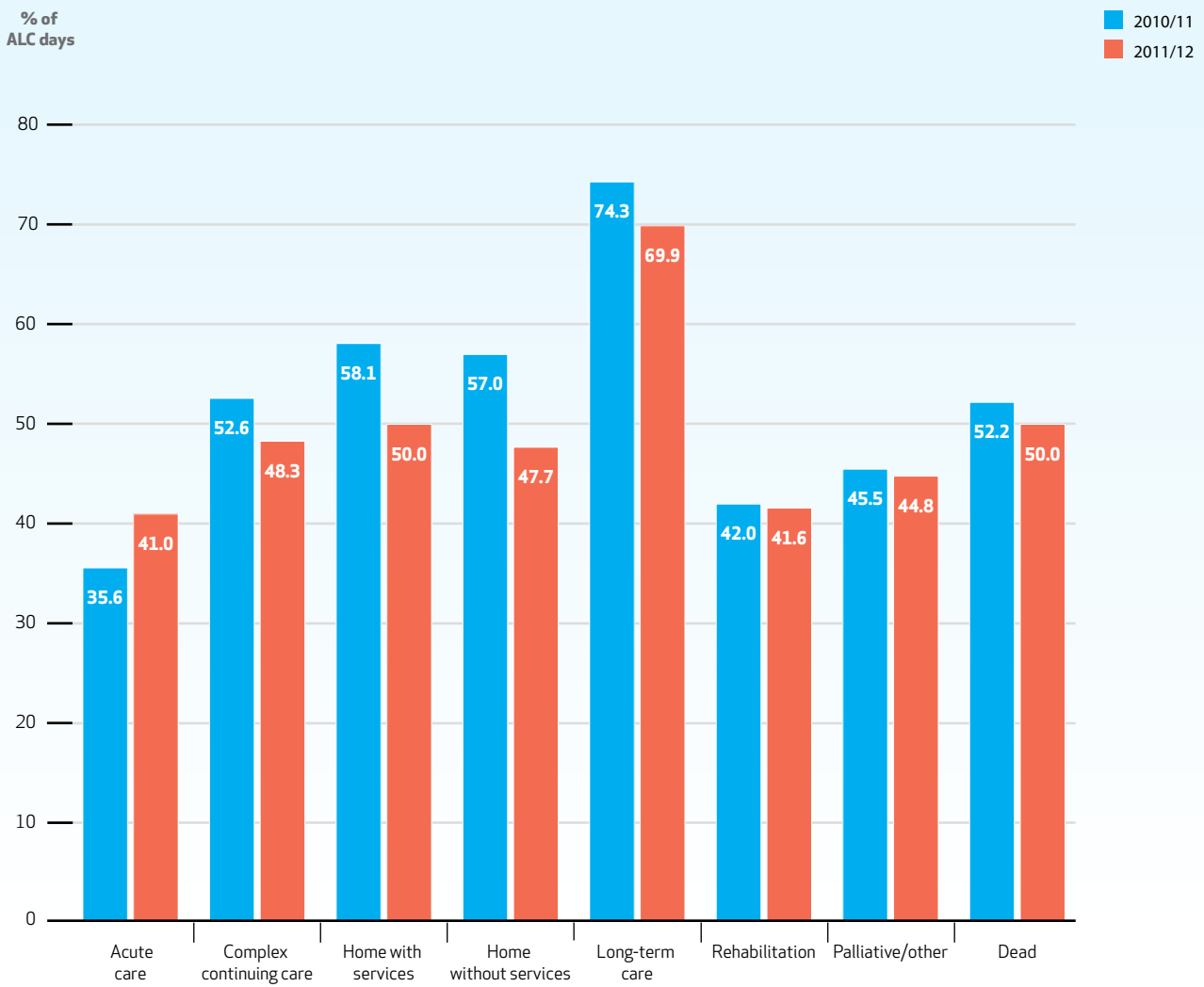


EXHIBIT 4.6 Discharge destination of adult patients with stroke or transient ischemic attack following admission to an acute care hospital, in Ontario and by sex, stroke type, Ontario Stroke System designation and Local Health Integration Network, 2003/04 and 2009/10–2011/12

Key Findings

- Provincially, the percentage of stroke/TIA patients discharged to long-term care and complex continuing care decreased from 8.5% and 8.8% in 2003/04 to 6.4% and 6.6% in 2011/12 (p<0.0001), respectively.
- A greater proportion of women were discharged to complex continuing care and long-term care in 2011/12 (7.3% and 8.6%, respectively), compared to men (5.9% and 4.3%, respectively).
- In 2011/12, 40.9% of patients were discharged home without services, compared to 44.8% in 2003/04 (p<0.0001).
- In 2011/12, men were less likely to be discharged home with services (11.8%), compared to women (16.1%) (p<0.0001).

Group/Subgroup	Year	Sample size[1]	Acute care	
Ontario	2003/04	13,237	603 (4.6)	
	2009/10	13,309	838 (6.3)	
	2010/11	13,642	902 (6.6)	
	2011/12	13,539	862 (6.4)	
Female	2003/04	6,682	294 (4.4)	
	2009/10	6,701	420 (6.3)	
	2010/11	6,876	453 (6.6)	
	2011/12	6,743	405 (6.0)	
Male	2003/04	6,555	309 (4.7)	
	2009/10	6,608	418 (6.3)	
	2010/11	6,766	449 (6.6)	
	2011/12	6,796	457 (6.7)	
Stroke Type				
Intracerebral hemorrhage	2003/04	1,030 (7.8)	136 (13.2)	
	2009/10	1,094 (8.2)	173 (15.8)	
	2010/11	1,069 (7.8)	152 (14.2)	
	2011/12	1,105 (8.2)	163 (14.8)	
Ischemic stroke	2003/04	9,111 (68.8)	330 (3.6)	
	2009/10	8,978 (67.5)	495 (5.5)	
	2010/11	9,246 (67.8)	590 (6.4)	
	2011/12	9,150 (67.6)	544 (5.9)	
Subarachnoid hemorrhage	2003/04	438 (3.3)	95 (21.7)	
	2009/10	527 (4.0)	126 (23.9)	
	2010/11	572 (4.2)	117 (20.5)	
	2011/12	548 (4.0)	120 (21.9)	
Transient ischemic attack	2003/04	2,658 (20.1)	42 (1.6)	
	2009/10	2,710 (20.4)	44 (1.6)	
	2010/11	2,754 (20.2)	43 (1.6)	
	2011/12	2,736 (20.2)	35 (1.3)	
Ontario Stroke System designation				
Regional stroke centre	2003/04	3,383 (25.6)	237 (7.0)	
	2009/10	4,165 (31.3)	393 (9.4)	
	2010/11	4,397 (32.2)	424 (9.6)	
	2011/12	4,338 (32.0)	421 (9.7)	

	Complex continuing care	Home with services	Home without services	Long-term care[2]	Rehabilitation	Other[3]
		Patients, n (%)				
	1,167 (8.8)	1,468 (11.1)	5,924 (44.8)	1,127 (8.5)	2,709 (20.5)	239 (1.8)
	970 (7.3)	1,905 (14.3)	5,460 (41.0)	935 (7.0)	3,020 (22.7)	181 (1.4)
	932 (6.8)	1,880 (13.8)	5,569 (40.8)	927 (6.8)	3,259 (23.9)	173 (1.3)
	897 (6.6)	1,882 (13.9)	5,539 (40.9)	867 (6.4)	3,307 (24.4)	185 (1.4)
	662 (9.9)	846 (12.7)	2,720 (40.7)	738 (11.0)	1,321 (19.8)	101 (1.5)
	537 (8.0)	1,129 (16.8)	2,448 (36.5)	631 (9.4)	1,456 (21.7)	80 (1.2)
	541 (7.9)	1,065 (15.5)	2,548 (37.1)	617 (9.0)	1,576 (22.9)	76 (1.1)
	493 (7.3)	1,083 (16.1)	2,484 (36.8)	577 (8.6)	1,625 (24.1)	76 (1.1)
	505 (7.7)	622 (9.5)	3,204 (48.9)	389 (5.9)	1,388 (21.2)	138 (2.1)
	433 (6.6)	776 (11.7)	3,012 (45.6)	304 (4.6)	1,564 (23.7)	101 (1.5)
	391 (5.8)	815 (12.0)	3,021 (44.6)	310 (4.6)	1,683 (24.9)	97 (1.4)
	404 (5.9)	799 (11.8)	3,055 (45.0)	290 (4.3)	1,682 (24.7)	109 (1.6)
	108 (10.5)	99 (9.6)	298 (28.9)	108 (10.5)	254 (24.7)	27 (2.6)
	136 (12.4)	104 (9.5)	274 (25.0)	71 (6.5)	322 (29.4)	14 (1.3)
	114 (10.7)	106 (9.9)	271 (25.4)	95 (8.9)	306 (28.6)	25 (2.3)
	105 (9.5)	132 (11.9)	276 (25.0)	90 (8.1)	326 (29.5)	13 (1.2)
	999 (11.0)	1,038 (11.4)	3,352 (36.8)	892 (9.8)	2,337 (25.7)	163 (1.8)
	784 (8.7)	1,306 (14.5)	2,959 (33.0)	735 (8.2)	2,561 (28.5)	138 (1.5)
	751 (8.1)	1,251 (13.5)	3,036 (32.8)	690 (7.5)	2,811 (30.4)	117 (1.3)
	734 (8.0)	1,253 (13.7)	3,019 (33.0)	647 (7.1)	2,826 (30.9)	127 (1.4)
	11 (2.5)	24 (5.5)	219 (50.0)	**	72 (16.4)	14 (3.2)
	18 (3.4)	39 (7.4)	257 (48.8)	8 (1.5)	75 (14.2)	**
	23 (4.0)	45 (7.9)	291 (50.9)	8 (1.4)	81 (14.2)	7 (1.2)
	13 (2.4)	33 (6.0)	292 (53.3)	**	80 (14.6)	6 (1.1)
	49 (1.8)	307 (11.6)	2,055 (77.3)	124 (4.7)	46 (1.7)	35 (1.3)
	32 (1.2)	456 (16.8)	1,970 (72.7)	121 (4.5)	62 (2.3)	25 (0.9)
	44 (1.6)	478 (17.4)	1,970 (71.5)	134 (4.9)	61 (2.2)	24 (0.9)
	45 (1.6)	464 (17.0)	1,952 (71.3)	126 (4.6)	75 (2.7)	39 (1.4)
	156 (4.6)	330 (9.8)	1,506 (44.5)	252 (7.4)	853 (25.2)	49 (1.4)
	224 (5.4)	463 (11.1)	1,771 (42.5)	250 (6.0)	1,022 (24.5)	42 (1.0)
	145 (3.3)	561 (12.8)	1,836 (41.8)	233 (5.3)	1,157 (26.3)	41 (0.9)
	146 (3.4)	513 (11.8)	1,783 (41.1)	224 (5.2)	1,206 (27.8)	45 (1.0)

EXHIBIT 4.6 *continued*

- In 2011/12, designated stroke centres had the highest proportion of patients discharged to inpatient rehabilitation (approximately 28%), compared to 20.3% in non-designated hospitals.
- For all stroke types, with the exception of subarachnoid hemorrhage, there was an increase in the proportion of patients being discharged to inpatient rehabilitation. There was no gender difference in the proportion of patients being discharged to inpatient rehabilitation.
- There was wide variation across LHINs in rates of discharge to inpatient rehabilitation from acute care in 2011/12, ranging from 17.8% in the Waterloo Wellington and Central West LHINs to 33.0% in the Erie St. Clair LHIN.

Group/Subgroup	Year	Sample size[1]	Acute care	
District stroke centre	2003/04	2,465 (18.6)	94 (3.8)	
	2009/10	2,824 (21.2)	192 (6.8)	
	2010/11	2,950 (21.6)	182 (6.2)	
	2011/12	3,013 (22.3)	146 (4.8)	
Non-designated	2003/04	7,389 (55.8)	272 (3.7)	
	2009/10	6,320 (47.5)	253 (4.0)	
	2010/11	6,294 (46.1)	296 (4.7)	
	2011/12	6,188 (45.7)	295 (4.8)	
Local Health Integration Network				
1. Erie St. Clair	2003/04	961 (7.3)	28 (2.9)	
	2009/10	861 (6.5)	21 (2.4)	
	2010/11	785 (5.8)	20 (2.5)	
	2011/12	758 (5.6)	24 (3.2)	
2. South West	2003/04	1,182 (8.9)	111 (9.4)	
	2009/10	1,170 (8.8)	96 (8.2)	
	2010/11	1,154 (8.5)	68 (5.9)	
	2011/12	1,145 (8.5)	75 (6.6)	
3. Waterloo Wellington	2003/04	588 (4.4)	20 (3.4)	
	2009/10	633 (4.8)	40 (6.3)	
	2010/11	653 (4.8)	49 (7.5)	
	2011/12	707 (5.2)	44 (6.2)	
4. Hamilton Niagara Haldimand Brant	2003/04	1,757 (13.3)	75 (4.3)	
	2009/10	1,677 (12.6)	112 (6.7)	
	2010/11	1,762 (12.9)	99 (5.6)	
	2011/12	1,648 (12.2)	120 (7.3)	
5. Central West	2003/04	491 (3.7)	15 (3.1)	
	2009/10	513 (3.9)	17 (3.3)	
	2010/11	562 (4.1)	26 (4.6)	
	2011/12	538 (4.0)	18 (3.3)	
6. Mississauga Halton	2003/04	882 (6.7)	44 (5.0)	
	2009/10	988 (7.4)	72 (7.3)	
	2010/11	998 (7.3)	89 (8.9)	
	2011/12	939 (6.9)	78 (8.3)	

	Complex continuing care	Home with services	Home without services	Long-term care[2]	Rehabilitation	Other[3]
			Patients, n (%)			
	207 (8.4)	277 (11.2)	1,031 (41.8)	164 (6.7)	648 (26.3)	44 (1.8)
	242 (8.6)	410 (14.5)	1,036 (36.7)	124 (4.4)	771 (27.3)	49 (1.7)
	266 (9.0)	330 (11.2)	1,102 (37.4)	140 (4.7)	882 (29.9)	48 (1.6)
	279 (9.3)	389 (12.9)	1,177 (39.1)	146 (4.8)	845 (28.0)	31 (1.0)
	804 (10.9)	861 (11.7)	3,387 (45.8)	711 (9.6)	1,208 (16.3)	146 (2.0)
	504 (8.0)	1,032 (16.3)	2,653 (42.0)	561 (8.9)	1,227 (19.4)	90 (1.4)
	521 (8.3)	989 (15.7)	2,630 (41.8)	554 (8.8)	1,220 (19.4)	84 (1.3)
	472 (7.6)	980 (15.8)	2,579 (41.7)	497 (8.0)	1,256 (20.3)	109 (1.8)
	43 (4.5)	125 (13.0)	372 (38.7)	84 (8.7)	288 (30.0)	21 (2.2)
	72 (8.4)	136 (15.8)	336 (39.0)	44 (5.1)	244 (28.3)	8 (0.9)
	48 (6.1)	117 (14.9)	296 (37.7)	36 (4.6)	259 (33.0)	9 (1.1)
	57 (7.5)	108 (14.2)	262 (34.6)	43 (5.7)	250 (33.0)	14 (1.8)
	164 (13.9)	123 (10.4)	488 (41.3)	82 (6.9)	204 (17.3)	10 (0.8)
	58 (5.0)	201 (17.2)	449 (38.4)	99 (8.5)	237 (20.3)	30 (2.6)
	44 (3.8)	217 (18.8)	457 (39.6)	81 (7.0)	276 (23.9)	11 (1.0)
	35 (3.1)	200 (17.5)	488 (42.6)	74 (6.5)	255 (22.3)	18 (1.6)
	76 (12.9)	70 (11.9)	250 (42.5)	54 (9.2)	113 (19.2)	**
	75 (11.8)	115 (18.2)	225 (35.5)	41 (6.5)	134 (21.2)	**
	70 (10.7)	92 (14.1)	283 (43.3)	37 (5.7)	113 (17.3)	9 (1.4)
	53 (7.5)	111 (15.7)	314 (44.4)	50 (7.1)	126 (17.8)	9 (1.3)
	173 (9.8)	178 (10.1)	770 (43.8)	171 (9.7)	363 (20.7)	27 (1.5)
	164 (9.8)	254 (15.1)	690 (41.1)	91 (5.4)	338 (20.2)	28 (1.7)
	176 (10.0)	251 (14.2)	683 (38.8)	111 (6.3)	421 (23.9)	21 (1.2)
	173 (10.5)	215 (13.0)	679 (41.2)	75 (4.6)	364 (22.1)	22 (1.3)
	92 (18.7)	58 (11.8)	213 (43.4)	44 (9.0)	60 (12.2)	9 (1.8)
	52 (10.1)	78 (15.2)	228 (44.4)	44 (8.6)	94 (18.3)	-
	59 (10.5)	127 (22.6)	194 (34.5)	47 (8.4)	102 (18.1)	7 (1.2)
	53 (9.9)	100 (18.6)	207 (38.5)	56 (10.4)	96 (17.8)	8 (1.5)
	52 (5.9)	57 (6.5)	390 (44.2)	50 (5.7)	283 (32.1)	6 (0.7)
	84 (8.5)	83 (8.4)	443 (44.8)	40 (4.0)	260 (26.3)	6 (0.6)
	83 (8.3)	95 (9.5)	436 (43.7)	50 (5.0)	241 (24.1)	**
	60 (6.4)	105 (11.2)	391 (41.6)	33 (3.5)	260 (27.7)	12 (1.3)

EXHIBIT 4.6 *continued*

- Rates of discharge to long-term care in 2011/12 varied from 3.5% in the Mississauga Halton LHIN to 10.6% in the Central LHIN, and rates of discharge to complex continuing care ranged from 2.2% in the North Simcoe Muskoka LHIN to 10.5% in the Hamilton Niagara Haldimand Brant LHIN.

Group/Subgroup	Year	Sample size[1]	Acute care	
7. Toronto Central	2003/04	1,421 (10.7)	47 (3.3)	
	2009/10	1,678 (12.6)	136 (8.1)	
	2010/11	1,727 (12.7)	155 (9.0)	
	2011/12	1,697 (12.5)	137 (8.1)	
8. Central	2003/04	1,098 (8.3)	20 (1.8)	
	2009/10	1,143 (8.6)	50 (4.4)	
	2010/11	1,201 (8.8)	33 (2.7)	
	2011/12	1,209 (8.9)	43 (3.6)	
9. Central East	2003/04	1,339 (10.1)	40 (3.0)	
	2009/10	1,269 (9.5)	46 (3.6)	
	2010/11	1,299 (9.5)	78 (6.0)	
	2011/12	1,267 (9.4)	65 (5.1)	
10. South East	2003/04	612 (4.6)	37 (6.0)	
	2009/10	525 (3.9)	46 (8.8)	
	2010/11	560 (4.1)	52 (9.3)	
	2011/12	574 (4.2)	31 (5.4)	
11. Champlain	2003/04	1,051 (7.9)	57 (5.4)	
	2009/10	1,022 (7.7)	68 (6.7)	
	2010/11	1,097 (8.0)	77 (7.0)	
	2011/12	1,153 (8.5)	78 (6.8)	
12. North Simcoe Muskoka	2003/04	615 (4.6)	18 (2.9)	
	2009/10	532 (4.0)	30 (5.6)	
	2010/11	565 (4.1)	42 (7.4)	
	2011/12	579 (4.3)	47 (8.1)	
13. North East	2003/04	908 (6.9)	67 (7.4)	
	2009/10	895 (6.7)	63 (7.0)	
	2010/11	890 (6.5)	73 (8.2)	
	2011/12	926 (6.8)	68 (7.3)	
14. North West	2003/04	332 (2.5)	24 (7.2)	
	2009/10	403 (3.0)	41 (10.2)	
	2010/11	388 (2.8)	41 (10.6)	
	2011/12	399 (2.9)	34 (8.5)	

Data source: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), 2003/04–2011/12.

Inclusion criteria: All patients aged ≥18 years discharged alive from an acute care hospital in Ontario with a diagnosis of stroke (ischemic or hemorrhagic) or transient ischemic attack.

Exclusion criteria: Patients with elective admissions.

	Complex continuing care	Home with services	Home without services	Long-term care[2]	Rehabilitation	Other[3]
			Patients, n (%)			
	81 (5.7)	194 (13.7)	599 (42.2)	149 (10.5)	313 (22.0)	38 (2.7)
	144 (8.6)	173 (10.3)	742 (44.2)	125 (7.4)	343 (20.4)	15 (0.9)
	66 (3.8)	200 (11.6)	727 (42.1)	110 (6.4)	453 (26.2)	16 (0.9)
	120 (7.1)	182 (10.7)	696 (41.0)	105 (6.2)	443 (26.1)	14 (0.8)
	84 (7.7)	105 (9.6)	469 (42.7)	135 (12.3)	270 (24.6)	15 (1.4)
	66 (5.8)	160 (14.0)	439 (38.4)	123 (10.8)	278 (24.3)	27 (2.4)
	113 (9.4)	130 (10.8)	505 (42.0)	133 (11.1)	266 (22.1)	21 (1.7)
	94 (7.8)	186 (15.4)	460 (38.0)	128 (10.6)	288 (23.8)	10 (0.8)
	174 (13.0)	181 (13.5)	534 (39.9)	107 (8.0)	275 (20.5)	28 (2.1)
	80 (6.3)	187 (14.7)	472 (37.2)	109 (8.6)	360 (28.4)	15 (1.2)
	74 (5.7)	157 (12.1)	470 (36.2)	107 (8.2)	399 (30.7)	14 (1.1)
	73 (5.8)	135 (10.7)	497 (39.2)	97 (7.7)	378 (29.8)	22 (1.7)
	37 (6.0)	80 (13.1)	308 (50.3)	32 (5.2)	106 (17.3)	12 (2.0)
	42 (8.0)	85 (16.2)	225 (42.9)	32 (6.1)	91 (17.3)	**
	48 (8.6)	111 (19.8)	207 (37.0)	32 (5.7)	102 (18.2)	8 (1.4)
	43 (7.5)	124 (21.6)	207 (36.1)	30 (5.2)	132 (23.0)	7 (1.2)
	38 (3.6)	112 (10.7)	501 (47.7)	101 (9.6)	219 (20.8)	23 (2.2)
	59 (5.8)	196 (19.2)	357 (34.9)	86 (8.4)	243 (23.8)	13 (1.3)
	71 (6.5)	147 (13.4)	440 (40.1)	87 (7.9)	255 (23.2)	20 (1.8)
	70 (6.1)	173 (15.0)	453 (39.3)	74 (6.4)	286 (24.8)	19 (1.6)
	36 (5.9)	51 (8.3)	341 (55.4)	40 (6.5)	107 (17.4)	22 (3.6)
	33 (6.2)	64 (12.0)	245 (46.1)	26 (4.9)	123 (23.1)	11 (2.1)
	21 (3.7)	80 (14.2)	267 (47.3)	33 (5.8)	118 (20.9)	**
	13 (2.2)	80 (13.8)	250 (43.2)	34 (5.9)	146 (25.2)	9 (1.6)
	50 (5.5)	96 (10.6)	517 (56.9)	69 (7.6)	90 (9.9)	19 (2.1)
	24 (2.7)	140 (15.6)	441 (49.3)	48 (5.4)	166 (18.5)	13 (1.5)
	37 (4.2)	111 (12.5)	434 (48.8)	48 (5.4)	166 (18.7)	21 (2.4)
	33 (3.6)	111 (12.0)	459 (49.6)	53 (5.7)	191 (20.6)	11 (1.2)
	67 (20.2)	38 (11.4)	172 (51.8)	9 (2.7)	18 (5.4)	**
	17 (4.2)	33 (8.2)	168 (41.7)	27 (6.7)	109 (27.0)	8 (2.0)
	22 (5.7)	45 (11.6)	169 (43.6)	15 (3.9)	88 (22.7)	8 (2.1)
	20 (5.0)	52 (13.0)	176 (44.1)	15 (3.8)	92 (23.1)	10 (2.5)

1 Based on unique patients (i.e., does not include multiple patient-visits).

2 Includes long-term care nursing homes and long-term care homes for the aged.

3 Includes palliative care.

** Cell value suppressed for reasons of privacy and confidentiality.

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) See Appendix E for a list of hospitals designated as regional and district stroke centres by the OSS.

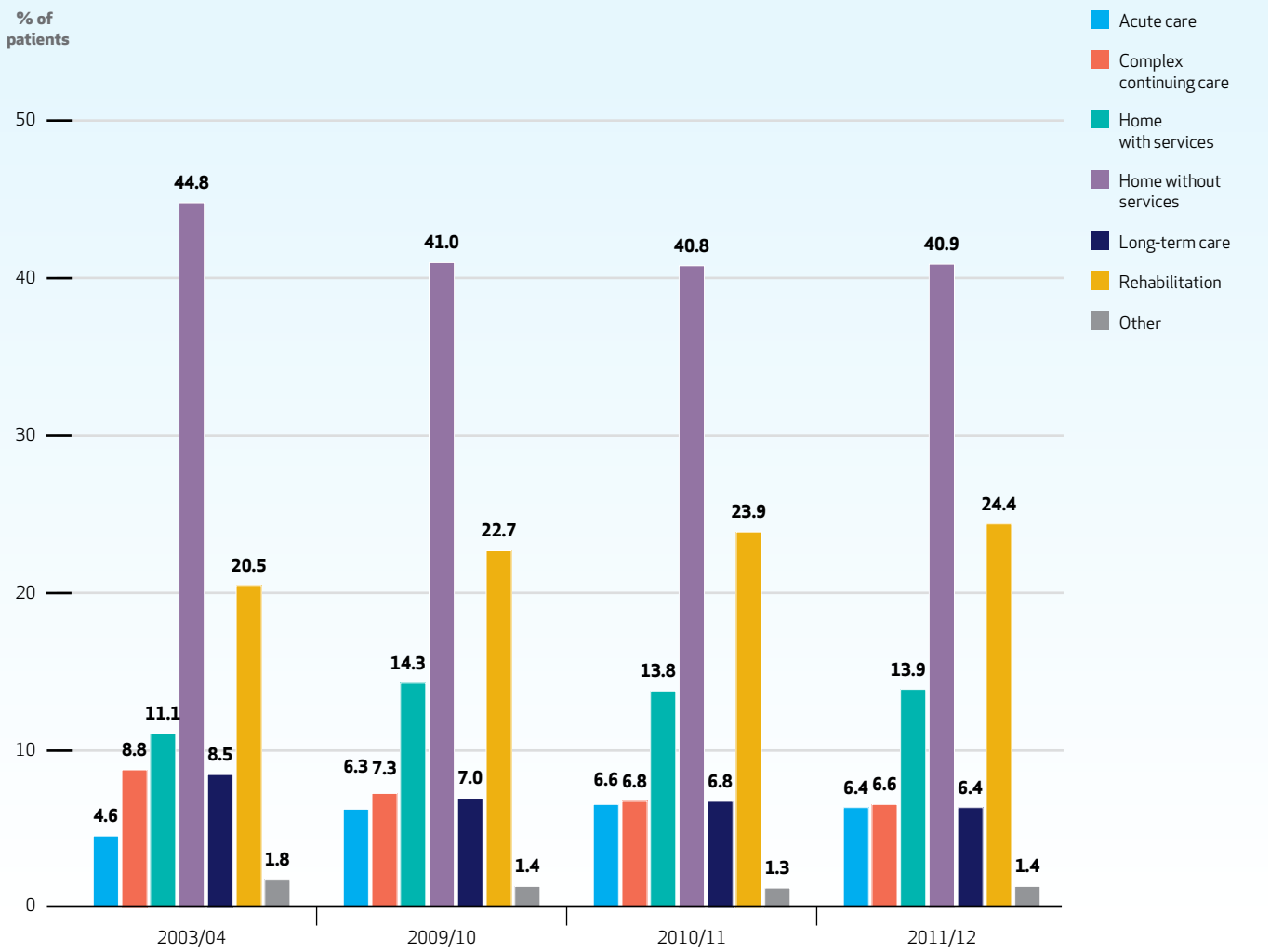
(3) See Appendix F for the calculation of stroke/TIA patient discharge disposition from acute care.

(4) Cells in which there were no reported/available data are marked with a hyphen (-).

EXHIBIT 4.6A Discharge destination of adult patients with stroke or transient ischemic attack following an acute care hospitalization, 2003/04 and 2009/10–2011/12

Key Findings

- Discharges to inpatient rehabilitation increased from 20.5% in 2003/04 to 24.4% in 2011/12.
- Discharges to long-term care decreased from 8.5% in 2003/04 to 6.4% in 2011/12.



Length of Stay and Inpatient Care

CONCLUSIONS

More than 2,700 patients with TIA were admitted to hospital in 2011/12; with a median total LOS of three days, this represents more than 8,100 acute care bed-days per year. This occurrence is surprising, given that Ontario has over 40 SPCs to provide investigations and assessments.

Overall, among admitted stroke/TIA patients, ALC days represented 27.3% of the total inpatient LOS. There continues to be wide variation in the proportion of ALC days to total LOS across LHINs, ranging from 19.7% to 34.5% in 2011/12; however, the extent of variation is less than it was in 2010/11 (19.0% to 42.8%).

Just over one in five admitted stroke/TIA patients had at least one ALC day (21.8 %) in 2011/12, an improvement from 23.8% in 2009/10.

Furthermore, there has been a reduction in the median ALC LOS among stroke/TIA patients who had at least one ALC day, from 7 median ALC days in 2009/10 (mean 17.2 days) to 6 median days in 2011/12 (mean 14.1 days). This is equivalent to a savings of almost 10,000 bed-days. There continues to be a five-day variation in the median number of ALC days across LHINs.

Among patients with ALC days (N = 3,323), the proportion of ALC days to total LOS was 51.6% in 2011/12, varying from 47.4% to 63.8% across LHINs. Although the proportion of TIA patients with ALC days was less than 5% of all patients with ALC days, their ALC days represented half of the total acute care LOS (50.5%, median 5 ALC days). This suggests that closer examination is needed, as this sub-group may require more complex case management beyond best practice stroke care.

Provincially, the ALC issue for stroke/TIA patients (i.e., the inability to discharge from acute care) often results in increased discharges to long-term care, home with services, and complex continuing care. Patients discharged to long-term care had the highest proportion of ALC days to total LOS among patients who had ALC days in 2011/12 (69.9%); however, this has decreased from 74.3% in 2010/11. There has been minimal decrease for patients going to inpatient rehabilitation following an acute stroke, from 42.0% in 2010/11 to 41.6% in 2011/12. There is still an opportunity to reduce ALC days and improve access to complex continuing care and inpatient rehabilitation for patients discharged to long-term care, as well as for those discharged home with services.

RECOMMENDATIONS

The OSN's work in support of the MOHLTC Stroke-QBP funding initiative should continue. The standards of care identified by the OSN, if implemented, would support ongoing improvement in access to best practices, reducing ALC days and costs of care while improving patient flow and outcomes. The OSN will continue to monitor ALC days among admitted stroke/TIA patients as the Stroke-QBP initiative is implemented.

Efforts to consolidate care into designated stroke centres should continue. The data support the view that patients admitted to designated stroke centres have better outcomes, LOS and ALC days.

EXHIBIT 4.7 Time to carotid intervention within 6 months of hospitalization for adults with stroke or transient ischemic attack, in Ontario and by sex, Ontario Stroke System designation and Local Health Integration Network, 2003/04 and 2009/10–2011/12

Key Findings

- The number of patients receiving carotid intervention decreased by almost 100 cases between 2010/11 and 2011/12.
- The median time to carotid intervention decreased substantially in Ontario, declining from 51 days in 2003/04 to 19 days in 2011/12 ($p<0.0001$).
- Wait times for carotid intervention were similar for men and women in 2011/12.
- Among LHINs, the median wait time for carotid intervention varied considerably. In 2011/12, it ranged from 10 days in the Toronto Central LHIN to 49 days in the South West LHIN.

Group/Subgroup	2003/04			2009/10			2010/11			2011/12		
	Patients[1] (n)	Mean time (days)	Median time (days)	Patients[1] (n)	Mean time (days)	Median time (days)	Patients[1] (n)	Mean time (days)	Median time (days)	Patients[1] (n)	Mean time (days)	Median time (days)
Ontario	419	61.8	51	518	38.8	22	559	37.1	21	469	33.6	19
Female	132	64.5	53.5	174	36.5	14.5	155	36.5	22	147	32.5	19
Male	287	60.5	50	344	39.9	24	404	37.3	20.5	322	34.2	19
Ontario Stroke System designation												
Regional stroke centre	140	49.7	34	207	28.3	13	209	24.3	11	181	21.4	11
District stroke centre	78	58.1	48.5	110	42.1	23.5	106	40.2	26	105	34.0	20
Non-designated	201	71.6	67	201	47.7	33	244	46.7	33	183	45.6	33
Local Health Integration Network												
1. Erie St. Clair	26	44.1	26	42	46.3	25	40	39.1	24	35	33.8	17
2. South West	41	65.7	51	37	46.1	40	40	49.0	49	29	54.9	49
3. Waterloo Wellington	16	83.0	87.5	21	48.6	36	24	39.5	15.5	13	42.0	29
4. Hamilton Niagara Haldimand Brant	43	85.7	76	54	46.7	28	67	49.6	33	55	28.2	17
5. Central West	11	62.5	56	8	41.0	26.5	16	31.6	20.5	15	52.9	33
6. Mississauga Halton	35	36.8	28	60	20.5	12	59	23.5	13	34	19.8	12.5
7. Toronto Central	46	59.9	35	62	17.2	7.5	53	28.0	11	50	21.8	10
8. Central	29	59.7	53	33	41.2	23	36	36.2	20.5	47	27.9	19
9. Central East	32	59.9	53	41	38.8	23	33	49.2	37	32	36.8	20.5
10. South East	27	52.8	41	31	38.1	25	40	35.9	14	21	39.0	31
11. Champlain	42	57.7	43.5	41	50.2	31	52	25.3	11.5	66	26.7	15
12. North Simcoe Muskoka	23	65.7	58	33	47.2	34	27	24.9	8	22	46.0	19.5
13. North East	37	73.4	65	37	49.3	37	55	47.6	35	38	46.6	32.5
14. North West	11	52.0	21	18	38.3	25	17	34.7	27	12	41.1	29

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), 2003/04–2011/12, and National Ambulatory Care Reporting System (NACRS), 2003/04–2011/12.

Inclusion criteria: All patients aged >18 years who visited or were admitted to an acute care hospital for stroke or transient ischemic attack and who underwent carotid revascularization through carotid endarterectomy or carotid artery stenting within six months of the index stroke/TIA event acute care hospital admission date, starting in 2003.

1 Based on unique patients (i.e., does not include multiple patient-visits).

** Cell value suppressed for reasons of privacy and confidentiality.

Notes:

(1) Facility-based analysis (i.e., the location of the facility where the index stroke event occurred is used to report regional performance).

(2) Degree of stenosis in patients requiring carotid revascularization is unavailable in administrative databases.

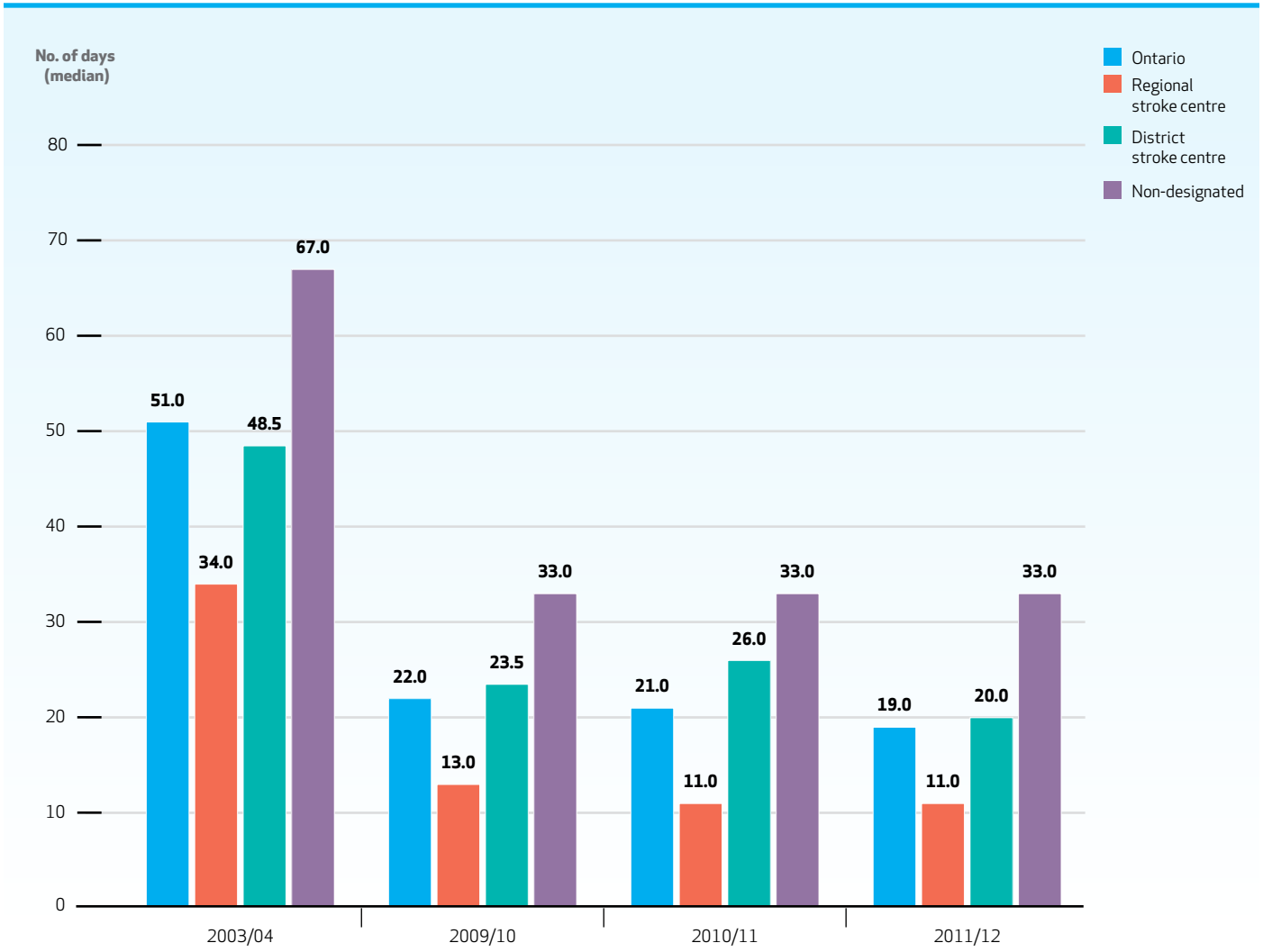
(3) Sub-LHIN planning area data not included as most carotid endarterectomies and coronary artery stenting are done at the 11 regional and enhanced district stroke centres.

(4) See Appendix E for a list of hospitals designated as regional and district stroke centres by the OSS.

EXHIBIT 4.7A Median time to carotid intervention within 6 months of hospitalization for adults with stroke or transient ischemic attack, in Ontario and by Ontario Stroke System designation, 2003/04 and 2009/10–2011/12

Key Findings

- Patients discharged from regional stroke centres continued to have the shortest wait times (11 median days in 2011/12) and meet the benchmark of having the procedure done within 2 weeks of the stroke/TIA event, compared to a median of 20 days and 33 days for patients discharged from district stroke centres and non-designated hospitals, respectively.
- Among district stroke centres, the time to carotid intervention dropped, from a median of 26 days in 2010/11 to 20 days in 2011/12.



Carotid Intervention

CONCLUSIONS

Provincially, the percentage of stroke/TIA patients discharged to long-term care and complex continuing care has dropped from 8.5% to 6.4% and from 8.8% to 6.6%, respectively, between 2003/04 and 2011/12 ($p<0.0001$). The 2.1% absolute reduction in discharges to long-term care, given that 13,500 stroke/TIA patients were discharged alive, is equivalent to 284 long-term care admissions avoided annually.

An increase was observed in the proportion of patients being discharged to inpatient rehabilitation, which surprisingly included TIA patients. This may explain the ALC issue among this group of patients and supports the need to examine the comorbidities of TIA patients.

Delays in receiving carotid intervention are being reduced, but regional variation exists. Stroke/TIA patients admitted to non-designated hospitals experienced the longest median wait time (33 days), compared to those admitted to district and regional stroke centres, (20 and 11 days, respectively).

RECOMMENDATIONS

The OSN should continue to monitor prevalence of stroke patients within long-term care homes. More in-depth examination of stroke care within long-term care homes is planned for later in the year. The OSN has set a target of 3.2% of stroke/TIA patients being admitted to long-term care homes within one year of an acute stroke by 2016/17 (*see* **Appendix L**).

There is a need for continued efforts to ensure timely carotid artery imaging and prompt referrals to surgeons in order to achieve the stroke care best practice recommendation of two weeks.[17] Regional stroke centres have significantly lower wait times for carotid intervention than district stroke centres or non-designated hospitals, reinforcing the importance of patients going to regional stroke centres for stroke care.

The OSN should continue to contribute to and advise the Ontario Wait Time Strategy as it relates to access to carotid interventions. Although district stroke centres have improved the time to carotid intervention, continued effort is needed as these centres have 80% of all patients receiving imaging while in hospital.[26]

To improve access to inpatient rehabilitation and facilitate decision-making, the OSN recommends the adoption of the AlphaFIM assessment to be completed on day 3 post-stroke. The OSN should continue to partner with CIHI and MOHLTC in addressing these data gaps. In addition, the OSN should continue to advocate for inclusion of the AlphaFIM assessment in the provincial Discharge Abstract Database.

5 Inpatient Rehabilitation and Complex Continuing Care

EXHIBIT 5.1 Characteristics and outcomes of adult stroke patients in inpatient rehabilitation, in Ontario and by sex, 2003/04 and 2009/10–2011/12

Key Findings

- In Ontario, 3,472 stroke patients were admitted to inpatient rehabilitation in 2011/12.
- The proportion of women admitted to inpatient rehabilitation was consistently lower than men, with women comprising 47.2% of inpatient rehabilitation patients in 2011/12.
- Women were 7 years older than men at the time of admission to rehabilitation (77 vs. 70 median years) in 2011/12.
- Among those admitted to inpatient rehabilitation, there were more men than women in the 46–65 year age group (63.8% vs. 36.2%) and more women than men in the 76–85 year age group (53.7% vs. 46.3%). In the over-85 age group, there were twice as many women as men (66.9% vs. 33.1%).
- The median number of days from stroke onset to admission remained at 10 for 2010/11 and 2011/12, with no gender difference.
- Between 2010/11 and 2011/12, there was an increase in the proportion of severely disabled patients admitted to inpatient rehabilitation (from 31.6% to 33.8%), and a decline in the proportion of mildly disabled patients admitted (from 20.6% to 18.8%).
- There was little change in median admission FIM scores over time (76 in 2003/04 and 77 in 2011/12), but women were admitted with lower scores than men (75 vs. 78). The overall change in the FIM score was 21 median points and the FIM efficiency was 0.8 (median) in 2011/12, with no difference between men and women.

Group/Subgroup	2003/04		
Ontario	2,979	1,410	1,569
Age[1,2]	**All**	**Female**	**Male**
Mean	71.3	73.2	69.6
Median	74	76	72
Age Group (in Years), n (%)			
18–45	111 (3.7)	54 (48.6)	57 (51.4)
46–65	719 (24.1)	266 (37.0)	453 (63.0)
66–75	834 (28.0)	357 (42.8)	477 (57.2)
76–85	1,021 (34.3)	544 (53.3)	477 (46.7)
>85	294 (9.9)	189 (64.3)	105 (35.7)
Days from Onset to Admission			
Mean ± SD	20.6 ± 46.9	22.0 ± 62.0	19.3 ± 26.8
Median (IQR)	13 (7–22)	13 (7–22)	13 (7–23)
Disability, n (%)			
Mild[3]	678 (23.3)	312 (22.7)	366 (23.9)
Moderate[4]	1,178 (40.6)	548 (39.9)	630 (41.1)
Severe[5]	1,049 (36.1)	512 (37.3)	537 (35.0)
Admission FIM Score, mean (median)			
Total motor FIM score	49.3 (50)	47.9 (48)	50.5 (51)
Total cognitive FIM score	25.4 (27)	25.8 (28)	25.1 (27)
Total FIM score	74.7 (76)	73.7 (75)	75.6 (77)
Discharge FIM Score, mean (median)			
Total motor FIM score	69.6 (77)	68.5 (76)	70.5 (78)
Total cognitive FIM score	28.3 (30)	28.4 (30)	28.1 (30)
Total FIM score	97.8 (106)	96.9 (105)	98.7 (107)
Change in FIM Score from Admission to Discharge, mean (median)			
Total motor FIM score	19.4 (18)	19.6 (19)	19.2 (18)
Total cognitive FIM score	2.5 (1)	2.4 (1)	2.7 (2)
Total FIM score	21.9 (21)	22.0 (21)	21.8 (20)
Improvement in functional status[6], %	26.9	27.5	26.0
FIM efficiency[7] in inpatient rehabilitation, mean (median)	0.8 (0.6)	0.8 (0.6)	0.8 (0.6)

	2009/10			2010/11			2011/12		
	3,351	1,551	1,800	3,428	1,640	1,788	3,472	1,639	1,833
	All	Female	Male	All	Female	Male	All	Female	Male
	71.4	73.6	69.4	71.9	73.7	70.2	71.6	74.4	69.2
	74	77	71	74	77	72	74	77	70
	134 (4.0)	60 (44.8)	74 (55.2)	128 (3.7)	66 (51.6)	62 (48.4)	106 (3.1)	43 (40.6)	63 (59.4)
	911 (27.2)	324 (35.6)	587 (64.4)	876 (25.6)	331 (37.8)	545 (62.2)	979 (28.2)	354 (36.2)	625 (63.8)
	842 (25.1)	353 (41.9)	489 (58.1)	843 (24.6)	366 (43.4)	477 (56.6)	827 (23.8)	340 (41.1)	487 (58.9)
	1,017 (30.3)	530 (52.1)	487 (47.9)	1,127 (32.9)	586 (52.0)	541 (48.0)	1,076 (31.0)	578 (53.7)	498 (46.3)
	447 (13.3)	284 (63.5)	163 (36.5)	454 (13.2)	291 (64.1)	163 (35.9)	484 (13.9)	324 (66.9)	160 (33.1)
	18.5 ± 64.1	17.2 ± 21.6	19.7 ± 85.2	15.23 ± 20.45	14.9 ± 17.68	15.53 ± 22.7	16.4 ± 30.29	16.0 ± 33.9	16.7 ± 26.7
	11 (7–18)	12 (7–19)	11 (7–18)	10 (7–17)	10 (7–17)	10 (6–17)	10 (6–17)	10 (6–17)	10 (6–18)
	692 (20.9)	293 (19.1)	399 (22.4)	695 (20.6)	323 (20.0)	372 (21.1)	642 (18.8)	282 (17.5)	360 (20.0)
	1,541 (46.5)	709 (46.2)	832 (46.7)	1,615 (47.8)	766 (47.4)	849 (48.3)	1,620 (47.4)	770 (47.7)	850 (47.2)
	1,083 (32.7)	531 (34.6)	552 (31.0)	1,066 (31.6)	528 (32.7)	538 (30.6)	1,155 (33.8)	563 (34.9)	592 (32.9)
	50.1 (51)	48.6 (50)	51.5 (52)	50.9 (52)	49.8 (51)	52.2 (53)	49.6 (50)	48.1 (49)	51.0 (52)
	25.4 (27)	25.2 (26)	25.5 (27)	25.3 (26)	25.4 (26)	25.3 (26)	25.0 (26)	25.0 (26)	25.0 (26)
	75.6 (77)	73.8 (76)	77.1 (79)	76.4 (78)	75.2 (77)	77.3 (80)	74.6 (77)	73.1 (75)	75.9 (78)
	71.0 (77)	69.5 (76)	72.3 (79)	71.9 (78)	70.7 (77)	73.2 (79)	71.5 (78)	69.6 (76)	73.1 (80)
	28.3 (30)	28.1 (30)	28.5 (30)	28.4 (30)	28.3 (30)	28.4 (30)	28.1 (30)	28.0 (29)	28.2 (30)
	99.3 (107)	97.6 (105)	100.8 (108)	100.3 (107)	98.9 (106)	101.5 (109)	99.6 (107)	97.5 (105)	101.4 (109)
	19.9 (19)	19.8 (19)	20.0 (19)	19.9 (19)	19.9 (19)	19.6 (18)	19.9 (19)	19.7 (19)	20.1 (19)
	2.6 (2)	2.6 (1)	2.7 (2)	2.6 (2)	2.6 (2)	2.6 (2)	2.6 (2)	2.4 (2)	2.8 (2)
	22.5 (21)	22.4 (22)	22.6 (21)	22.1 (21)	22.4 (21)	22.6 (21)	22.5 (21)	22.1 (21)	22.9 (21)
	27.3	27.8	27.0	26.7	27.8	25.8	26.4	27.3	25.5
	0.9 (0.7)	0.9 (0.7)	0.9 (0.7)	0.9 (0.8)	0.9 (0.8)	0.9 (0.8)	0.9 (0.8)	0.9 (0.8)	0.9 (0.8)

EXHIBIT 5.1 *continued*

- Between 2010/11 and 2011/12, the median admission FIM score decreased from 77 to 75 for women and from 80 to 78 for men.
- The total length of stay in inpatient rehabilitation decreased from a median of 31 days in 2003/04 to 28 days in 2011/12. The proportion of total length of stay that was Alternate Level of Care declined from 6.6% in 2009/10 to 5.2% in 2011/12.
- In 2011/12, more men than women were discharged home without services (39.1% vs. 26.7%) and more women than men were discharged to long-term care (9.4% vs. 6.8%).

Group/Subgroup	2003/04			
Length of Stay	**All**	**Male**	**Female**	
Total length of stay[8] in days in inpatient rehabilitation, mean (median)	37.6 (31)	36.6 (30)	38.4 (32)	
Active length of stay[9] in days in inpatient rehabilitation, mean (median)	37.8 (32)	36.7 (31)	38.8 (33)	
Proportion of ALC[10] days to total length of stay in inpatient rehabilitation, %	-	-	-	
Discharge Destination Following Inpatient Rehabilitation, %				
Home without services	29.1	23.5	34.3	
Home with services	43.2	44.4	42.1	
Other community services	5.3	6.7	4.1	
Long-term care facility	13.5	15.5	11.6	
Acute care facility	5.8	6.2	5.4	
Deceased	0.8	1.3	0.3	
Unavailable/unknown	2.4	2.5	2.3	

	2009/10			2010/11			2011/12		
	All	Male	Female	All	Male	Female	All	Male	Female
	36.0 (30)	35.5 (30)	36.5 (30)	33.0 (28)	33.0 (28)	31.5 (27)	32.1 (28)	31.8 (28)	32.4 (28)
	34.2 (29)	34.2 (29)	34.3 (30)	31.4 (28)	31.2 (28)	31.6 (28)	31.4 (28)	31.1 (28)	31.7 (28)
	6.6	5.5	7.6	6.6	7.3	6.0	5.2	5.1	5.1
	29.6	25.5	33.1	31.9	27.9	35.7	33.2	26.7	39.1
	43.6	42.5	44.5	41.2	42.5	40.2	41.3	43.3	39.6
	6.2	8.4	4.2	7.4	9.1	6.1	7.5	10.7	4.6
	10.2	12.0	8.6	10.1	11.1	8.7	8.0	9.4	6.8
	8.1	9.4	7.0	7.6	7.3	7.9	8.0	8.0	8.0
	0.3	0.3	0.4	0.7	0.8	0.5	0.6	0.7	0.5
	2.1	1.9	2.3	1.1	1.3	1.0	1.3	1.2	1.4

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD) and the National Rehabilitation Reporting System (NRS), 2003/04–2010/11.

Inclusion criteria: All patients aged ≥18 years with a diagnosis of stroke (using ICD-10 codes) discharged from an acute care hospital who were admitted to inpatient rehabilitation and classified as Rehabilitation Client Group 1 (Stroke) in the NRS database in the same fiscal year.

1 Based on unique patients (i.e., does not include multiple patient-visits).

2 Based on stroke/TIA patients discharged from acute care hospitals in the CIHI–DAD in 2003/04 to 2009/10.

3 Mild disability includes Rehabilitation Patient Groups (RPGs) 1160 and 1150.

4 Moderate disability includes RPGs 1140, 1130 and 1120.

5 Severe disability includes RPGs 1110 and 1100.

6 Relative improvement in median total FIM score from admission to discharge.

7 FIM efficiency is the change in total FIM score divided by total length of stay; it provides information on the average amount of functional recovery per day of inpatient rehabilitation.

8 Length of stay (LOS) refers to the total time spent in inpatient rehabilitation and is calculated using the admission and discharge dates in the NRS database (LOS = discharge date – admission date).

9 Active LOS excludes days waiting for discharge from inpatient rehabilitation and service disruptions (e.g., short readmissions into acute care).

10 A patient is designated Alternate Level of Care (ALC) by a physician or his/her delegate when the patient is occupying a bed in a hospital and does not require the intensity of resources/services provided in the current care setting (acute, complex continuing care, mental health or rehabilitation). The ALC wait period starts at the time of designation and ends at the time of discharge/transfer to a discharge destination (or when the patient's needs or condition changes and the ALC designation no longer applies). The standardized provincial ALC definition was implemented across all acute care facilities in Ontario on July 1, 2009. The number of ALC days is calculated using the total length of stay and the active length of stay in the NRS database (ALC = total LOS – active LOS).

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) Cells in which there were no reported/available data are marked with a hyphen (-).

SD = standard deviation.

IQR = interquartile range (25th–75th percentile).

FIM = Functional Independence Measure.

EXHIBIT 5.1A Proportion of adult stroke patients in inpatient rehabilitation in Ontario, by age group and sex, 2011/12

Key Finding

- Among those in inpatient rehabilitation in 2011/12, a higher proportion of men were in the younger age groups (18–75 years) and a higher proportion of women were in the older age groups (76 years and older).

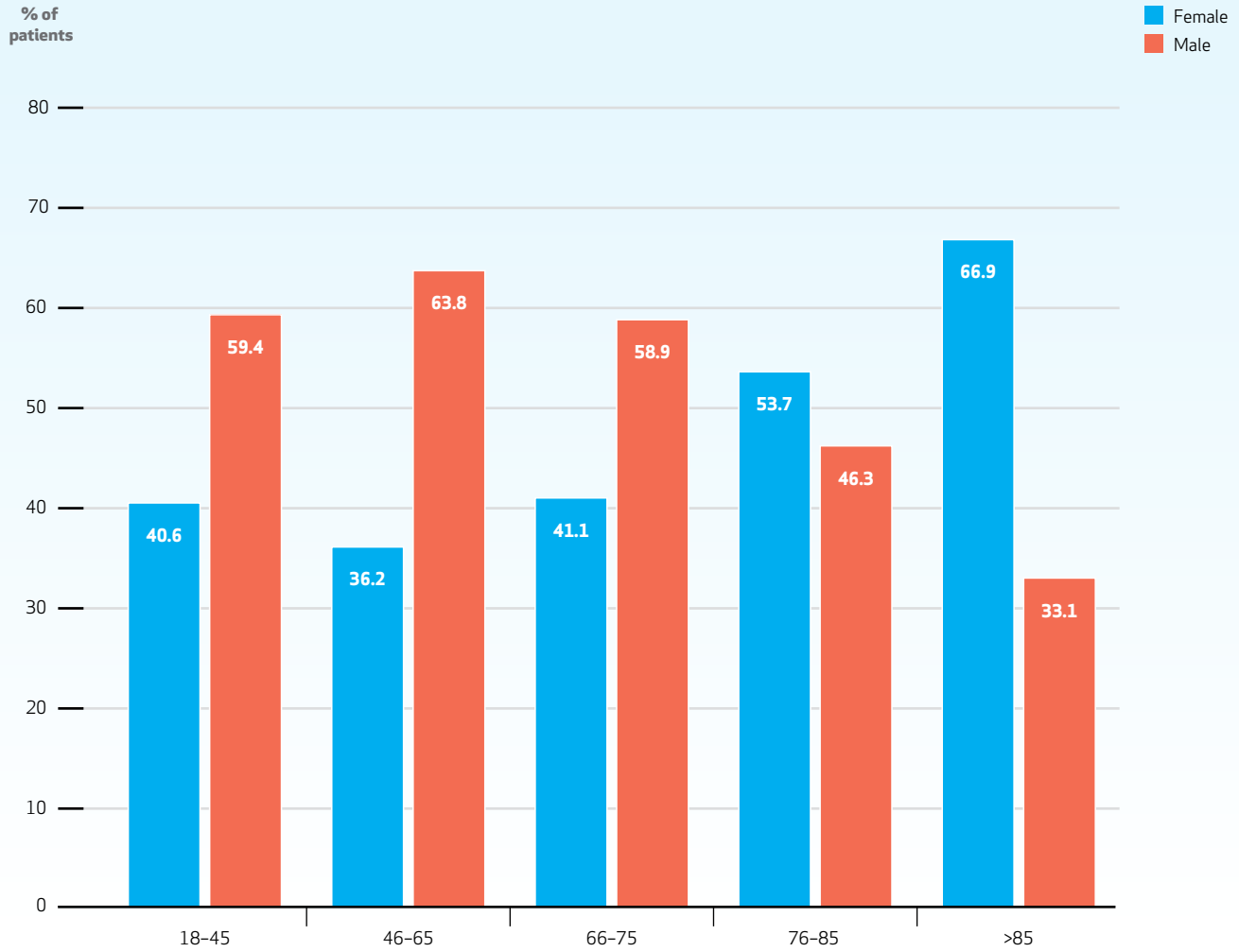


EXHIBIT 5.1B Discharge destinations of adult stroke patients following inpatient rehabilitation in Ontario, 2003/04 and 2009/10–2011/12

Key Findings

- The proportion of patients discharged to long-term care decreased from 13.5% in 2003/04 to 8.0% in 2011/12.
- The proportion of patients discharged to an acute care facility increased from 5.8% in 2003/04 to 8.0% in 2011/12.
- The proportion of patients discharged home without services following inpatient rehabilitation increased from 29.1% in 2003/04 to 33.2% in 2011/12.

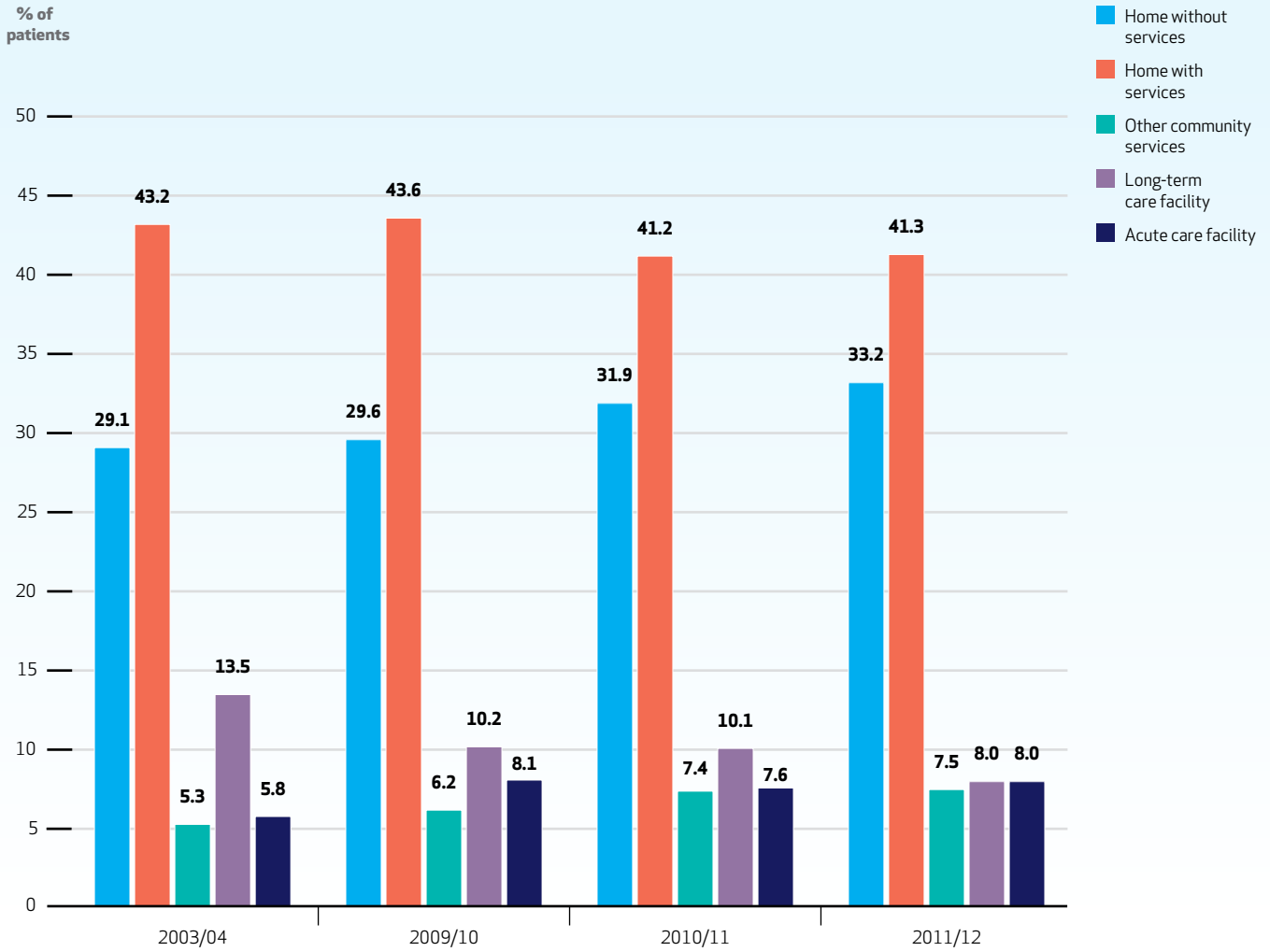


EXHIBIT 5.2 Characteristics and outcomes of adult stroke patients in inpatient rehabilitation, in Ontario and by facility type, 2003/04 and 2009/10–2011/12

Key Findings

- In 2011/12, there were a total of 62 rehabilitation facilities with designated rehabilitation beds, of which 16 were freestanding and 46 were non-freestanding facilities.[e]
- Almost half (48.0%) of the patients in non-freestanding facilities were over 75 years of age, compared to 39.2% of patients in freestanding facilities.
- In 2011/12, non-freestanding facilities had a higher proportion of severely disabled stroke patients than freestanding facilities (35.8% vs. 26.2%). Despite this, rehabilitation length of stay in non-freestanding facilities was shorter than in freestanding facilities (25 vs. 32 median days).
- Between 2003/04 and 2011/12, a 6-point increase in the total admission FIM score was observed in freestanding facilities (from a median of 74 to 80).
- For the years 2009/10 to 2011/12, the median admission and discharge FIM scores were higher for freestanding than non-freestanding facilities (80 vs. 76 and 109 vs. 105, respectively, in 2011/12) with lower FIM efficiency (0.8 vs. 1.0).
- Non-freestanding facilities discharged a higher proportion of patients to long-term care homes than freestanding facilities in 2011/12 (9.4% vs. 6.3%). This may reflect the higher prevalence of moderately disabled patients and the lower prevalence of severely disabled patients in freestanding facilities.

	2003/04		
Characteristic	**Ontario**	**Freestanding facility**[1]	**Non-freestanding facility**
Facilities, n	62	17	45
Patients[2]**, n**	3,021	1,311	1,710
Female, n (%)	1,452 (48.1)	628 (47.9)	824 (48.2)
Male, n (%)	1,569 (51.9)	683 (52.1)	886 (51.8)
Age Group (in Years), n (%)			
18–45	124 (4.1)	64 (4.9)	60 (3.5)
46–65	696 (23.0)	296 (22.6)	400 (23.4)
66–75	838 (27.7)	387 (29.5)	451 (26.4)
76–85	1,050 (34.8)	437 (33.3)	613 (35.8)
>85	313 (10.4)	127 (9.7)	186 (10.9)
Days from Onset to Admission			
Mean ± SD	30.6 ± 241.8	43.3 ± 362.3	20.9 ± 49.5
Median (IQR)	14 (8–26)	19 (12–33)	11 (7–21)
Days from Ready for Admission to Admission			
Mean ± SD	4.0 ± 8.0	5.7 ± 9.6	2.8 ± 6.1
Median (IQR)	1 (0–5)	3 (1–7)	0 (0–3)
Disability, n (%)			
Mild[3]	662 (21.9)	233 (17.8)	429 (25.1)
Moderate[4]	1,222 (40.5)	594 (45.3)	628 (36.7)
Severe[5]	1,137 (37.6)	484 (36.9)	653 (38.2)
Length of Stay[6] **(Days)**			
Mean ± SD	41.5 ± 30.6	48.8 ± 32.3	35.9 ± 27.9
Median (IQR)	35 (20–56)	43 (28–63)	28.5 (15–49)
Total Patient Days Past Trim Point			
Mean ± SD	27.1 ± 37.9	28.5 ± 40.0	23.7 ± 32.2
Median (IQR)	14 (6–31)	17 (6–31)	10.5 (5.5–28)
Admission Total FIM Score			
Mean ± SD	73.6 ± 24.7	73.3 ± 23.1	73.8 ± 25.9
Median (IQR)	75 (56–93)	74 (57–91)	75 (55–95)
Discharge Total FIM Score			
Mean ± SD	96.1 ± 25.2	96.5 ± 23.8	95.8 ± 26.2
Median (IQR)	105 (83–115)	104 (84–115)	105 (82–116)
FIM Efficiency[7]			
Mean ± SD	0.7 ± 0.9	0.6 ± 0.6	0.8 ± 1.1

e See **Appendix G**: Designated Rehabilitation Beds/Facilities by Ontario Stroke System Region, 2012

	2009/10			2010/11			2011/12		
	Ontario	Freestanding facility[1]	Non-freestanding facility	Ontario	Freestanding facility[1]	Non-freestanding facility	Ontario	Freestanding facility[1]	Non-freestanding facility
	64	16	48	62	15	47	62	16	46
	3,860	1,719	2,141	3,913	1,807	2,106	3,554	1,556	1,998
	1,777 (46.0)	784 (45.6)	993 (46.4)	1,853 (47.4)	860 (47.6)	993 (47.2)	1,693 (47.6)	728 (46.8)	965 (48.3)
	2,083 (54.0)	935 (54.4)	1,148 (53.6)	2,060 (52.6)	947 (52.4)	1,113 (52.8)	1,861 (52.4)	828 (53.2)	1,033 (51.7)
	163 (4.2)	86 (5.0)	77 (3.6)	164 (4.2)	86 (4.8)	78 (3.7)	127 (3.6)	77 (4.9)	50 (2.5)
	1,044 (27.0)	500 (29.1)	544 (25.4)	1,005 (25.7)	488 (27.0)	517 (24.5)	1014 (28.5)	504 (32.4)	510 (25.5)
	966 (25.0)	429 (25.0)	537 (25.1)	966 (24.7)	431 (23.9)	535 (25.4)	845 (23.8)	365 (23.5)	480 (24.0)
	1,190 (30.8)	502 (29.2)	688 (32.1)	1,272 (32.5)	580 (32.1)	692 (32.9)	1,079 (30.4)	436 (28.0)	643 (32.2)
	497 (12.9)	202 (11.8)	295 (13.8)	506 (12.9)	222 (12.3)	284 (13.5)	489 (13.8)	174 (11.2)	315 (15.8)
	23.1 ± 53.9	27.0 ± 62.7	20.0 ± 45.4	21.2 ± 72.0	25.7 ± 52.9	17.3 ± 84.9	21.9 ± 78.5	29.4 ± 110.9	16.1 ± 36.2
	12 (8–22)	15 (10–25)	11 (6–18)	11 (7–20)	14 (9–24)	9 (6–16)	11 (7–20)	13 (8–25)	9 (6–16)
	2.7 ± 5.5	3.7 ± 5.8	1.6 ± 4.9	2.7 ± 6.5	3.4 ± 5.9	1.8 ± 6.9	2.4 ± 5.8	3.4 ± 7.4	1.4 ± 3.5
	1 (0–3)	1 (1–5)	0 (0–1)	1 (0–3)	1 (1–4)	0 (0–1)	1 (0–3)	1 (1–4)	0 (0–1)
	761 (19.7)	324 (18.8)	437 (20.4)	737 (18.8)	345 (19.1)	392 (18.6)	675 (19.0)	291 (18.7)	384 (19.2)
	1,815 (47.0)	929 (54.0)	886 (41.4)	1,921 (49.1)	963 (53.3)	958 (45.5)	1,755 (49.4)	857 (55.1)	898 (44.9)
	1,284 (33.3)	466 (27.1)	818 (38.2)	1,255 (32.1)	499 (27.6)	756 (35.9)	1,124 (31.6)	408 (26.2)	716 (35.8)
	37.5 ± 28.6	39.9 ± 27.1	35.5 ± 29.6	34.7 ± 24.9	38.6 ± 25.2	31.4 ± 24.3	33.4 ± 22.9	36.9 ± 23.5	30.6 ± 22.0
	31.5 (19–48.5)	35 (23–50)	28 (16–45)	29 (18–43)	34 (23–46)	26 (14–41)	29 (17–43)	32 (22–45)	25 (14–41)
	41.9 ± 64.4	48.1 ± 77.0	37.9 ± 55.2	30.3 ± 29.6	29.3 ± 30.4	32.1 ± 28.8	24.4 ± 29.4	28.1 ± 33.3	19.6 ± 23.4
	19 (6–46)	19 (8–47)	18.5 (4–40.5)	18 (9–48)	17.5 (9–33)	20 (8–57)	15 (6–31)	16 (5–39)	12.5 (7–23.5)
	75.2 ± 23.4	78.5 ± 22.2	72.6 ± 24.0	75.7 ± 23.1	77.6 ± 22.2	74.1 ± 23.7	75.6 ± 23.5	78.4 ± 22.0	73.5 ± 24.4
	77 (59–93)	79 (64–95)	74 (54–91)	77 (59–93)	79 (63–95)	76 (56–92)	78 (59–94)	80 (63.5–95.5)	76 (55–92)
	99.1 ± 22.5	101.7 ± 20.2	96.9 ± 24.0	99.7 ± 21.8	101.3 ± 20.4	98.2 ± 22.8	99.2 ± 22.8	102.2 ± 20.4	96.8 ± 24.4
	107 (90–115)	108 (94–116)	105 (86–114)	107 (91–115)	108 (93–116)	106 (88–115)	107 (89–115)	109 (94–116)	105 (85.5–114.5)
	0.8 ± 0.8	0.7 ± 0.6	0.9 ± 0.9	0.8 ± 0.8	0.7 ± 0.6	1.0 ± 0.9	0.9 ± 0.9	0.8 ± 1.0	1.0 ± 0.9

EXHIBIT 5.2 *continued*

- The provincial decrease from 2003/03 to 2011/12 in the proportion of stroke patients being discharged to long-term care homes after inpatient rehabilitation may be a reflection of the overall change in the stroke inpatient rehabilitation population.
- Freestanding facilities had a higher prevalence of patients discharged to home without services, compared to non-freestanding facilities (45.4% vs. 21.9%).

Characteristic	2003/04			
	Ontario	Freestanding facility[1]	Non-freestanding facility	
Rehabilitation Discharge Destination, n (%)				
Home without services	685 (23.5)	366 (29.0)	319 (19.3)	
Home with services	1348 (46.3)	541 (42.8)	807 (48.9)	
Other community services	172 (5.9)	81 (6.4)	91 (5.5)	
Long-term care facility	436 (15)	201 (15.9)	235 (14.3)	
Acute care facility	212 (7.3)	61 (4.8)	151 (9.2)	
Deceased	12 (0.4)	5 (0.4)	7 (0.4)	
Missing/unavailable/unknown	47 (1.6)	8 (0.6)	39 (2.4)	

	2009/10			2010/11			2011/12		
	Ontario	Freestanding facility[1]	Non-freestanding facility	Ontario	Freestanding facility[1]	Non-freestanding facility	Ontario	Freestanding facility[1]	Non-freestanding facility
	1063 (28.6)	694 (41.8)	369 (18.0)	1149 (30.4)	740 (42.1)	409 (20.2)	1108 (32.2)	688 (45.4)	420 (21.9)
	1655 (44.6)	590 (35.6)	1065 (51.8)	1613 (42.7)	605 (34.4)	1008 (49.9)	1475 (42.9)	526 (34.7)	949 (49.4)
	230 (6.2)	82 (4.9)	148 (7.2)	282 (7.5)	119 (6.8)	163 (8.1)	257 (7.5)	106 (7.0)	151 (7.9)
	398 (10.7)	171 (10.3)	227 (11.0)	403 (10.7)	186 (10.6)	217 (10.7)	277 (8.1)	96 (6.3)	181 (9.4)
	344 (9.3)	119 (7.2)	225 (10.9)	309 (8.2)	103 (5.9)	206 (10.2)	296 (8.6)	96 (6.3)	200 (10.4)
	-	-	-	-	-	-	-	-	-
	24 (0.6)	**	21 (1.0)	25 (0.7)	6 (0.3)	19 (0.9)	23 (0.7)	**	19 (1.0)

Data source: Canadian Institute for Health Information, National Rehabilitation Reporting System (NRS), 2003/04–2010/11.

Inclusion criteria: All patients aged ≥18 years admitted to inpatient rehabilitation and classified as Rehabilitation Client Group 1 (Stroke) in the NRS database.

Exclusion criteria: Patients discharged from one facility and admitted to another within 24 hours (N = 123 in 2003/04, 110 in 2009/10, 73 in 2010/11 and 86 in 2011/12).

1 Freestanding Rehab Centre – A geographic site that is physically separated from an affiliated acute care hospital and does not have on-site access to acute medical care services.

2 Based on unique patients (i.e., does not include multiple patient-visits).

3 Mild disability includes Rehabilitation Patient Groups (RPGs) 1160 and 1150.

4 Moderate disability includes RPGs 1140, 1130 and 1120.

5 Severe disability includes RPGs 1110 and 1100.

6 Length of stay (LOS) refers to the total time spent in inpatient rehabilitation and is calculated using the admission and discharge dates in the NRS database (LOS = discharge date – admission date).

7 FIM efficiency is the change in total FIM rating divided by total length of stay; it provides information on the average amount of functional recovery per day of inpatient rehabilitation.

** Cell value suppressed for reasons of privacy and confidentiality.

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) Cells in which there were no reported/available data are marked with a hyphen (-).

SD = standard deviation.

IQR = interquartile range (25th–75th percentile).

FIM = Functional Independence Measure.

EXHIBIT 5.2A Median time from stroke onset to admission for adult stroke patients in inpatient rehabilitation, in Ontario and by facility type, 2003/04 and 2009/10–2011/12

Key Findings

- Provincially, the median time from stroke onset to inpatient rehabilitation admission decreased by 3 days since 2003/04, from a median of 14 days to 11 days in 2011/12.
- In 2011/12, the time to admission was shorter for non-freestanding facilities than for freestanding facilities (9 vs. 13 median days).

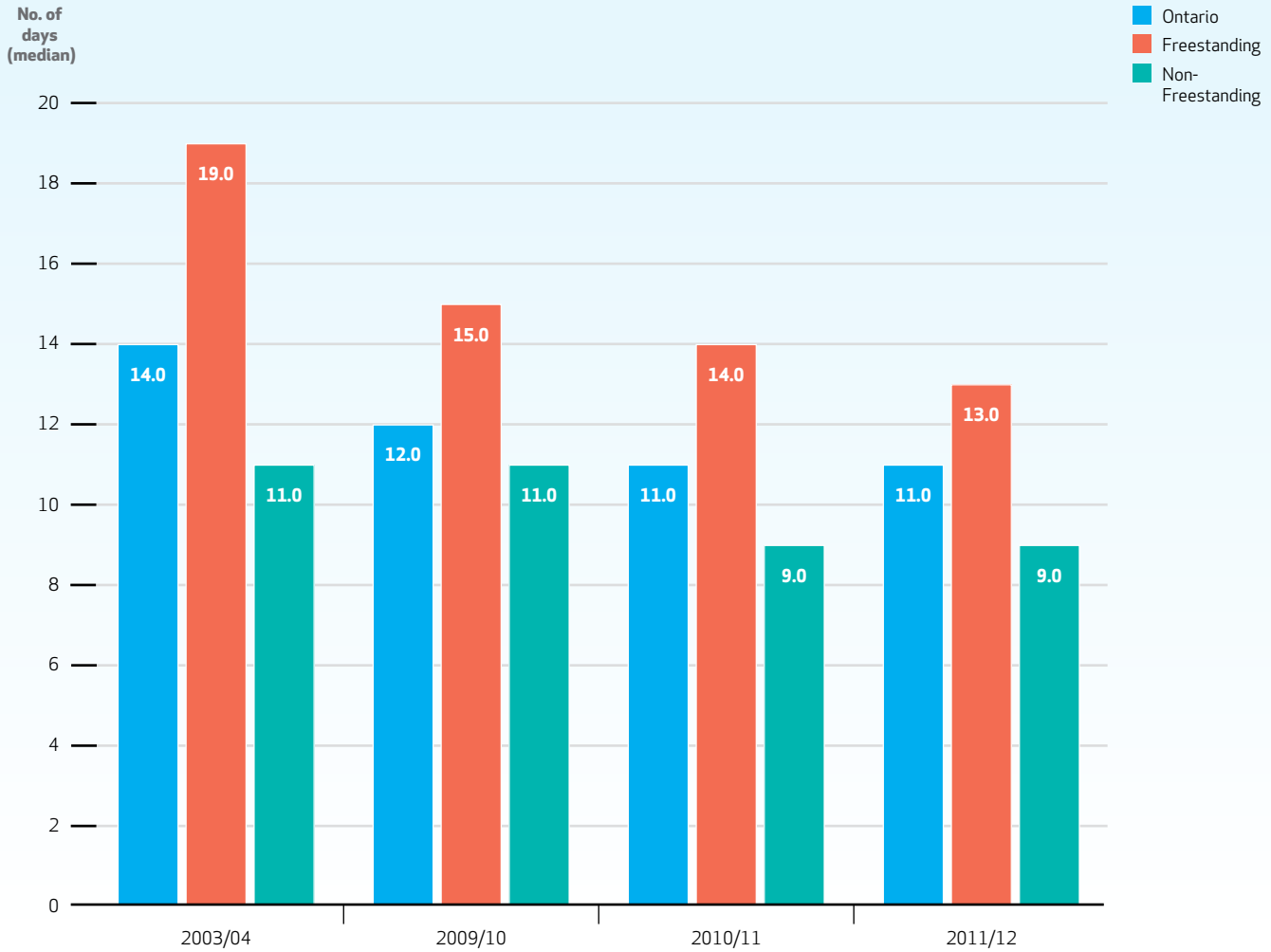


EXHIBIT 5.2B Median length of stay for adult stroke patients in inpatient rehabilitation, in Ontario and by facility type, 2003/04 and 2009/10–2011/12

Key Findings

- Provincially, the median length of stay decreased from 35 days in 2003/04 to 29 days in 2011/12.
- Among the freestanding facilities, an 11-day decrease in median length of stay was observed between 2003/04 and 20011/12.

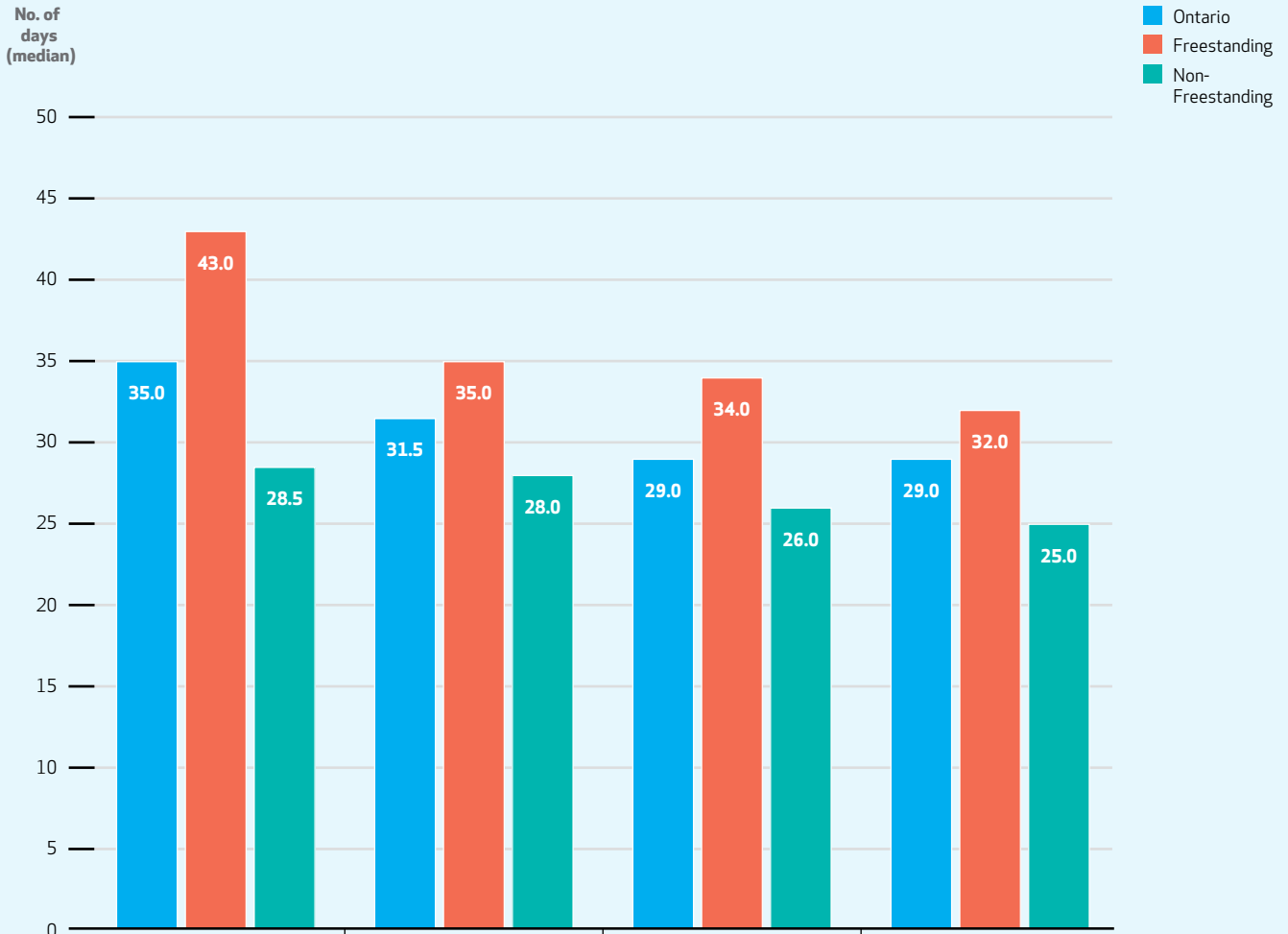


EXHIBIT 5.2C Proportion of adult stroke patients in inpatient rehabilitation with mild disability, in Ontario and by facility type, 2003/04 and 2009/10–2011/12

Key Findings

- From 2003/04 to 2011/12, there was a decrease in the proportion of severely disabled stroke patients admitted to freestanding facilities (from 36.9% to 26.2%), and an increase in the proportion of moderately disabled stroke patients admitted (from 45.3% to 55.1%).
- A similar trend was observed among non-freestanding facilities but was less dramatic: a decrease from 38.2% to 35.8% for severely disabled patients, and an increase from 36.7% to 44.9% for moderately disabled patients.
- The non-freestanding facilities dramatically reduced the proportion of mildly disabled patients admitted, from 25.1% in 2003/04 to 19.2% in 2011/12.

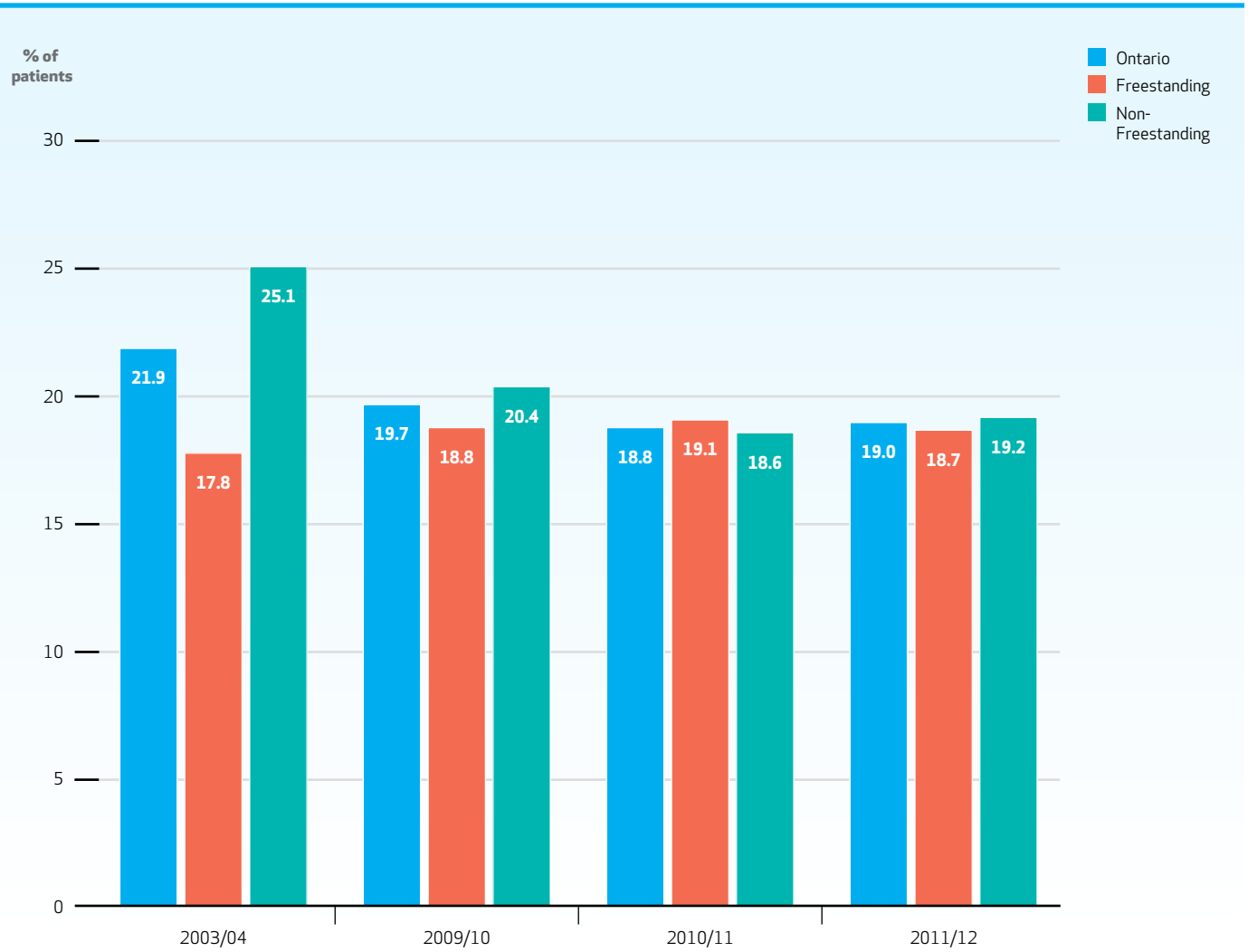


EXHIBIT 5.2D Proportion of adult stroke patients in inpatient rehabilitation with moderate disability, in Ontario and by facility type, 2003/04 and 2009/10–2011/12

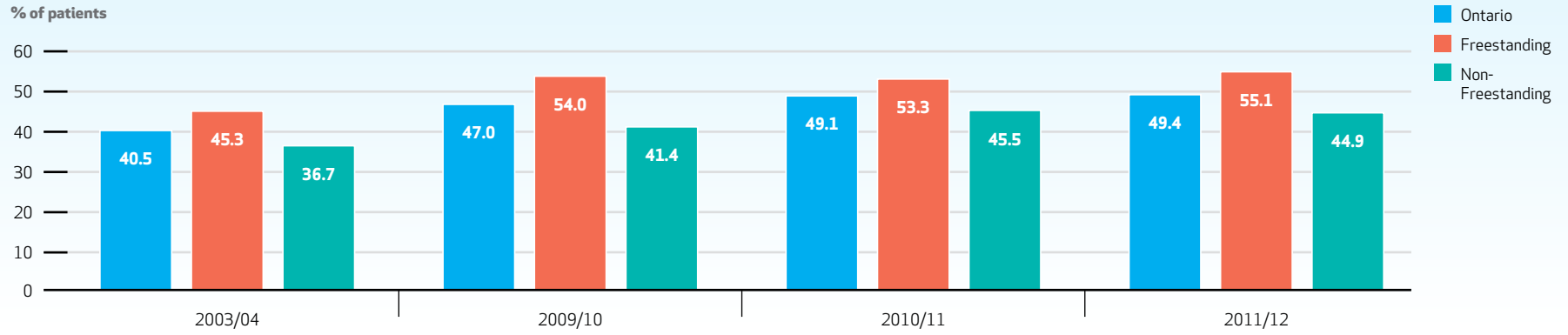
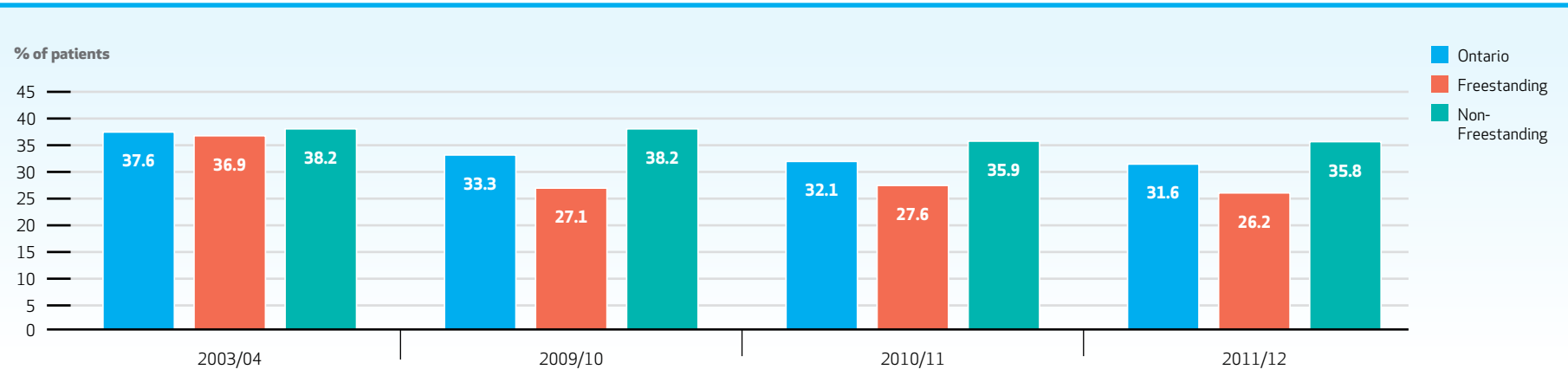


EXHIBIT 5.2E Proportion of adult stroke patients in inpatient rehabilitation with severe disability, in Ontario and by facility type, 2003/04 and 2009/10–2011/12



Inpatient Rehabilitation

CONCLUSIONS

There have been several positive trends over the past few years:

- A decrease in the time from stroke onset to inpatient rehabilitation from a median of 13 days in 2003/04 to 10 days in 2011/12;
- A decrease in total length of stay from a median of 31 days in 2003/04 to 28 days in 2011/12; and
- An improvement in the median FIM efficiency score of 0.2 points (*see* **Appendix F**).

Much of this has been achieved by increasing the proportion of moderately disabled stroke patients receiving inpatient rehabilitation over time. There should be continued focus on severely disabled stroke patients receiving inpatient rehabilitation because although there has been an increase in the past year, from 31.7% in 2010/11 to 33.8% in 2011/12, the current rate is lower than it was in 2003/04 (36.1%).

Gender differences in access to inpatient rehabilitation are apparent among the younger age groups (less than 76 years of age), with a greater proportion of men receiving inpatient rehabilitation. This may reflect gender differences in the age at which stroke occurs and in stroke severity, or a bias in admission; further investigation is needed.

Although the proportion of rehabilitation patients being discharged to acute care has remained fairly stable for the past three years, this indicator should continue to be monitored in order to assess compliance with the Stroke-QBP expert panel recommendation that stroke patients be discharged on day 5 for ischemic stroke and on day 8 for hemorrhagic stroke.[3]

The increase in access to inpatient rehabilitation has been a result of freestanding facilities increasing the proportion of moderately disabled patients admitted, minimally changing the proportion of mildly disabled patients admitted, and reducing the proportion of severely disabled patients admitted. Non-freestanding inpatient rehabilitation facilities see a higher proportion of severely disabled patients and have shorter lengths of stay. Non-freestanding facilities discharge a higher proportion of patients from rehabilitation to acute and long-term care and discharge a lower proportion home without services compared to the freestanding rehabilitation facilities.

There has been an increase in the proportion of patients being discharged back to acute care, and this will need to be monitored as the Stroke-QBP funding is implemented in the next fiscal year.

RECOMMENDATIONS

1. The OSN should continue to monitor the time to access inpatient rehabilitation and the rate of discharge to acute care while recommendations made in the Stroke – Quality Based Procedure (QBP) funding initiative are implemented across the hospitals.

2. The OSN should consider further examination of gender differences in access to inpatient rehabilitation to better understand the reasons for the lower proportion of women under the age of 76 receiving rehabilitation.

3. Further work is needed to continue to develop outpatient resources, as mildly disabled stroke patients could receive rehabilitation on an outpatient basis if services were available.

EXHIBIT 5.3 Characteristics and outcomes of adult stroke patients[1] in inpatient rehabilitation, in Ontario and by Local Health Integration Network, 2003/04 and 2009/10–2011/12

Key Findings

- Admission to inpatient rehabilitation remained stable from 2009/10 to 2011/12, at approximately 31.5%.
- The time from stroke onset to admission declined but remained high at a median of 10 days (16.5 mean) overall in 2011/12.
- There was wide variation across LHINs in time from stroke onset to inpatient rehabilitation admission and in mean FIM efficiency scores in 2010/11. The Central West LHIN had the lowest FIM efficiency (0.5) and the North Simcoe Muskoka LHIN had the highest (1.0).
- Rehabilitation LOS decreased across most LHINs in 2011/12 compared to previous years. There was little gender difference in inpatient LOS.
- Provincially, 74.5% of patients were discharged home with or without services from inpatient rehabilitation in 2011/12.

Characteristics and Outcomes for 2003/04		Ontario	Erie St. Clair	South West	Waterloo Wellington	
Patients Discharged Alive from Acute Care in 2003/04, n		10,566	814	906	505	
Admission to inpatient rehabilitation[1], n (%)	All	2,932 (27.7)	305 (37.5)	256 (28.3)	116 (23.0)	
	Female	1,389 (26.2)	160 (36.1)	110 (25.3)	56 (20.3)	
	Male	1,543 (29.3)	145 (39.1)	146 (30.9)	60 (26.2)	
Days from stroke onset to inpatient rehabilitation admission, mean (median)	All	20.7 (13)	13.8 (8)	26.9 (13)	27.1 (13)	
	Female	22.1 (13)	12.2 (8)	37.7 (14)	32.5 (12)	
	Male	19.4 (13)	15.5 (8)	18.6 (13)	22.2 (15.5)	
Disability, n (%)	Mild	663 (23.1)	69 (26.5)	54 (21.3)	38 (33.6)	
	Moderate	1,166 (40.7)	80 (30.8)	95 (37.4)	47 (41.6)	
	Severe	1,035 (36.1)	111 (42.7)	105 (41.3)	28 (24.8)	
Functional Independence Measure score, mean (median)	Admission FIM score	74.7 (76)	70.3 (72.5)	74.6 (76.5)	82.6 (84)	
	Discharge FIM score	97.9 (106)	89.0 (99)	95.3 (106)	103.6 (107)	
	Change in FIM score	22.0 (21)	17.9 (16)	19.9 (17)	20.7 (20)	
	FIM efficiency[2]	0.8 (0.6)	1.0 (0.7)	0.6 (0.5)	1.0 (0.5)	
	Relative change (%)	36.0 (27.0)	30.0 (20.5)	33.2 (24.1)	29.5 (23.0)	
Discharge destination following inpatient rehabilitation, n (%)	Home without services	756 (29.2)	38 (17.2)	73 (30.7)	18 (16.8)	
	Home with services	1,121 (43.2)	105 (47.5)	93 (39.1)	55 (51.4)	
	Other community services	136 (5.2)	11 (5.0)	7 (2.9)	11 (10.3)	
	Long-term care facility	349 (13.5)	37 (16.7)	47 (19.7)	12 (11.2)	
	Acute care hospital	149 (5.7)	13 (5.9)	10 (4.2)	6 (5.6)	
Average length of stay[3] in days, mean (median)	All	37.9 (31)	24.4 (15)	42.1 (33)	43.8 (29.5)	
	Female	37.0 (30.5)	22.7 (14)	37.4 (27)	39.5 (26)	
	Male	38.7 (32)	26.2 (17)	45.7 (37)	47.8 (30.5)	
Characteristics and Outcomes by Stroke Type – Ischemic, n		2,575	272	221	106	
Days from stroke onset to inpatient rehabilitation admission by stroke type, mean (median)	All	19.8 (12)	12.5 (8)	25.2 (13)	26.7 (13)	
	Female	21.0 (12)	10.7 (8)	35.0 (13)	32.7 (10.5)	
	Male	18.7 (12)	14.5 (8)	17.7 (13)	21.3 (13)	
Average length of stay[3] in days by stroke type, mean (median)	All	37.4 (31)	23.6 (14)	41.0 (32)	42.0 (26.5)	
	Female	36.7 (30)	22.1 (13)	35.6 (27)	39.2 (22)	
	Male	38.1 (32)	25.2 (15)	45.0 (37)	44.6 (29)	
Characteristics and Outcomes by Stroke Type – Hemorrhagic, n		356	33	35	10	
Days from stroke onset to inpatient rehabilitation admission by stroke type, mean (median)	All	26.9 (19)	24.3 (18)	37.4 (26)	31.2 (25.5)	
	Female	29.3 (19)	23.7 (18)	54.5 (26)	30.4 (26)	
	Male	24.6 (19)	25.0 (18.5)	24.6 (26)	32.0 (25)	
Average length of stay[3] in days by stroke type, mean (median)	All	41.2 (34)	30.4 (27)	49.6 (43)	62.1 (47)	
	Female	38.9 (34)	26.7 (18)	48.7 (43)	42.6 (30)	
	Male	43.6 (34)	35.3 (32)	50.3 (41.5)	81.6 (101)	

	Hamilton Niagara Haldimand Brant	Central West	Mississauga Halton	Toronto Central	Central	Central East	South East	Champlain	North Simcoe Muskoka	North East	North West
	1,329	509	677	987	1,019	1,262	447	831	420	646	215
	400 (30.1)	118 (23.2)	245 (36.2)	276 (28.0)	303 (29.7)	274 (21.7)	127 (28.4)	258 (31.0)	118 (28.1)	105 (16.3)	31 (14.4)
	199 (29.2)	52 (20.5)	118 (35.9)	131 (26.8)	143 (27.6)	113 (17.9)	72 (32.9)	112 (27.3)	62 (32.1)	50 (16.0)	11 (10.1)
	201 (31.1)	66 (25.9)	127 (36.5)	145 (29.1)	160 (31.9)	161 (25.6)	55 (24.1)	146 (34.8)	56 (24.7)	55 (16.5)	20 (18.9)
	22.8 (13)	16.2 (13)	11.8 (8)	20.3 (15)	21.3 (15)	15.7 (10)	31.5 (15)	27.3 (19)	14.7 (8.5)	20.8 (15)	36.2 (28)
	26.8 (12.5)	16.9 (13)	11.0 (8)	18.1 (15)	23.0 (15)	15.9 (11)	29.4 (15)	29.4 (19)	13.4 (8.5)	20.9 (15.5)	43.6 (42)
	18.8 (13)	15.6 (13)	12.5 (8)	22.3 (17)	19.9 (14)	15.5 (10)	34.3 (16)	25.7 (19)	16.1 (8.5)	20.8 (15)	32.2 (22.5)
	81 (20.4)	33 (28.0)	56 (23.1)	73 (26.7)	76 (25.4)	70 (25.7)	15 (12.0)	50 (19.4)	23 (19.7)	19 (18.1)	6 (20.0)
	179 (45.0)	49 (41.5)	83 (34.3)	131 (48.0)	128 (42.8)	107 (39.3)	63 (50.4)	105 (40.7)	39 (33.3)	50 (47.6)	10 (33.3)
	138 (34.7)	36 (30.5)	103 (42.6)	69 (25.3)	95 (31.8)	95 (34.9)	47 (37.6)	103 (39.9)	55 (47.0)	36 (34.3)	14 (46.7)
	74.4 (74)	79.8 (80.5)	69.8 (70.5)	79.2 (80)	77.3 (79)	75.0 (78)	74.1 (73)	73.3 (73)	68.0 (67)	75.1 (78)	73.5 (78)
	97.2 (102)	105.8 (112)	95.0 (102.5)	103.0 (110)	101.2 (107.5)	101.5 (111)	97.8 (106)	98.1 (107.5)	91.5 (108)	96.6 (106)	97.6 (110)
	22.3 (21.5)	23.6 (21)	24.1 (23)	22.3 (21)	22.5 (22)	24.6 (22)	23.5 (22)	23.0 (21.5)	22.5 (24)	19.0 (16)	20.2 (18)
	0.8 (0.7)	0.8 (0.7)	1.2 (0.9)	0.7 (0.6)	0.8 (0.7)	0.9 (0.7)	0.6 (0.5)	0.5 (0.4)	1.0 (0.9)	0.5 (0.4)	0.4 (0.4)
	37.0 (27.9)	35.4 (25.0)	44.7 (31.0)	33.3 (25.0)	33.9 (27.5)	44.7 (28.0)	34.3 (29.7)	37.2 (29.5)	37.0 (29.7)	33.0 (19.4)	30.9 (23.9)
	112 (32.8)	41 (37.3)	75 (33.5)	94 (39.3)	89 (31.6)	58 (23.0)	26 (22.6)	74 (32.2)	20 (18.3)	31 (29.8)	7 (33.3)
	136 (39.9)	48 (43.6)	108 (48.2)	81 (33.9)	125 (44.3)	127 (50.4)	59 (51.3)	89 (38.7)	44 (40.4)	38 (36.5)	13 (61.9)
	22 (6.5)	**	7 (3.1)	16 (6.7)	16 (5.7)	11 (4.4)	**	18 (7.8)	7 (6.4)	**	-
	50 (14.7)	12 (10.9)	27 (12.1)	31 (13.0)	37 (13.1)	27 (10.7)	17 (14.8)	31 (13.5)	6 (5.5)	15 (14.4)	-
	15 (4.4)	6 (5.5)	6 (2.7)	11 (4.6)	13 (4.6)	17 (6.7)	7 (6.1)	16 (7.0)	13 (11.9)	15 (14.4)	**
	34.3 (29)	37.4 (35)	29.9 (24)	39.6 (36)	34.6 (31)	40.7 (33)	51.0 (41)	54.1 (56)	25.6 (22)	41.9 (35)	70.5 (68)
	34.1 (30)	41.5 (38)	31.3 (26)	42.2 (39)	35.7 (34)	37.1 (30)	50.4 (36)	54.1 (57.5)	28.4 (22)	37.8 (30)	61.2 (72)
	34.7 (28.5)	34.2 (30)	28.6 (21)	36.8 (34)	33.6 (30)	42.4 (34)	51.7 (46)	54.1 (56)	22.7 (21)	45.6 (42)	78.3 (69)
	354	101	212	240	268	241	120	215	103	93	29
	22.1 (12)	15.2 (12)	10.9 (8)	20.4 (15)	19.9 (14)	14.5 (10)	30.2 (15)	27.0 (19)	14.3 (8)	19.8 (15)	35.1 (28)
	26.8 (12)	15.9 (12)	9.8 (7)	17.9 (14)	20.8 (15)	13.7 (10)	27.6 (15)	29.2 (19)	13.9 (9)	18.9 (15)	43.6 (42)
	17.6 (12)	14.7 (12)	11.8 (8)	22.7 (17)	19.2 (13)	15.1 (10)	33.5 (16)	25.4 (18)	14.7 (8)	20.6 (13.5)	29.9 (22.5)
	33.3 (29)	37.3 (36)	30.0 (24)	38.6 (36)	35.3 (32)	39.9 (33)	51.1 (39)	55.3 (57)	26.2 (22)	41.8 (35)	65.4 (66.5)
	33.6 (30)	41.0 (38)	32.1 (26)	40.5 (38.5)	36.5 (34)	36.2 (30)	49.9 (34.5)	55.9 (58)	29.1 (23)	36.6 (29)	61.2 (72)
	33.0 (27)	34.2 (30)	28.2 (21.5)	37.0 (35)	34.2 (30)	42.2 (34)	52.6 (46)	54.8 (56)	23.1 (21)	46.3 (42)	68.4 (65)
	46	17	33	36	35	32	7	43	15	12	**
	27.5 (16.5)	22.1 (16)	18.0 (9)	19.3 (18.5)	32.3 (18)	24.2 (14)	53.9 (54)	28.9 (26)	17.8 (9)	28.5 (27)	52.0 (52)
	26.8 (15.5)	25.3 (22.5)	18.5 (11)	19.5 (18)	36.0 (21)	29.4 (16.5)	58.3 (42.5)	30.3 (24.5)	10.5 (4.5)	32.7 (31)	-
	28.4 (21)	20.3 (15)	17.4 (7.5)	19.2 (19)	26.8 (18)	19.0 (10)	48.0 (55)	27.7 (26)	26.1 (22)	22.6 (25)	52.0 (52)
	42.5 (39.5)	38.0 (31)	28.6 (22.5)	45.1 (35)	29.4 (26)	46.9 (36.5)	49.3 (52)	48.6 (50)	21.8 (15)	42.5 (37)	131.5 (131.5)
	37.4 (33.5)	44.5 (45)	25.7 (23)	52.2 (39)	30.9 (31)	41.9 (36.5)	59.0 (56)	46.1 (45)	23.9 (15)	44.7 (49)	-
	49.3 (44.5)	34.1 (23.5)	31.5 (20)	38.8 (34)	27.0 (22)	51.9 (38.5)	36.3 (37)	50.8 (55)	19.0 (19)	39.4 (32)	131.5 (131.5)

EXHIBIT 5.3 *continued*

- Over time there was an increase in the proportion of patients being discharged back to acute care (from 5.7% in 2003/04 to 8.0% in 2011/12) and a decrease in the proportion discharged to long-term care (from 13.5% in 2003/04 to 8.0% in 2011/12). Rates of discharge to long-term care in 2011/12 varied from 4.0% in the Champlain LHIN to 16.5% in the Erie St. Clair LHIN.

- For ischemic stroke patients, the Central West and Champlain LHINs had the longest wait times for inpatient rehabilitation (13 median days), compared to 8 days for the Central East and North Simcoe Muskoka LHINs.

- Hemorrhagic stroke patients in the South East LHIN had a median wait time of 28 days from stroke onset to admission to inpatient rehabilitation, whereas patients in the Hamilton Niagara Haldimand Brant, Mississauga Halton, Toronto Central and Central LHINs were admitted in half the time (approximately 13 days).

Characteristics and Outcomes for 2009/10		Ontario	Erie St. Clair	South West	Waterloo Wellington	
Patients Discharged Alive from Acute Care in 2009/10, n		**10,591**	**726**	**900**	**536**	
Admission to inpatient rehabilitation[1], n (%)	All	3,285 (31.0)	267 (36.8)	271 (30.1)	163 (30.4)	
	Female	1,515 (28.8)	114 (33.1)	131 (28.5)	83 (29.4)	
	Male	1,770 (33.2)	153 (40.1)	140 (31.8)	80 (31.5)	
Days from stroke onset to inpatient rehabilitation admission, mean (median)	All	18.6 (11)	14.4 (10)	17.3 (10)	16.8 (11)	
	Female	17.3 (12)	14.2 (11)	18.8 (10)	17.5 (11)	
	Male	19.8 (11)	14.5 (10)	15.9 (10)	16.0 (11)	
Disability, n (%)	Mild	674 (20.7)	47 (18.8)	54 (20.0)	38 (23.5)	
	Moderate	1,513 (46.6)	118 (47.2)	110 (40.7)	79 (48.8)	
	Severe	1,063 (32.7)	85 (34.0)	106 (39.3)	45 (27.8)	
Functional Independence Measure score, mean (median)	Admission FIM score	74.6 (76)	70.3 (72.5)	74.6 (76.5)	82.6 (84)	
	Discharge FIM score	99.3 (107)	94.9 (103)	99.9 (109)	99.6 (106.5)	
	Change in FIM score	22.6 (22)	20.3 (20)	23.8 (21)	20.2 (20)	
	FIM efficiency[2]	0.8 (0.7)	0.9 (0.7)	0.9 (0.8)	0.7 (0.7)	
	Relative change (%)	35.7 (27.3)	32.6 (27.2)	37.2 (28.7)	29.1 (23.1)	
Discharge destination following inpatient rehabilitation, n (%)	Home without services	909 (29.8)	40 (16.7)	129 (50.6)	24 (15.5)	
	Home with services	1,327 (43.4)	110 (45.8)	62 (24.3)	86 (55.5)	
	Other community services	186 (6.1)	20 (8.3)	16 (6.3)	15 (9.7)	
	Long-term care facility	312 (10.2)	28 (11.7)	27 (10.6)	16 (10.3)	
	Acute care hospital	247 (8.1)	14 (5.8)	20 (7.8)	12 (7.7)	
Average length of stay[3] in days, mean (median)	All	36.1 (30)	29.3 (24)	34.1 (30)	35.6 (30)	
	Female	35.7 (30)	27.4 (22)	31.1 (27)	35.8 (32)	
	Male	36.5 (30)	30.6 (27)	37.0 (33)	35.4 (28)	
Characteristics and Outcomes by Stroke Type – Ischemic, n		**2,866**	**234**	**229**	**146**	
Days from stroke onset to inpatient rehabilitation admission by stroke type, mean (median)	All	17.8 (11)	13.2 (9.5)	16.8 (9)	16.1 (11)	
	Female	16.3 (11)	13.5 (9.5)	18.2 (9)	17.4 (11)	
	Male	19.1 (10.5)	13.0 (9.5)	15.5 (9)	14.8 (9.5)	
Average length of stay[3] in days by stroke type, mean (median)	All	35.5 (30)	27.7 (23)	33.1 (30)	34.8 (30.5)	
	Female	35.5 (30)	26.1 (22)	31.2 (28)	36.5 (33)	
	Male	35.5 (29)	28.9 (24)	34.8 (30.5)	32.9 (28)	
Characteristics and Outcomes by Stroke Type – Hemorrhagic, n		**419**	**33**	**42**	**17**	
Days from stroke onset to inpatient rehabilitation admission by stroke type, mean (median)	All	24.2 (17)	22.3 (18.5)	20.5 (16)	22.4 (14)	
	Female	23.2 (17)	19.6 (18.5)	22.1 (15.5)	18.6 (13.5)	
	Male	25.2 (17)	24.5 (18.5)	18.7 (16.5)	25.8 (16)	
Average length of stay[3] in days by stroke type, mean (median)	All	40.7 (33)	40.4 (34)	39.6 (32)	42.9 (29)	
	Female	37.5 (29)	36.3 (26)	30.1 (21.5)	29.1 (22.5)	
	Male	43.8 (36)	43.7 (36)	50.1 (44)	55.1 (64)	

	Hamilton Niagara Haldimand Brant	Central West	Mississauga Halton	Toronto Central	Central	Central East	South East	Champlain	North Simcoe Muskoka	North East	North West
	1,289	**551**	**709**	**915**	**1,125**	**1,200**	**437**	**847**	**415**	**647**	**294**
	380 (29.5)	141 (25.6)	248 (35.0)	264 (28.9)	333 (29.6)	397 (33.1)	124 (28.4)	263 (31.1)	136 (32.8)	187 (28.9)	111 (37.8)
	173 (26.6)	50 (20.1)	114 (33.4)	125 (26.8)	152 (26.8)	186 (30.3)	51 (23.4)	135 (30.7)	64 (31.7)	80 (26.8)	57 (43.2)
	207 (32.4)	91 (30.1)	134 (36.4)	139 (31.0)	181 (32.5)	211 (36.0)	73 (33.3)	128 (31.4)	72 (33.8)	107 (30.7)	54 (33.3)
	28.8 (11)	22.4 (14)	13.1 (8)	17.2 (12)	16.5 (12)	13.7 (9)	20.0 (12)	25.24 (15)	16.5 (12)	20.3 (12)	16.9 (13)
	17.2 (12)	16.5 (12)	15.1 (8.5)	17.3 (13)	15.5 (13)	14.7 (11)	18.0 (13)	24.96 (15)	18.0 (11.5)	17.4 (12)	17.3 (14)
	38.5 (11)	25.6 (15)	11.3 (8)	17.2 (11)	17.3 (11)	12.8 (9)	21.4 (12)	25.54 (16)	15.2 (12.5)	22.5 (12)	16.5 (13)
	50 (13.2)	31 (22.0)	49 (19.9)	55 (21.1)	87 (26.6)	90 (22.7)	18 (14.5)	57 (21.8)	34 (25.4)	45 (24.1)	19 (17.3)
	191 (50.3)	72 (51.1)	97 (39.4)	152 (58.2)	141 (43.1)	180 (45.5)	69 (55.6)	131 (50.0)	52 (38.8)	70 (37.4)	51 (46.4)
	139 (36.6)	38 (27.0)	100 (40.7)	54 (20.7)	99 (30.3)	126 (31.8)	37 (29.8)	74 (28.2)	48 (35.8)	72 (38.5)	40 (36.4)
	74.4 (74)	79.8 (80.5)	69.8 (70.5)	79.2 (80)	77.3 (79)	74.9 (78)	74.1 (73)	73.3 (73)	68.0 (67)	75.1 (78)	73.5 (78)
	98.7 (106)	101.2 (108)	97.7 (105)	103.8 (11)	99.5 (108)	97.3 (105)	99.4 (107)	100.6 (107)	105.4 (112)	97.2 (106)	102.1 (110)
	25.9 (25)	20.2 (20)	24.4 (23)	21.5 (20)	22.2 (23)	22.6 (22)	21.2 (19)	21.6 (20)	24.5 (20.5)	21.0 (19)	24.2 (22)
	1.0 (0.8)	0.6 (0.5)	1.2 (1.0)	0.7 (0.6)	0.9 (0.7)	0.9 (0.7)	0.6 (0.5)	0.7 (0.6)	0.9 (0.8)	0.7 (0.5)	0.7 (0.6)
	44.2 (32.9)	28.0 (25.6)	39.7 (33.3)	32.5 (23.2)	33.6 (27.1)	36.1 (29.0)	32.6 (24.1)	32.7 (25.4)	41.1 (24.7)	36.2 (23.2)	41.5 (28.0)
	92 (26.1)	32 (23.7)	35 (14.8)	129 (52.0)	107 (35.8)	81 (21.3)	26 (22.4)	99 (39.4)	53 (44.5)	27 (15.0)	35 (38.5)
	173 (49.1)	83 (61.5)	138 (58.5)	69 (27.8)	125 (41.8)	180 (47.4)	62 (53.4)	82 (32.7)	25 (21.0)	100 (55.6)	32 (35.2)
	41 (11.6)	**	19 (8.1)	10 (4.0)	9 (3.0)	19 (5.0)	**	23 (9.2)	**	7 (3.9)	-
	29 (8.2)	16 (11.9)	24 (10.2)	25 (10.1)	35 (11.7)	64 (16.8)	12 (10.3)	7 (2.8)	13 (10.9)	14 (7.8)	**
	15 (4.3)	**	18 (7.6)	14 (5.6)	21 (7.0)	12 (3.2)	12 (10.3)	30 (12.0)	26 (21.8)	31 (17.2)	20 (22.0)
	37.9 (29)	42.7 (41)	31.9 (26)	38.1 (33)	34.0 (29)	33.0 (30)	42.4 (42)	38.6 (34)	35.0 (26.5)	43.6 (32)	42.7 (37)
	36.0 (29.5)	43.9 (37)	33.9 (25.5)	39.4 (37)	36.0 (29)	33.1 (29)	43.3 (44)	39.2 (34)	34.1 (27)	38.7 (27.5)	40.9 (38)
	39.5 (29)	42.1 (42)	30.3 (26)	36.8 (32)	32.3 (29)	32.9 (30)	41.7 (37)	38.0 (34)	35.9 (23)	47.2 (37)	44.7 (35.5)
	329	**120**	**223**	**233**	**292**	**342**	**107**	**237**	**112**	**161**	**101**
	29.5 (11)	20.1 (13)	12.8 (8)	16.9 (11)	15.2 (11)	12.2 (9)	19.0 (12)	24.4 (15)	15.4 (12)	18.5 (11)	16.3 (13)
	15.9 (11)	15.7 (12)	14.9 (9)	16.6 (12)	14.6 (12)	13.1 (10)	16.7 (12)	24.8 (15)	16.0 (10)	15.1 (11)	16.3 (14)
	40.6 (10)	22.7 (14.5)	11.1 (8)	17.2 (11)	15.8 (11)	11.5 (9)	20.5 (12)	23.9 (15)	14.9 (12)	21.2 (12)	16.3 (12.5)
	37.1 (29)	43.4 (40.5)	30.9 (25)	38.7 (33)	32.9 (29)	32.8 (30)	41.4 (38)	38.9 (34)	35.4 (25.5)	40.5 (30.5)	42.6 (37)
	36.1 (32)	42.7 (36.5)	32.3 (25)	40.1 (37.5)	34.2 (29)	33.3 (30)	42.3 (43)	40.1 (34.5)	34.4 (31.5)	37.0 (26.5)	41.6 (39)
	37.9 (28)	43.8 (42)	29.7 (26)	37.6 (32)	31.8 (28)	32.3 (30)	40.7 (36)	37.7 (32)	36.2 (21.5)	43.2 (35.5)	43.7 (32.5)
	51	**21**	**25**	**31**	**41**	**55**	**17**	**26**	**24**	**26**	**10**
	24.3 (16)	35.4 (17)	15.3 (11)	19.7 (17)	25.6 (18)	22.9 (13)	26.5 (17)	33.2 (29.5)	21.8 (18.5)	31.2 (22.5)	22.9 (17)
	24.6 (16)	22.3 (20.5)	16.5 (7)	21.0 (18)	22.7 (17.5)	24.1 (15.5)	24.3 (17)	26.5 (21)	24.1 (19.5)	33.4 (17)	29.5 (18)
	24.0 (17.5)	40.6 (16)	13.9 (13)	17.6 (16)	27.8 (18)	21.6 (11)	28.9 (17)	39.9 (37)	17.4 (16.5)	29.8 (30)	18.5 (17)
	43.6 (34)	38.9 (41)	42.0 (29)	33.3 (35)	41.8 (35)	33.9 (29.5)	48.6 (46)	35.6 (34)	33.3 (29)	62.4 (47.5)	44.3 (39.5)
	36.1 (27)	52.8 (58)	48.2 (35)	36.1 (36)	49.9 (29.5)	31.4 (26.5)	47.7 (46)	30.9 (27)	33.1 (22)	50.2 (36)	31.8 (15.5)
	50.8 (38)	33.3 (26)	36.3 (26.5)	28.8 (30.5)	35.4 (35)	36.6 (31.5)	49.6 (50)	40.4 (36)	33.9 (32)	69.9 (67.5)	52.7 (48)

EXHIBIT 5.3 *continued*

- In 2011/12, hemorrhagic stroke patients waited longer than ischemic stroke patients for inpatient rehabilitation after stroke onset (15 vs. 10 median days).
- Hemorrhagic stroke patients had longer LOS than ischemic stroke patients (33 vs. 27 median days). The variation in rehabilitation LOS among ischemic stroke patients ranged from 21 median days in the North Simcoe Muskoka LHIN to 42 median days in the Central West LHIN.
- The variation in rehabilitation LOS among hemorrhagic stroke patients ranged from 27 days in the South West LHIN to 55 days in the South East LHIN.

Characteristics and Outcomes for 2010/11		Ontario	Erie St. Clair	South West	Waterloo Wellington
Patients Discharged Alive from Acute Care in 2010/11, n		**10,878**	**667**	**850**	**548**
Admission to inpatient rehabilitation[1], n (%)	All	3,337 (30.7)	258 (38.7)	303 (35.6)	161 (29.4)
	Female	1,598 (29.5)	142 (40.6)	159 (37.1)	75 (25.9)
	Male	1,739 (31.8)	116 (36.6)	144 (34.2)	86 (33.3)
Days from stroke onset to inpatient rehabilitation admission, mean (median)	All	15.3 (10)	13.5 (10)	13.7 (8)	17.4 (11)
	Female	15.0 (11)	12.7 (9)	12.6 (8)	17.0 (10)
	Male	15.6 (10)	14.4 (11)	15.0 (8)	17.8 (11)
Disability, n (%)	Mild	667 (20.3)	54 (21.5)	56 (18.8)	50 (31.4)
	Moderate	1,578 (48.0)	90 (35.9)	125 (41.9)	61 (38.4)
	Severe	1,044 (31.7)	107 (42.6)	117 (39.3)	48 (30.2)
Functional Independence Measure score, mean (median)	Admission FIM score	76.1 (78)	69.7 (72)	74.8 (77)	78.9 (81)
	Discharge FIM score	100.2 (107)	91.8 (100)	97.4 (106)	101.2 (108)
	Change in FIM score	22.2 (21)	20.7 (20)	21.5 (19)	20.6 (21)
	FIM efficiency[2]	0.9 (0.8)	0.8 (0.7)	0.9 (0.8)	0.8 (0.8)
	Relative change (%)	34.6 (26.0)	38.3 (25.8)	35.1 (24.7)	28.7 (25.5)
Discharge destination following inpatient rehabilitation, n (%)	Home without services	919 (32.3)	50 (22.2)	113 (44.1)	26 (17.7)
	Home with services	1,172 (41.2)	101 (44.9)	63 (24.6)	73 (49.7)
	Other community services	209 (7.3)	24 (10.7)	13 (5.1)	20 (13.6)
	Long-term care facility	279 (9.8)	30 (13.3)	45 (17.6)	13 (8.8)
	Acute care hospital	214 (7.5)	8 (3.6)	20 (7.8)	14 (9.5)
Average length of stay[3] in days, mean (median)	All	33.2 (28)	31.7 (27.5)	30.9 (27)	35.2 (28)
	Female	33.2 (28)	29.3 (25.5)	30.7 (28)	33.8 (28)
	Male	33.1 (28)	34.6 (30)	31.0 (25.5)	36.3 (29)
Characteristics and Outcomes by Stroke Type – Ischemic, n		**2,982**	**246**	**264**	**141**
Days from stroke onset to inpatient rehabilitation admission by stroke type, mean (median)	All	14.2 (10)	13.1 (9)	12.7 (8)	14.7 (10)
	Female	14.1 (10)	12.1 (8)	11.7 (8)	16.1 (10.5)
	Male	14.3 (10)	14.3 (10)	13.7 (8)	13.4 (10)
Average length of stay[3] in days by stroke type, mean (median)	All	32.5 (28)	32.0 (28)	30.4 (27)	33.6 (28)
	Female	32.8 (28)	28.8 (25)	30.1 (28)	34.0 (26)
	Male	32.2 (28)	35.5 (31)	30.8 (26)	33.1 (28)
Characteristics and Outcomes by Stroke Type – Hemorrhagic, n		**376**	**25**	**38**	**20**
Days from stroke onset to inpatient rehabilitation admission by stroke type, mean (median)	All	23.9 (16)	17.2 (14)	21.3 (13)	36.8 (17)
	Female	21.9 (15)	17.8 (13)	18.3 (13)	27.0 (8)
	Male	25.7 (16)	16.3 (14)	25.3 (8.5)	40.9 (27.5)
Average length of stay[3] in days by stroke type, mean (median)	All	38.6 (32)	29.1 (24.5)	33.8 (27)	46.4 (31.5)
	Female	34.8 (33)	32.0 (32)	26.3 (26)	42.1 (42)
	Male	40.7 (33)	22.2 (20)	32.5 (25)	52.9 (38.5)

	Hamilton Niagara Haldimand Brant	Central West	Mississauga Halton	Toronto Central	Central	Central East	South East	Champlain	North Simcoe Muskoka	North East	North West
	1,389	588	754	935	1,214	1,256	497	878	416	610	276
	453 (32.6)	148 (25.2)	179 (23.7)	294 (31.4)	301 (24.8)	420 (33.4)	146 (29.4)	265 (30.2)	116 (27.9)	196 (32.1)	97 (35.1)
	214 (31.3)	58 (21.2)	81 (21.1)	148 (31.6)	128 (22.1)	194 (30.5)	70 (28.7)	137 (30.6)	56 (28.0)	93 (31.1)	43 (32.8)
	239 (33.9)	90 (28.7)	98 (26.4)	146 (31.3)	173 (27.2)	226 (36.5)	76 (30.0)	128 (29.7)	60 (27.8)	103 (33.1)	54 (37.2)
	15.5 (11)	17.4 (14)	13.7 (8)	14.9 (11)	16.1 (11)	10.6 (8)	15.6 (13)	23.8 (13)	12.0 (8)	15.9 (12)	18.0 (15)
	15.5 (11)	15.5 (14)	11.1 (9)	13.6 (12)	15.7 (12)	9.8 (8)	16.8 (13)	25.8 (14)	13.6 (10)	16.0 (11.5)	18.9 (16)
	15.4 (10)	18.7 (14)	15.9 (8)	16.3 (10)	16.5 (11)	11.2 (8)	14.4 (12)	21.7 (12.5)	10.4 (6)	15.7 (13)	17.4 (14)
	71 (15.8)	26 (17.8)	20 (11.3)	49 (17.0)	80 (26.9)	71 (17.4)	29 (20.1)	56 (21.3)	34 (29.6)	47 (24.0)	24 (24.7)
	229 (51.0)	87 (59.6)	94 (53.1)	171 (59.4)	149 (50.2)	196 (47.9)	61 (42.4)	135 (51.3)	42 (36.5)	95 (48.5)	43 (44.3)
	149 (33.2)	33 (22.6)	63 (35.6)	68 (23.6)	68 (22.9)	142 (34.7)	54 (37.5)	72 (27.4)	39 (33.9)	54 (27.6)	30 (30.9)
	73.8 (76)	79.1 (78.5)	72.4 (73)	80.3 (81)	80.0 (82)	73.5 (76)	74.3 (76.5)	79.2 (81)	74.7 (80)	81.6 (86)	76.5 (82)
	103.1 (109)	103.5 (108)	97.6 (101)	103.2 (108)	101.8 (108)	95.9 (103)	99.9 (108)	102.0 (108)	105.2 (111)	102.1 (111.5)	107.4 (114)
	26.8 (26)	23.0 (24)	22.6 (22)	21.1 (19)	20.3 (19)	21.4 (20)	24.7 (24)	21.6 (19)	24.8 (23)	19.3 (16)	24.5 (22)
	1.0 (0.9)	0.7 (0.6)	1.1 (0.9)	0.7 (0.6)	0.8 (0.7)	1.1 (0.9)	0.8 (0.6)	0.9 (0.7)	1.4 (0.9)	0.8 (0.6)	0.8 (0.7)
	44.3 (31.4)	32.8 (29.7)	34.1 (27.2)	30.5 (23.4)	29.2 (23)	33.2 (25.1)	38.4 (33.5)	31.9 (24.9)	37.0 (27.2)	29.7 (19.4)	39.6 (24.2)
	104 (26.3)	33 (27.0)	15 (9.8)	124 (50.4)	118 (44.4)	96 (27.6)	30 (26.3)	100 (44.8)	45 (45.9)	47 (28.1)	18 (21.4)
	207 (52.3)	65 (53.3)	90 (58.8)	70 (28.5)	106 (39.8)	149 (42.8)	51 (44.7)	53 (23.8)	25 (25.5)	75 (44.9)	44 (52.4)
	25 (6.3)	**	15 (9.8)	15 (6.1)	8 (3.0)	32 (9.2)	13 (11.4)	25 (11.2)	7 (7.1)	**	**
	32 (8.1)	14 (11.5)	13 (8.5)	25 (10.2)	19 (7.1)	37 (10.6)	10 (8.8)	21 (9.4)	7 (7.1)	9 (5.4)	**
	23 (5.8)	6 (4.9)	19 (12.4)	9 (3.7)	13 (4.9)	16 (4.6)	9 (7.9)	19 (8.5)	14 (14.3)	30 (18.0)	14 (16.7)
	33.9 (28)	40.7 (36)	27.4 (25)	37.6 (32.5)	31.7 (29)	26.9 (23)	41.5 (39)	33.1 (29)	26.7 (20.5)	35.6 (29)	45.5 (35)
	34.0 (28)	43.9 (43.5)	26.5 (23)	39.5 (35)	31.3 (28.5)	27.7 (24)	41.7 (36)	33.8 (33)	27.4 (19.5)	35.0 (27)	46.4 (37)
	33.9 (29)	38.6 (35.5)	28.1 (26)	35.7 (30)	32.0 (29)	26.3 (22)	41.4 (42)	32.4 (27)	26.0 (21.5)	36.1 (33)	44.8 (33.5)
	388	127	162	266	265	389	131	229	104	184	86
	14.3 (10)	15.9 (13)	14.1 (8)	12.9 (10)	15.4 (11)	9.9 (8)	15.0 (12.5)	23.15 (13)	10.0 (7)	15.0 (12)	16.8 (15)
	14.3 (11)	14.7 (14)	11.1 (9)	13.5 (12)	14.2 (11)	9.6 (7.5)	16.2 (13)	25.8 (13)	11.0 (9)	14.0 (11)	17.0 (16)
	14.2 (9.5)	16.7 (12)	16.6 (8)	12.3 (10)	16.2 (11)	10.1 (8)	13.8 (11.5)	20.4 (11)	9.2 (6)	16.0 (13)	16.6 (14)
	32.9 (28)	40.0 (36)	27.5 (25)	36.2 (31)	31.4 (28)	26.7 (23)	41.7 (41)	31.8 (28)	25.0 (20)	35.1 (28)	44.6 (35)
	33.4 (28)	44.3 (44)	27.0 (23)	38.2 (32.5)	29.7 (28)	28.0 (24)	42.6 (26)	33.2 (32)	27.2 (17)	34.0 (24)	48.0 (37)
	32.5 (28)	37.2 (36)	27.9 (26)	34.1 (30)	32.6 (28.5)	25.6 (21)	40.9 (42)	30.3 (25.5)	23.1 (20)	36.1 (33)	42.1 (32)
	65	21	17	29	36	32	15	36	12	19	11
	22.5 (16)	26.5 (19)	9.9 (7)	33.1 (16)	21.9 (15)	19.7 (11)	20.5 (20)	28.1 (19.5)	28.7 (21.5)	24.0 (16)	28.0 (22)
	21.7 (15)	20.4 (8)	10.9 (5.5)	15.3 (11)	24.7 (17.5)	13.4 (10)	23.0 (21)	25.7 (19.5)	29.3 (23.5)	38.1 (18.5)	30.2 (29)
	23.4 (17.5)	30.3 (20)	9.0 (10)	39.9 (22)	19.1 (13)	23.2 (17)	18.8 (20)	31.1 (19.5)	27.5 (19)	13.7 (13)	25.4 (14)
	40.1 (33)	44.9 (36)	26.9 (24)	50.1 (40)	34.0 (31)	29.1 (25)	39.7 (37)	41.5 (35)	41.5 (39)	40.2 (37)	52.3 (37)
	44.5 (43.5)	36.4 (34)	32.5 (30)	48.1 (42)	31.5 (34)	27.8 (29.5)	59.0 (59)	32.4 (32.5)	18.1 (15.5)	31.4 (37)	41.3 (48
	43.6 (37)	47.0 (35)	30.9 (26)	45.6 (36)	26.8 (29)	32.6 (25)	45.1 (42)	47.0 (33.5)	67.5 (58)	36.2 (28.5)	70.8 (42)

EXHIBIT 5.3 *continued*

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD) and National Rehabilitation Reporting System (NRS), 2003/04–2011/12.

Inclusion criteria: All patients aged ≥18 years with a diagnosis of stroke excluding transient ischemic attack (using ICD-10 codes) discharged from an acute care hospital, admitted to inpatient rehabilitation and classified as Rehabilitation Client Group 1 (Stroke) in the NRS database; patients had rehabilitation assessments completed in the same fiscal year as the acute care facility discharge.

1 Based on unique patients (i.e., does not include multiple patient-visits) who were discharged alive from acute care stroke/TIA hospitalization and were admitted to inpatient rehabilitation.

2 FIM efficiency is the change in total FIM score divided by total length of stay; it provides information on the average amount of functional recovery per day of inpatient rehabilitation.

3 Length of stay (LOS) refers to the total time spent in inpatient rehabilitation and is calculated using the admission and discharge dates in the NRS database (LOS = discharge date – admission date).

** Cell value suppressed for reasons of privacy and confidentiality.

Notes:

(1) Population-based analysis (i.e., the location of the patient's residence is used to report regional performance).

(2) Cells in which there were no reported/available data are marked with a hyphen (-).

(3) LHIN/sub-LHIN populations were determined using POPLHIN 2003-2010, POPLHIN_PROJECTED 2011 and POPSUBLHIN VERSION 9 2006-2008 files from the Ontario Ministry of Health and Long-Term Care: IntelliHEALTH ONTARIO for 2011/12 data.

(4) LHIN/sub-LHIN populations were determined using POPLHIN 2003-2009, POPLHIN_PROJECTED 2010 and POPSUBLHIN VERSION 9 2006-2008 files from the Ontario Ministry of Health and Long-Term Care: IntelliHealth Ontario for 2003/04, 2009/10 and 2010/11 data.

Characteristics and Outcomes for 2011/12		Ontario	Erie St. Clair	South West	Waterloo Wellington	
Patients Discharged Alive from Acute Care in 2011/12, n		**10,793**	**659**	**842**	**614**	
Admission to inpatient rehabilitation[1], n (%)	All	3,405 (31.5)	239 (36.3)	282 (33.5)	189 (30.8)	
	Female	1,610 (30.3)	117 (35.5)	138 (35.3)	96 (29.7)	
	Male	1,795 (32.8)	122 (37.1)	144 (31.9)	93 (32.0)	
Days from stroke onset to inpatient rehabilitation admission, mean (median)	All	16.5 (10)	15.6 (9)	16.0 (9)	21.1 (11)	
	Female	16.2 (10)	13.8 (10)	14.8 (10)	22.4 (12)	
	Male	16.8 (10)	17.3 (9)	17.2 (9)	19.8 (10)	
Disability, n (%)	Mild	626 (18.7)	50 (21.1)	65 (23.3)	44 (23.4)	
	Moderate	1,581 (47.2)	102 (43.0)	106 (38.0)	77 (41.0)	
	Severe	1,144 (34.1)	85 (35.9)	108 (38.7)	67 (35.6)	
Functional Independence Measure score, mean (median)	Admission FIM score	74.5 (76)	74.0 (77)	74.6 (76)	75.7 (75)	
	Discharge FIM score	99.6 (107)	94.2 (103)	96.9 (106)	99.0 (106)	
	Change in FIM score	22.6 (21)	19.1 (20)	21.2 (18.5)	23.0 (23)	
	FIM efficiency[2]	0.9 (0.8)	0.8 (0.7)	0.9 (0.8)	0.9 (0.7)	
	Relative change	35.7 (26.5)	33.7 (23.4)	35.5 (25.0)	34.8 (27.1)	
Discharge destination following inpatient rehabilitation, n (%)	Home without services	956 (33.4)	54 (24.1)	120 (50.2)	30 (18.1)	
	Home with services	1,177 (41.1)	96 (42.9)	52 (21.8)	89 (53.6)	
	Other community services	216 (7.5)	19 (8.5)	9 (3.8)	19 (11.4)	
	Long-term care facility	230 (8.0)	37 (16.5)	26 (10.9)	11 (6.6)	
	Acute care hospital	229 (8.0)	11 (4.9)	29 (12.1)	14 (8.4)	
Average length of stay[3] in days, mean (median)	All	32.2 (28)	29.9 (25)	29.7 (24)	36.3 (33)	
	Female	32.0 (28)	29.1 (24.5)	30.6 (26)	36.7 (35.5)	
	Male	32.5 (28)	30.6 (25)	28.9 (22)	35.9 (28)	
Characteristics and Outcomes by Stroke Type – Ischemic, n		**2,976**	**214**	**249**	**158**	
Days from stroke onset to inpatient rehabilitation admission by stroke type, mean (median)	All	15.5 (10)	15.5 (9)	14.9 (9)	19.2 (10)	
	Female	15.0 (10)	13.5 (9)	13.8 (10)	18.4 (11)	
	Male	15.9 (10)	17.5 (9)	15.9 (8)	20.1 (10)	
Average length of stay[3] in days by stroke type, mean (median)	All	31.6 (27)	29.5 (25)	29.4 (23)	36.4 (32)	
	Female	31.6 (28)	28.9 (24)	31.1 (26)	35.4 (33)	
	Male	31.7 (27)	30.1 (25)	27.7 (21)	37.4 (32)	
Characteristics and Outcomes by Stroke Type – Hemorrhagic, n		**429**	**25**	**33**	**31**	
Days from stroke onset to inpatient rehabilitation admission by stroke type, mean (median)	All	23.5 (15)	16.4 (15)	24.6 (14)	30.8 (19)	
	Female	23.9 (16)	17.2 (18)	21.4 (13)	39.0 (26)	
	Male	23.2 (14)	15.9 (15)	27.9 (17)	17.9 (9)	
Average length of stay[3] in days by stroke type, mean (median)	All	36.5 (33)	33.8 (30.5)	32.2 (27)	35.4 (35)	
	Female	34.8 (33)	32.0 (32)	26.3 (26)	42.1 (42)	
	Male	38.3 (32)	35.0 (29)	38.6 (36.5)	24.1 (24)	

	Hamilton Niagara Haldimand Brant	Central West	Mississauga Halton	Toronto Central	Central	Central East	South East	Champlain	North Simcoe Muskoka	North East	North West
	1,291	**553**	**714**	**928**	**1,239**	**1,196**	**482**	**934**	**424**	**633**	**284**
	400 (31.0)	140 (25.3)	256 (35.9)	270 (29.1)	297 (24.0)	429 (35.9)	153 (31.7)	289 (30.9)	152 (35.8)	198 (31.3)	111 (39.1)
	184 (28.9)	56 (22.1)	128 (36.9)	130 (27.2)	151 (24.5)	202 (33.4)	80 (32.0)	123 (27.4)	74 (33.9)	78 (27.2)	53 (38.4)
	216 (33.0)	84 (28.0)	128 (34.9)	140 (31.1)	146 (23.4)	227 (38.3)	73 (31.5)	166 (34.2)	78 (37.9)	120 (34.7)	58 (39.7)
	15.9 (11)	23.5 (13.5)	17.4 (10)	13.9 (11)	16.6 (11)	11.8 (8)	15.3 (10)	26.9 (14)	13.1 (8)	12.1 (9)	14.8 (11)
	16.1 (11)	19.2 (14.5)	15.3 (9)	14.4 (11)	15.6 (11)	12.1 (8)	14.4 (10)	29.3 (13)	13.9 (8)	11.3 (8.5)	17.0 (11)
	15.8 (11)	26.3 (13)	19.5 (10)	13.4 (11)	17.5 (10)	11.4 (8)	16.2 (11)	25.1 (15)	12.5 (8)	12.6 (9)	12.9 (10.5)
	62 (15.8)	20 (14.4)	40 (15.9)	30 (11.5)	64 (22.2)	76 (18.2)	21 (13.8)	56 (19.5)	32 (21.5)	49 (24.7)	17 (15.5)
	179 (45.5)	85 (61.2)	113 (45.0)	164 (62.6)	155 (53.8)	193 (46.2)	66 (43.4)	146 (50.9)	55 (36.9)	94 (47.5)	46 (41.8)
	152 (38.7)	34 (24.5)	98 (39.0)	68 (26.0)	69 (24.0)	149 (35.6)	65 (42.8)	85 (29.6)	62 (41.6)	55 (27.8)	47 (42.7)
	71.2 (72)	78.0 (77)	69.7 (71)	78.6 (79)	78.4 (81)	72.2 (77)	70.9 (70)	77.6 (80)	70.5 (76)	79.9 (84.5)	71.6 (75)
	101.7 (108)	103.3 (106.5)	95.7 (101)	105.0 (109)	102.8 (109)	95.5 (107)	97.8 (105)	100.9 (109)	102.4 (110)	102.9 (112)	101.1 (109)
	26.8 (25)	22.7 (22.5)	22.6 (21)	24.9 (23)	22.2 (20)	21.4 (20)	25.1 (24.5)	21.8 (21)	23.9 (22)	18.9 (15)	23.4 (22.5)
	0.9 (0.8)	0.7 (0.5)	0.9 (0.8)	0.8 (0.7)	0.9 (0.7)	1.1 (0.8)	0.9 (0.7)	0.8 (0.7)	1.4 (1.0)	0.8 (0.7)	0.8 (0.7)
	43.4 (32.2)	31.7 (26.8)	36.9 (28.1)	36.9 (26.7)	32.0 (24.4)	33.7 (24.4)	39.3 (31.0)	33.0 (25.5)	36.5 (25.1)	30.1 (15.2)	42.6 (25.1)
	129 (37.3)	27 (25.0)	39 (17.8)	142 (62.3)	101 (43.0)	89 (24.7)	20 (15.7)	102 (41.3)	34 (27.0)	46 (31.7)	23 (24.7)
	135 (39.0)	66 (61.1)	126 (57.5)	51 (22.4)	101 (43.0)	163 (45.3)	78 (61.4)	69 (27.9)	51 (40.5)	62 (42.8)	38 (40.9)
	32 (9.2)	**	22 (10.0)	12 (5.3)	10 (4.3)	21 (5.8)	10 (7.9)	33 (13.4)	6 (4.8)	10 (6.9)	8 (8.6)
	30 (8.7)	**	18 (8.2)	13 (5.7)	11 (4.7)	38 (10.6)	8 (6.3)	10 (4.0)	8 (6.3)	**	12 (12.9)
	18 (5.2)	**	13 (5.9)	10 (4.4)	10 (4.3)	23 (6.4)	8 (6.3)	30 (12.1)	26 (20.6)	20 (13.8)	12 (12.9)
	36.9 (32)	42.6 (38)	30.9 (27)	36.0 (31)	30.8 (28)	26.4 (23)	35.5 (28)	31.2 (30)	26.1 (20)	31.0 (24)	37.2 (30)
	37.9 (34)	42.2 (41)	31.3 (28)	36.1 (31)	29.4 (27.5)	28.0 (25.5)	33.9 (28)	30.6 (28)	24.0 (17)	28.3 (21)	35.6 (30)
	36.0 (30)	42.9 (37)	30.6 (25.5)	36.0 (31)	32.3 (30)	25.0 (21)	37.3 (31)	31.7 (30)	28.2 (23)	32.7 (28)	38.5 (29.5)
	345	**117**	**207**	**230**	**258**	**384**	**143**	**258**	**134**	**176**	**103**
	15.3 (10)	21.9 (13)	16.0 (9)	12.6 (11)	15.3 (11)	10.5 (8)	14.0 (10)	26.7 (13)	12.3 (8)	11.2 (9)	14.2 (10)
	15.6 (10.5)	17.5 (14)	15.4 (9)	12.5 (11)	14.8 (11)	10.5 (8)	13.6 (9.5)	29.4 (13)	12.8 (7)	10.4 (9)	16.0 (11)
	15.2 (10)	24.6 (12)	16.7 (10)	12.7 (10.5)	15.9 (10)	10.5 (8)	14.5 (10)	24.8 (14)	11.9 (8)	11.7 (9)	12.5 (10)
	35.8 (31)	43.4 (42)	30.6 (27)	34.5 (29)	30.3 (28)	26.1 (22)	34.0 (28)	30.4 (29)	26.6 (21)	30.3 (23)	36.9 (30)
	36.8 (32)	43.9 (44.5)	31.0 (27.5)	34.4 (29.5)	29.0 (24)	28.0 (24)	33.1 (28)	30.3 (25.5)	25.2 (18)	28.0 (20)	35.2 (30)
	35.0 (29.5)	43.2 (37.5)	30.2 (26)	34.7 (29)	31.6 (29)	24.3 (20)	34.9 (28)	30.6 (30)	27.9 (23)	31.8 (27)	38.2 (28)
	55	**23**	**49**	**40**	**39**	**45**	**10**	**31**	**18**	**22**	**8**
	19.3 (12)	31.2 (20)	23.0 (13)	21.3 (13)	24.6 (13)	22.5 (15)	32.9 (28)	28.6 (21)	19.3 (15.5)	19.6 (16.5)	23.6 (25)
	18.8 (12.5)	25.7 (19.5)	14.8 (12)	27.1 (20)	20.7 (13)	27.5 (14)	45.5 (45.5)	28.7 (19.5)	19.3 (15.5)	20.6 (8)	29.3 (29.5)
	19.9 (12)	37.3 (20)	29.7 (13)	17.0 (11)	29.2 (18)	18.9 (16)	29.8 (27)	28.5 (21)	19.5 (18.5)	19.1 (19)	18.0 (12)
	44.3 (42)	38.8 (32)	32.3 (28)	44.7 (38)	34.0 (34)	29.6 (30)	57.6 (55)	38.0 (35)	22.0 (15.5)	37.7 (37.5)	42.2 (40.5)
	44.5 (43.5)	36.4 (34)	32.5 (30)	48.1 (42)	31.5 (34)	27.8 (29.5)	59.0 (59)	32.4 (32.5)	18.1 (15.5)	31.4 (37)	41.3 (48)
	44.0 (41)	41.4 (28)	32.1 (21)	42.3 (35)	37.7 (41.5)	31.1 (30)	57.1 (55)	48.0 (48.5)	33.8 (33)	41.2 (38)	43.0 (33)

EXHIBIT 5.3A Proportion of adult stroke patients admitted to inpatient rehabilitation, in Ontario and by Local Health Integration Network, 2011/12

Key Finding

- In 2011/12, there was wide variation across the LHINs in the proportion of patients admitted to inpatient rehabilitation, ranging from 24.0% in the Central LHIN to 39.1% in the North West LHIN.

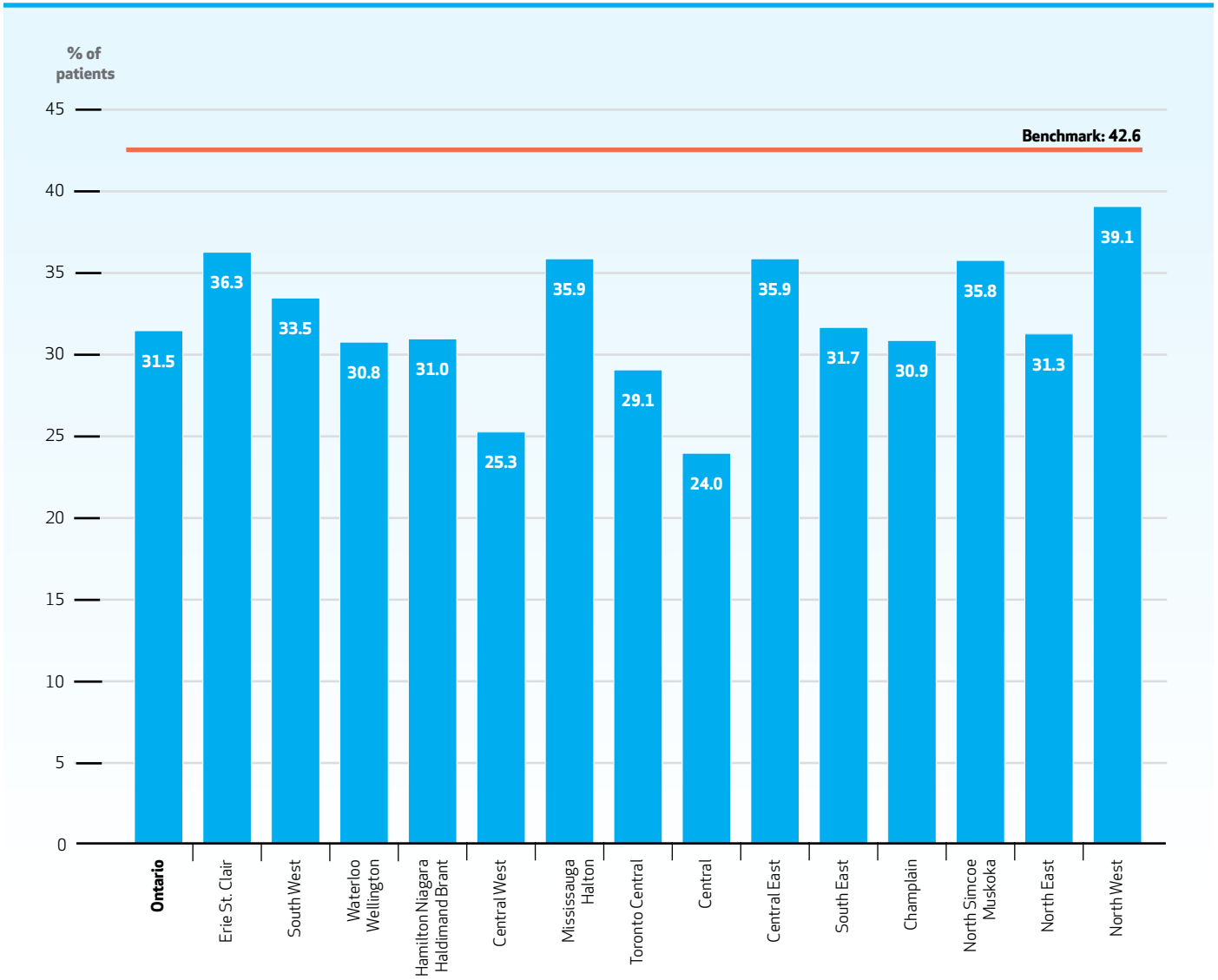


EXHIBIT 5.3B Median time from stroke onset to admission to inpatient rehabilitation for adult stroke patients, in Ontario and by Local Health Integration Network, 2011/12

Key Finding

- Patients in the Central East and North Simcoe Muskoka LHINs had the shortest time to inpatient rehabilitation (8 median days), whereas patients in the Champlain LHIN had the longest (14 days).

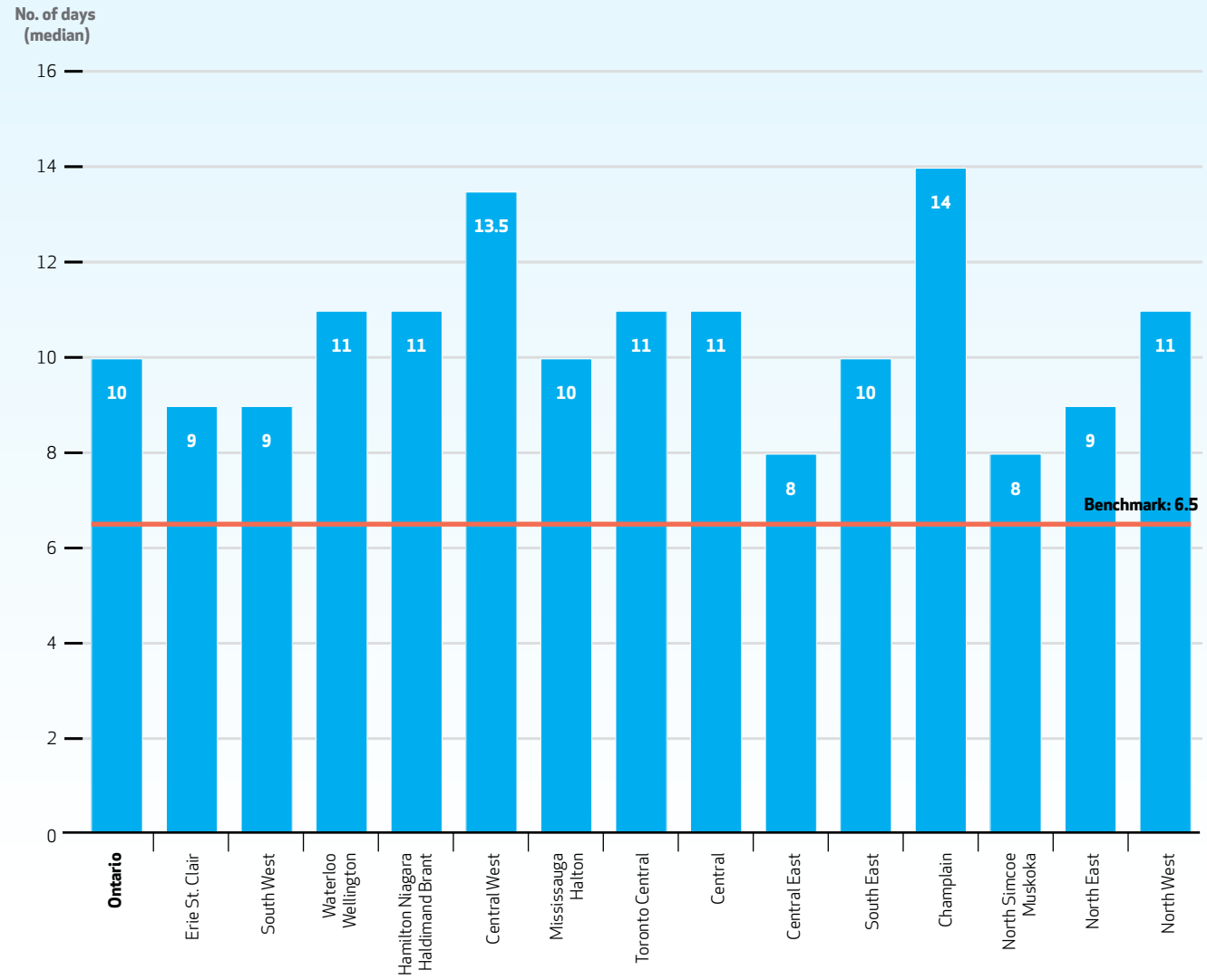


EXHIBIT 5.3C Proportion of adult stroke patients admitted to inpatient rehabilitation in Ontario, by degree of disability, 2003/04 and 2009/10–2011/12

Key Findings

- There was an increase in the proportion of moderately disabled patients admitted to inpatient rehabilitation, from 40.7% in 2003/04 to 47.2% in 2011/12.
- Although the proportion of severely disabled patients receiving inpatient rehabilitation rose from 31.7% in 2010/11 to 34.1% in 2011/12, the proportion declined from 36.1% to 34.1% between 2003/04 and 2011/12.
- The proportion of mildly disabled patients admitted to inpatient rehabilitation between 2003/04 and 2011/12 decreased from 23.1% to 18.7%.

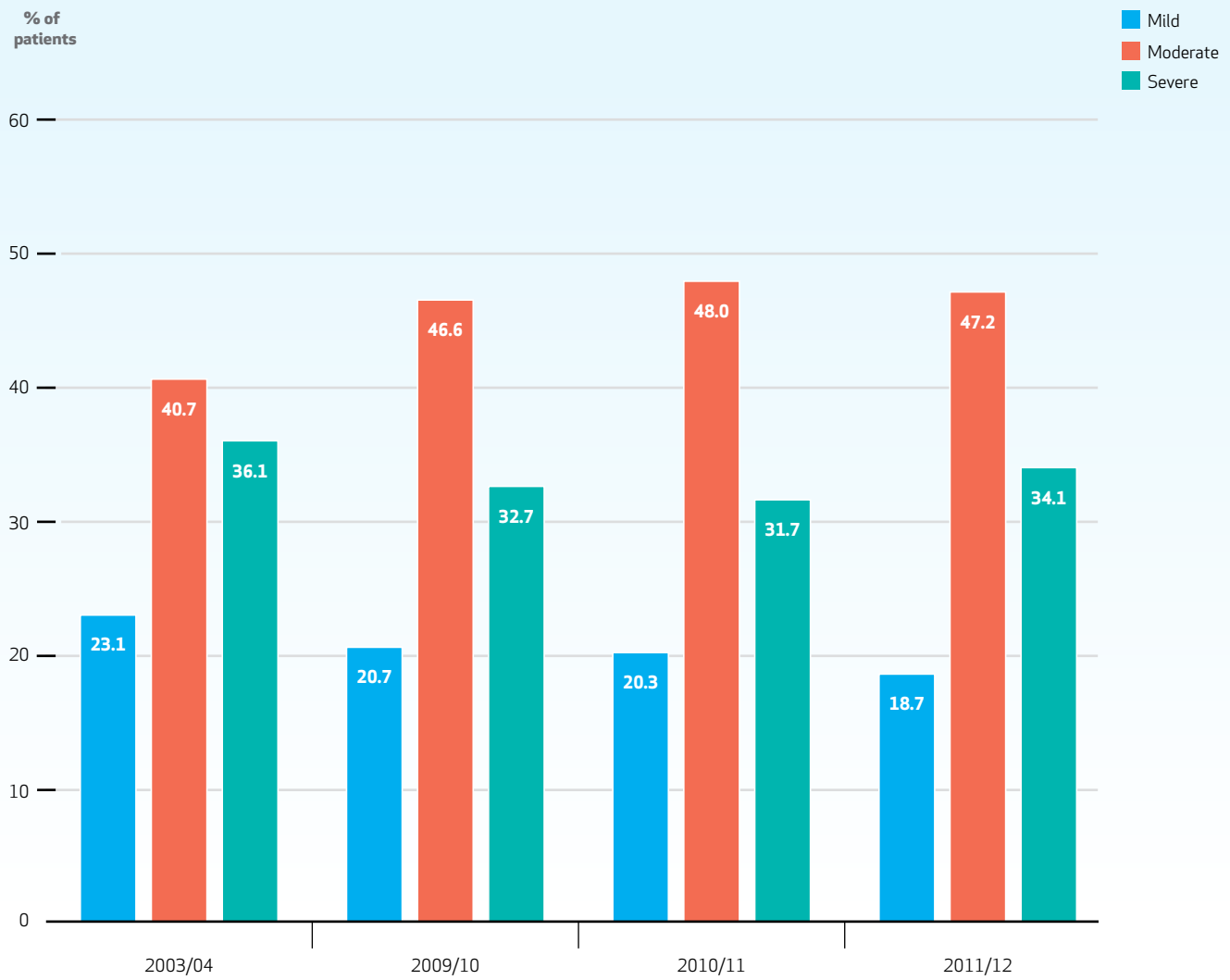


EXHIBIT 5.3D Proportion of adult stroke patients in inpatient rehabilitation, in Ontario and by Local Health Integration Network and degree of disability, 2011/12

Key Finding

- Across LHINs, the proportion of mildly disabled patients with access to inpatient rehabilitation varied from 11.5% in the Toronto Central LHIN to 24.7% in the North East LHIN. For severely disabled stroke patients, inpatient rehabilitation admission rates ranged from approximately 24% in the Central and Central West LHINs to 42.8% in the South East LHIN.

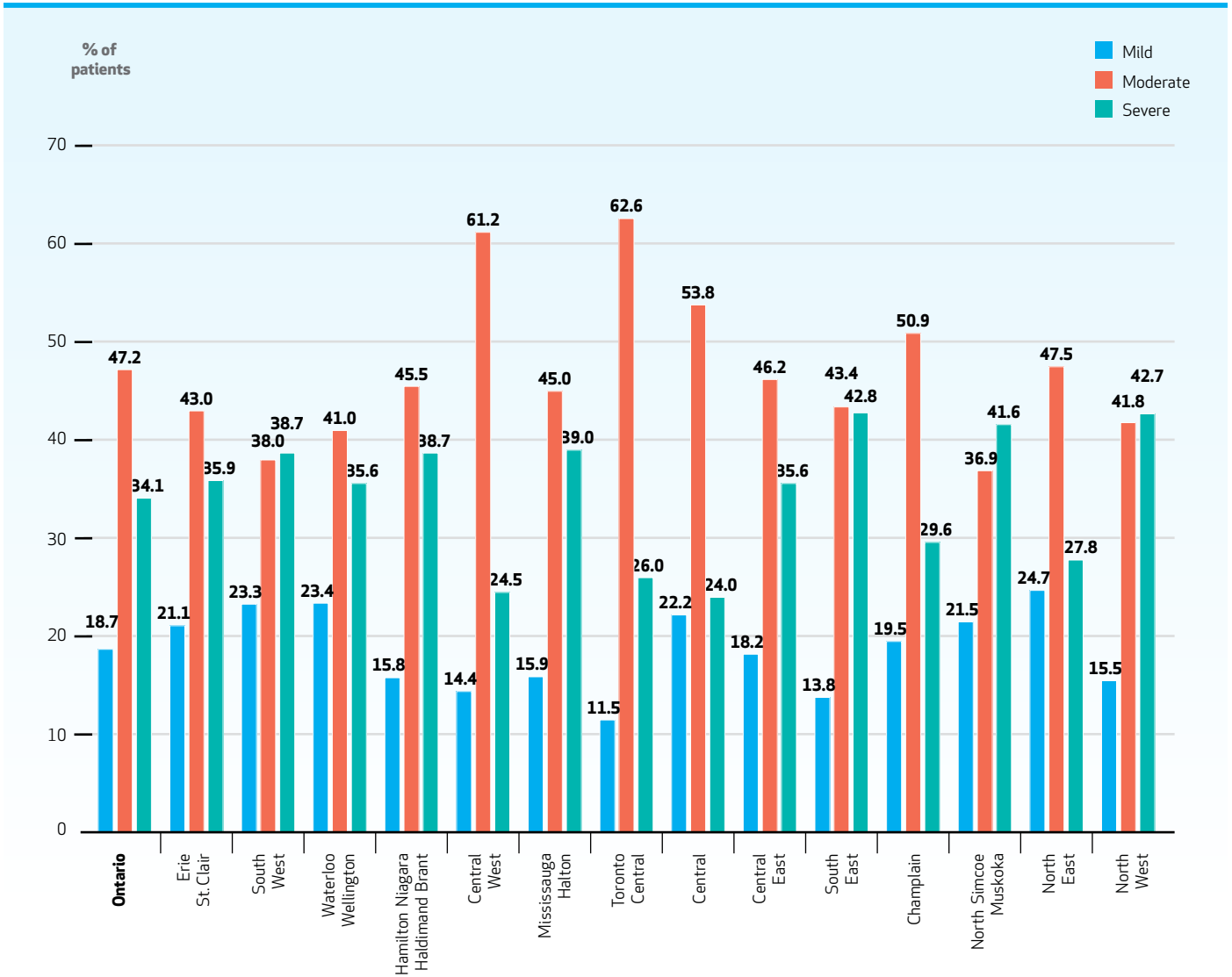


EXHIBIT 5.4A Median length of stay in a rehabilitation facility by adult stroke patients in Ontario, by Rehabilitation Patient Group, 2003/04 and 2009/10–2011/12

Key Finding

- The median length of stay in inpatient rehabilitation decreased for all Rehabilitation Patient Groups (RPGs) between 2003/04 and 2011/12, from 18 to 17 days for mildly disabled patients, from 35 to 28 days for moderately disabled patients, and from 50 to 43 days for severely disabled patients.

Actual and target lengths of stay in inpatient rehabilitation in Ontario, by Rehabilitation Patient Group, 2011/12

Disability Level	RPG	Actual No. of Days, mean (median)	Target No. of Days
Mild	1160	15.3 (14)	0.0
	1150	21.4 (20)	7.7
Moderate	1140	23.5 (22)	14.4
	1130	29.3 (28)	25.2
	1120	34.3 (31.5)	35.8
Severe	1110	43.6 (41)	41.8
	1100	52.5 (50)	48.9

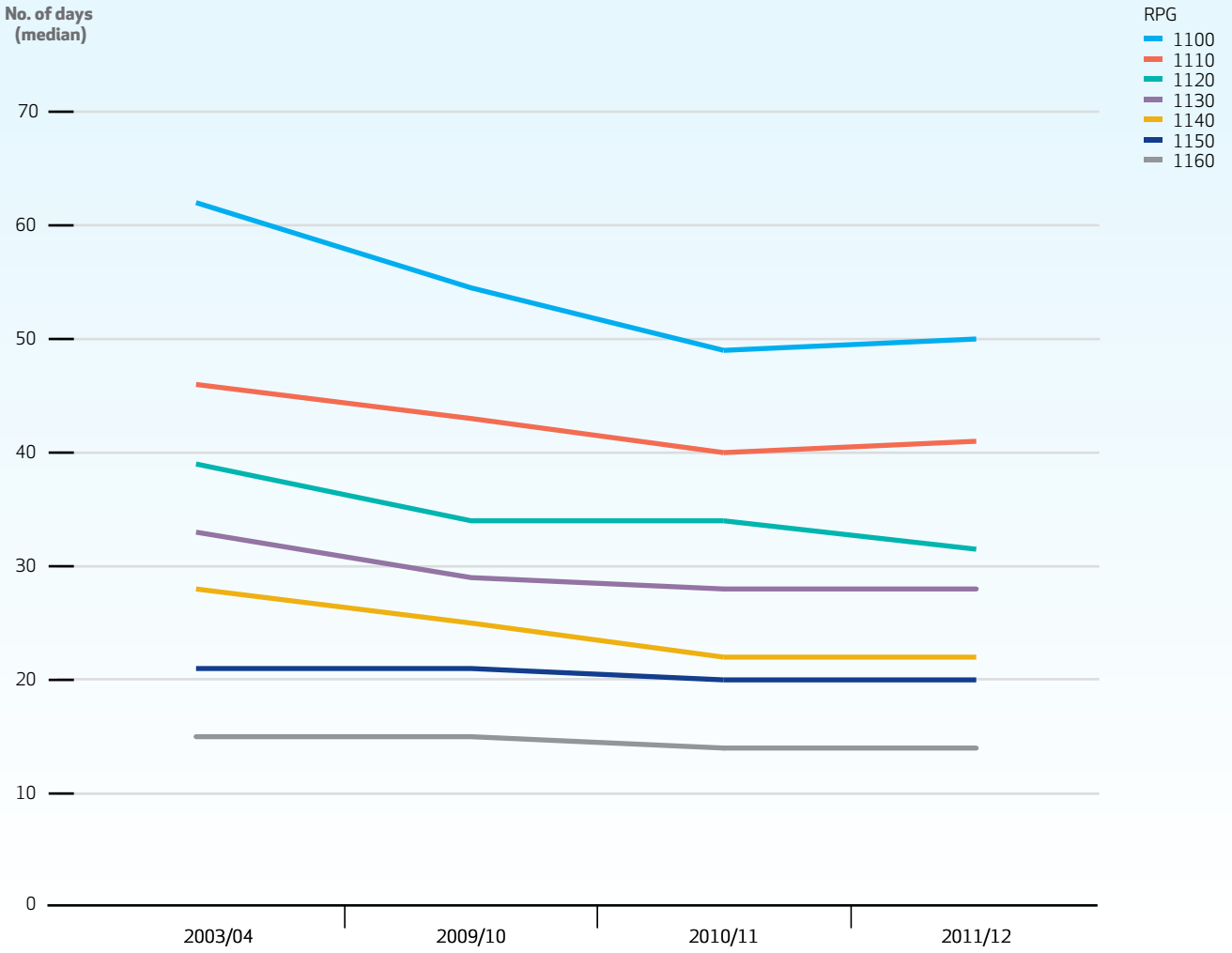


EXHIBIT 5.4B Median length of stay in inpatient rehabilitation by adult stroke patients with mild disability, in Ontario and by Local Health Integration Network, 2011/12

Key Findings

- Among mildly disabled stroke patients, there was wide variation in the median rehabilitation LOS, from 12.5 days in the Central East LHIN to 30.5 days in the Central West LHIN (data not shown). Wider variation was seen among patients in Rehabilitation Group (RPG) 1150 than among those in RPG 1160.
- Best practice expected targets for LOS for milder RPGs have been set. As recommended, patients in RPG 1160 were not receiving inpatient rehabilitation.
- The best practice expected length of stay for RPG 1150 is 7.7 days and all LHINs exceeded this by as much as 22.8 days and as little as 9.0 days.

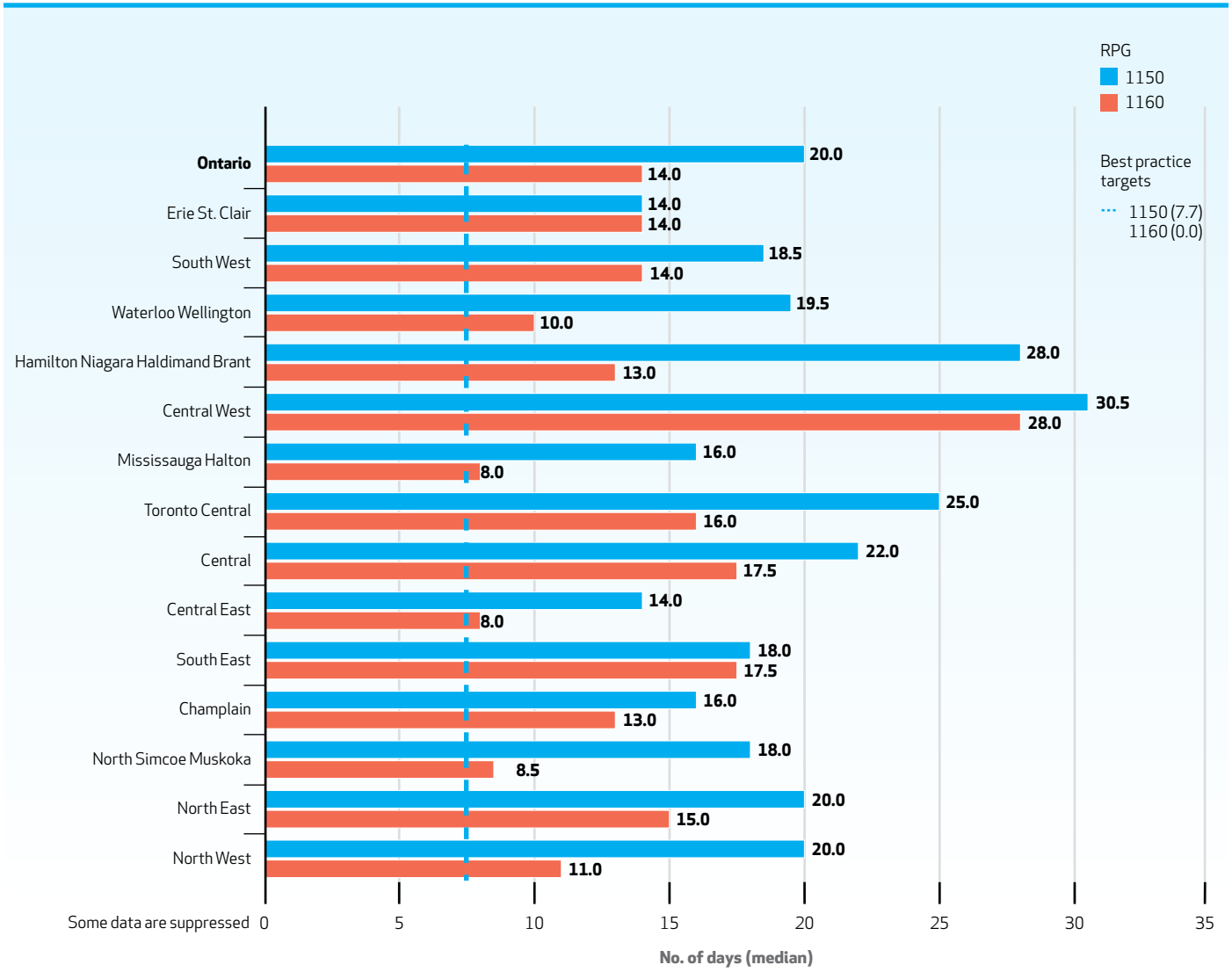


EXHIBIT 5.4C Median length of stay in inpatient rehabilitation by adult stroke patients with moderate disability, in Ontario and by Local Health Integration Network, 2011/12

Key Findings

- Among moderately disabled stroke patients, the median LOS varied from 15 days in the North Simcoe Muskoka LHIN to 55 days in the Central West LHIN (data not shown), with the widest variation observed among patients in Rehabilitation Patient Group (RPG) 1130.
- For moderately disabled stroke patients, the expected best practice LOS is 14.4, 25.2 and 35.8 days for RPGs 1140, 1130 and 1120, respectively. The best practice expected LOS among patients in RPG 1140 was achieved in one LHIN, for patients in RPG 1130 in 7 LHINs and for patients in RPG 1120 in 10 LHINs.

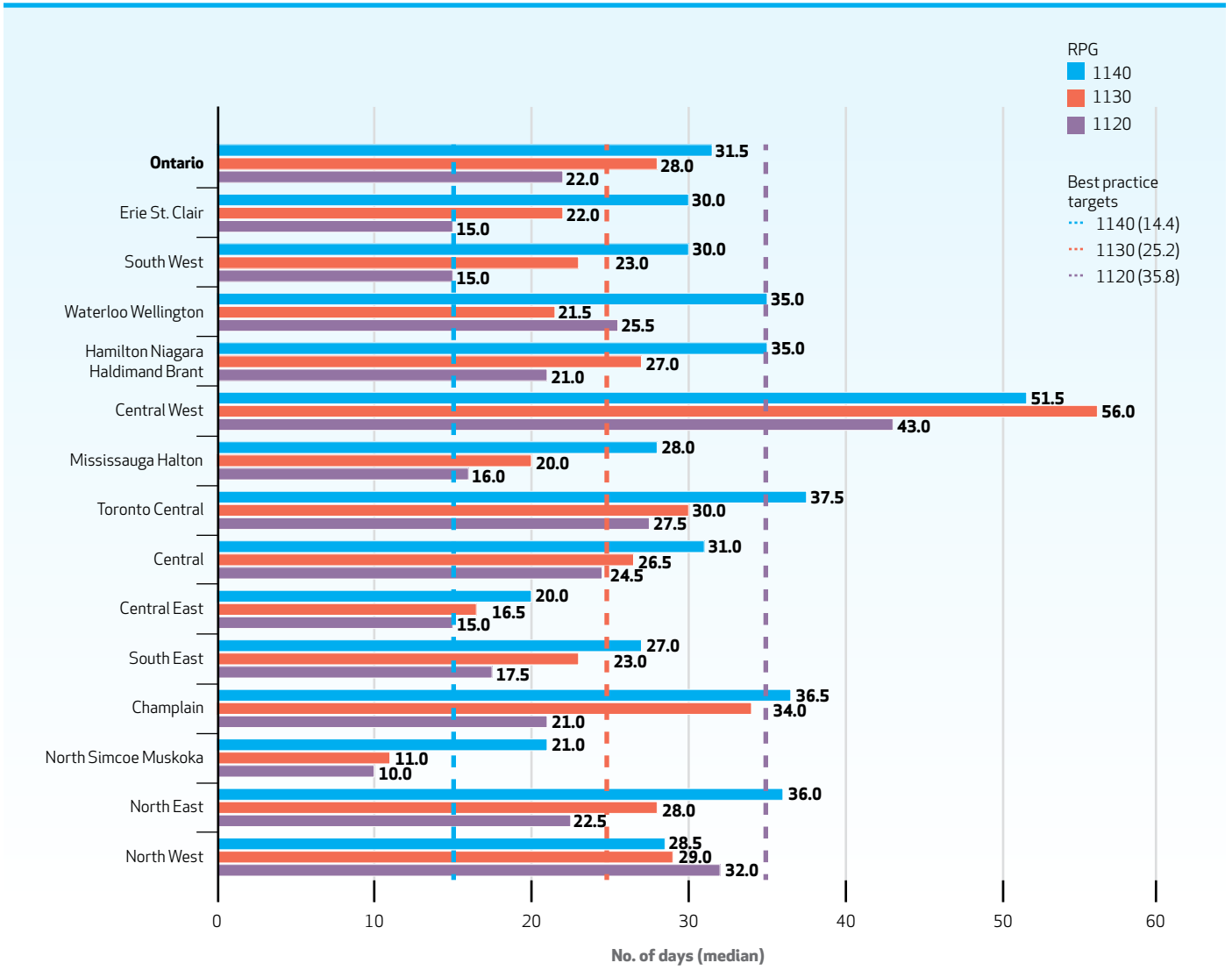
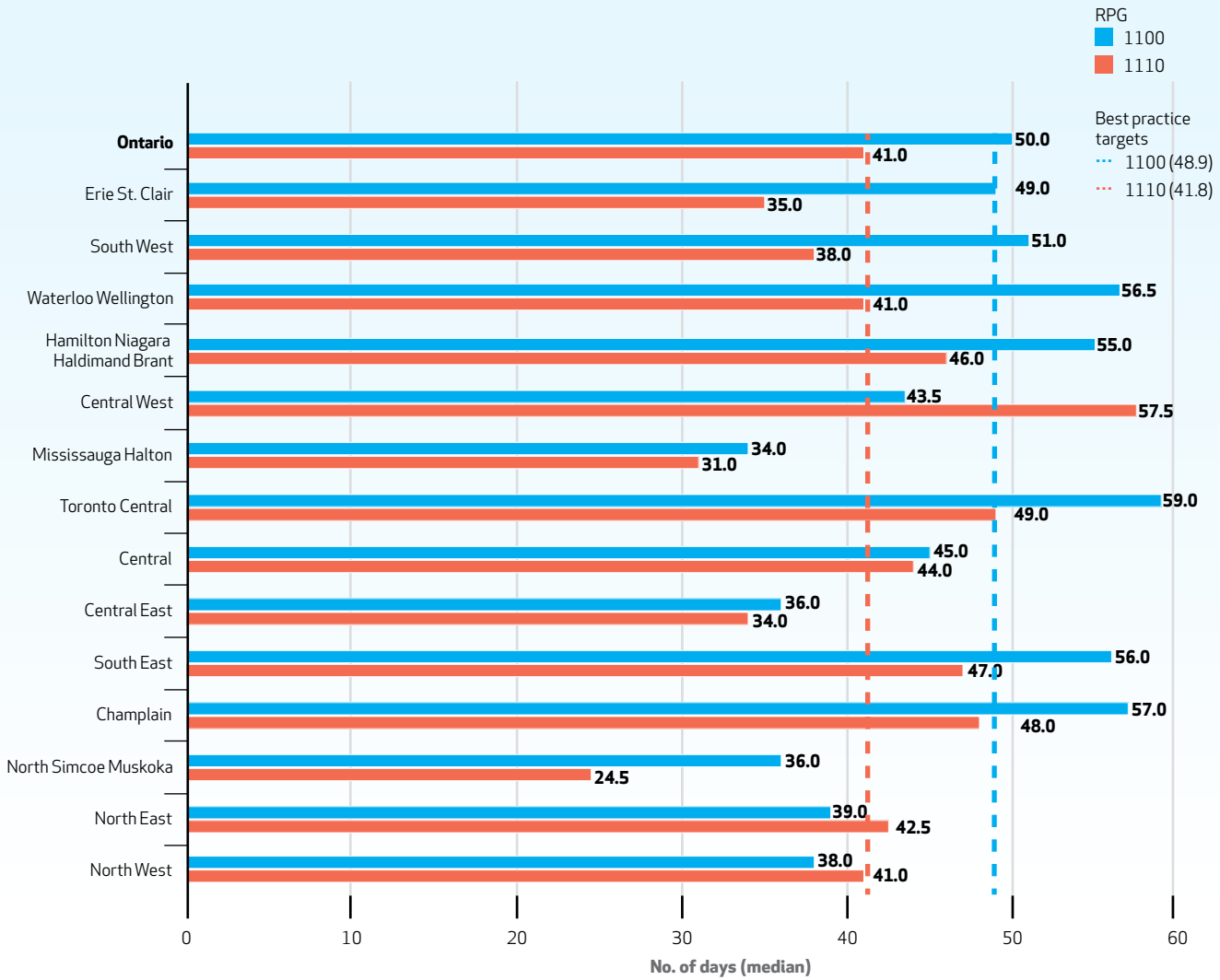


EXHIBIT 5.4D Median length of stay in inpatient rehabilitation by adult stroke patients with severe disability, in Ontario and by Local Health Integration Network, 2011/12

Key Findings

- Among severely disabled stroke patients, inpatient rehabilitation LOS ranged from 26 days in the North Simcoe Muskoka LHIN to 56 days in the Central West LHIN, with most variation occurring in RPG 1110 (data not shown).
- For severely disabled stroke patients, best practice expected LOS was achieved by half of the LHINs (7) for patients in both RPG 1110 and 1100.



Inpatient Rehabilitation

CONCLUSIONS

Admission to inpatient rehabilitation has increased from 27.7% in 2003/04 to 31.5% in 2011/12; however, the current rate has persisted for the past three years. The variation across LHINs has decreased from a 23.3% range in 2003/04 to a 15.0% range in 2011/12. In 2011/12, the North West LHIN had the highest rate of admission to inpatient rehabilitation (39.1%) and the Central LHIN had the lowest (24.0%).

The time from stroke onset to admission is decreasing but overall remains high at a median of 10 days (a mean of 16.5 days) in 2011/12. The variation across LHINs in the median time from stroke onset to inpatient rehabilitation admission has decreased from a range of 20 days in 2003/04 to a range of 5.5 days in 2011/12. Between 2010/11 and 2011/12, the variation across LHINs in the median time to inpatient rehabilitation decreased from 7 days to 5.5 days, a 35.7% relative decrease in one year.

Since 2003/04 there has been an increase in the proportion of moderately disabled patients admitted to inpatient rehabilitation, ranging from 40.7% in 2003/04 to 47.2% in 2011/12, with a decrease in severely disabled patients (from 36.1% to 34.1%) and mildly disabled patients (from 23.1% to 18.7%).

The OSN report *The Impact of Moving to Stroke Rehabilitation Best Practices in Ontario*[3] established target length of stay for Rehabilitation Patient Groups (RPGs). The LOS for most RPGs exceeds the targets; however, performance in achieving these targets is best for severely disabled stroke patients. This report has noted that investing in early supported discharge services and outpatient rehabilitation could reduce inpatient LOS and inappropriate use of inpatient rehabilitation by individuals with milder strokes who could be treated in the community. Much work to enhance outpatient rehabilitation services is needed to achieve these targets for mildly and moderately disabled stroke patients.

The implementation of the Stroke-QBP funding should help inpatient rehabilitation move toward these targets.

RECOMMENDATIONS

1. The OSN should continue to monitor length of stay for Rehabilitation Patient Groups as Quality Based Procedure funding is implemented.

2. The OSN should continue to advocate to the Ministry of Health and Long-Term Care and the Canadian institute for Health Information to develop measurements of rehabilitation intensity in order to drive performance to meet these targets.

3. The OSN should continue its work with the Ministry of Health and Long-Term Care and the Canadian Institute for Health Information to define a metric to monitor and evaluate the intensity of rehabilitation needed to achieve inpatient rehabilitation required efficiency and maximize functional outcomes within all care settings.

4. The OSN should work with the Ministry of Health and Long-Term Care to develop QBP for early supported discharge and outpatient rehabilitation to promote earlier discharge from inpatient services.

5. The Regional Stroke Networks should work with their LHINs to communicate these length of stay targets and develop strategies to achieve them in order to improve patient outcomes and efficiencies.

EXHIBIT 5.5 Characteristics of adult patients admitted to complex continuing care following an acute care inpatient stroke/TIA discharge, in Ontario and by Local Health Integration Network, 2008/09–2010/11

Key Findings

- In 2010/11, 1,279 patients were admitted to complex continuing care (CCC) following an acute care stroke/TIA hospitalization; 55.0% were women and the median age was 78 years, 4 years older than patients admitted to inpatient rehabilitation.
- In 2010/11, patients waited 28 median days from the time of their acute care admission to CCC, a reduction from 32 days in 2009/10. The acute care LOS for these patients was 16 median days, 9 days longer than the acute care LOS for the general stroke population.
- The median LOS in CCC was 57 days in 2010/11, a decrease from 62 days in 2008/09.

Characteristics,[1] 2008/09	Ontario	Erie St. Clair	South West	Waterloo Wellington
Patients, n	1,230	92	68	58
Female, n (%)	658 (53.5)	46 (50.0)	37 (54.4)	29 (50.0)
Age, mean (median)	76.2 (79)	79.9 (84)	79.1 (81)	73.2 (75.5)
Acute care length of stay in days, mean (median)	25.2 (16)	16.9 (10)	25.1 (15)	20.0 (9.5)
Alternate Level of Care length of stay in days, mean (median)	10.0 (2)	5.6 (0)	13.5 (0)	9.5 (0)
Length of stay in complex continuing care in days, mean (median)	107.0 (62)	74.8 (37)	105.0 (46)	74.3 (58)
Time from acute care admission to complex continuing care in days, mean (median)	49.6 (36)	52.2 (36)	48.2 (32.5)	39.0 (19.5)
Patients admitted from long-term care, n (%)	66 (5.4)	12 (13.0)	**	7 (12.1)
Dementia, n (%)				
Patients with dementia	186 (15.1)	18 (19.6)	15 (22.1)	**
Patients with Alzheimer's	41 (3.3)	8 (8.7)	**	**
Discharge Destinations Following Complex Continuing Care, n (%)				
Inpatient acute care	150 (12.2)	11 (12.0)	**	**
Inpatient continuing care	34 (2.8)	**	**	6 (10.3)
Home care service	242 (19.7)	10 (10.9)	7 (10.3)	16 (27.6)
Private home (no home care)	109 (8.9)	**	**	**
Long-term care home	345 (28.0)	30 (32.6)	28 (41.2)	10 (17.2)
Retirement home	54 (4.4)	6 (6.5)	**	**
Deceased	172 (14.0)	20 (21.7)	12 (17.6)	6 (10.3)
Other	124 (10.1)	7 (7.6)	9 (13.2)	10 (17.2)

Characteristics,[1] 2009/10	Ontario	Erie St. Clair	South West	Waterloo Wellington
Patients, n	1292	100	65	76
Female, n (%)	706 (54.6)	58 (58.0)	33 (50.8)	40 (52.6)
Age, mean (median)	76.3 (79)	78.2 (81)	78.0 (81)	75.6 (78)
Acute care length of stay in days, mean (median)	24.7 (16)	16.8 (14)	25.2 (15)	24.0 (17)
Alternate Level of Care length of stay in days, mean (median)	9.7 (2.5)	3.9 (0)	8.7 (1)	13.4 (4.5)
Length of stay in complex continuing care in days, mean (median)	97.2 (59)	76.6 (43)	83.7 (57)	79.5 (50.5)
Time from acute care admission to complex continuing care in days, mean (median)	46.9 (32)	43.3 (32)	51.9 (29)	41.4 (26)
Patients admitted from long-term care, n (%)	60 (4.6)	**	**	7 (9.2)
Dementia, n (%)				
Patients with dementia	192 (14.9)	24 (24.0)	7 (10.8)	7 (9.2)
Patients with Alzheimer's	31 (2.4)	**	**	**
Discharge Destinations Following Complex Continuing Care, n (%)				
Inpatient acute care	150 (11.6)	6 (6.0)	6 (9.2)	**
Inpatient continuing care	19 (1.5)	**	**	**

	Hamilton Niagara Haldimand Brant	Central West	Mississauga Halton	Toronto Central	Central	Central East	South East	Champlain	North Simcoe Muskoka	North East	North West
	145	56	89	168	135	196	50	65	37	29	41
	84 (57.9)	31 (55.4)	43 (48.3)	97 (57.7)	65 (48.1)	94 (48.0)	34 (68.0)	36 (55.4)	26 (70.3)	16 (55.2)	19 (46.3)
	76.1 (79)	73.9 (75)	75.8 (80)	77.2 (79)	76.8 (79)	73.6 (76)	76.0 (79)	75.8 (76)	78.7 (79)	74.5 (76)	80.2 (83)
	22.3 (15)	18.6 (12.5)	33.2 (16)	31.0 (23.5)	28.5 (21)	22.1 (16)	27.3 (16)	30.6 (27)	30.0 (21)	28.9 (15)	14.0 (12)
	11.3 (5)	7.5 (3.5)	13.7 (1)	12.5 (6)	9.6 (1)	7.1 (1)	10.1 (3)	9.2 (1)	14.5 (7)	16.8 (3)	4.0 (2)
	106.3 (50)	79.8 (83)	109.9 (55)	153.8 (90)	98.0 (66)	81.6 (49.5)	122.0 (60.5)	198.9 (135)	89.2 (68)	97.4 (70)	82.1 (48)
	49.3 (28)	32.7 (20)	63.4 (46)	48.7 (38.5)	49.9 (38)	49.2 (37)	46.7 (23.5)	50.3 (40)	57.9 (40)	58.7 (54)	49.1 (28)
	10 (6.9)	**	**	8 (4.8)	**	**	**	6 (9.2)	-	**	**
	19 (13.1)	**	15 (16.9)	34 (20.2)	19 (14.1)	28 (14.3)	12 (24.0)	12 (18.5)	**	**	**
	7 (4.8)	**	**	**	**	**	**	**	**	**	**
	15 (10.3)	6 (10.7)	11 (12.4)	29 (17.3)	21 (15.6)	20 (10.2)	6 (12.0)	12 (18.5)	**	**	**
	**	**	**	**	**	**	**	**	**	**	**
	17 (11.7)	11 (19.6)	13 (14.6)	38 (22.6)	37 (27.4)	70 (35.7)	**	**	**	7 (24.1)	6 (14.6)
	16 (11.0)	**	15 (16.9)	16 (9.5)	12 (8.9)	**	8 (16.0)	12 (18.5)	**	**	**
	37 (25.5)	19 (33.9)	17 (19.1)	44 (26.2)	30 (22.2)	56 (28.6)	16 (32.0)	22 (33.8)	14 (37.8)	9 (31.0)	13 (31.7)
	11 (7.6)	**	**	9 (5.4)	6 (4.4)	**	**	**	**	**	**
	29 (20.0)	**	20 (22.5)	24 (14.3)	18 (13.3)	17 (8.7)	6 (12.0)	**	**	**	**
	18 (12.4)	10 (17.9)	6 (6.7)	6 (3.6)	6 (4.4)	21 (10.7)	7 (14.0)	11 (16.9)	**	**	**

	Hamilton Niagara Haldimand Brant	Central West	Mississauga Halton	Toronto Central	Central	Central East	South East	Champlain	North Simcoe Muskoka	North East	North West
	166	73	86	142	147	196	41	111	37	39	29
	95 (57.2)	24 (32.9)	50 (58.1)	70 (49.3)	83 (56.5)	102 (52.0)	28 (68.3)	49 (58.3)	27 (65.9)	22 (59.5)	24 (66.7)
	77.7 (80)	73.4 (76)	77.2 (79)	76.9 (80.5)	74.8 (77)	75.6 (79)	79.4 (82)	72.1 (75)	76.4 (80)	78.5 (80)	78.5 (80.5)
	22.5 (15)	21.9 (15)	22.2 (17)	26.2 (20)	26.2 (16)	25.2 (15)	26.1 (17)	32.2 (28)	27.3 (21)	43.0 (14)	12.4 (12.5)
	9.4 (3)	8.2 (3)	6.6 (1)	10.4 (6)	8.2 (4)	10.4 (0)	11.6 (1)	11.9 (3.5)	9.4 (5)	30.7 (2)	4.4 (3)
	106.4 (59)	76.1 (66)	130.7 (83)	113.0 (75.5)	87.7 (51)	81.7 (57.5)	67.0 (45)	148.3 (64.5)	84.0 (73)	120.4 (42)	103.7 (48)
	47.6 (29.5)	42.6 (32)	42.4 (32.5)	41.9 (29.5)	50.1 (31)	47.0 (36.5)	43.6 (30)	44.9 (35.5)	52.0 (36)	71.8 (41)	58.1 (44)
	7 (4.2)	**	7 (8.1)	8 (5.6)	7 (4.8)	**	**	**	12 (100.0)	**	**
	32 (19.3)	7 (9.6)	11 (12.8)	25 (17.6)	25 (17.0)	23 (11.7)	6 (14.6)	9 (10.7)	9 (22.0)	**	**
	**	**	7 (8.1)	**	**	**	**	**	**	**	**
	13 (7.8)	7 (9.6)	9 (10.5)	27 (19.0)	13 (8.8)	27 (13.8)	**	19 (22.6)	**	**	7 (19.4)
	**	**	**	**	**	**	**	**	**	**	**

EXHIBIT 5.5 *continued*

- Provincially, there was a slight increase in the proportion of patients discharged home with services from CCC (from 18.2% in 2009/10 to 22.7% in 2010/11; p=0.0579).
- In 2010/11, 21.8% of patients were discharged to long-term care, a decrease from 29.4% in 2009/10 (p=0.0003), and 15.6% were discharged back to inpatient acute care, an increase from 11.6% in 2009/10 (p=0.0101).
- There was substantial variability in discharge destinations across LHINs. The proportion discharged home with services varied from 7.2% in the Champlain LHIN to 37.8% in the Central East LHIN. The proportion of patients discharged to long-term care ranged from 12.0% in the Mississauga Halton LHIN to 36.2% in the South West LHIN.

Home care service	235 (18.2)	12 (12.0)	**	11 (14.5)	
Private home (no home care)	130 (10.1)	**	**	10 (13.2)	
Long-term care home	380 (29.4)	38 (38.0)	25 (38.5)	21 (27.6)	
Retirement home	51 (3.9)	**	**	**	
Deceased	188 (14.6)	26 (26.0)	16 (24.6)	12 (15.8)	
Other	139 (10.8)	7 (7.0)	7 (10.8)	12 (15.8)	
Characteristics,[1] 2010/11	**Ontario**	**Erie St. Clair**	**South West**	**Waterloo Wellington**	
Patients, n	1,279	90	58	72	
Female, n (%)	703 (55.0)	48 (53.3)	30 (51.7)	45 (62.5)	
Age, mean (median)	75.7 (78)	78.9 (79)	78.3 (79.5)	75.7 (80)	
Acute care length of stay in days, mean (median)	21.9 (16)	21.3 (16)	18.7 (11)	18.8 (13.5)	
Alternate Level of Care length of stay in days, mean (median)	7.5 (2)	7.3 (0)	6.3 (0)	8.5 (2)	
Length of stay in complex continuing care in days, mean (median)	84.0 (57)	94.5 (62)	74.5 (35.5)	56.0 (42)	
Time from acute care admission to complex continuing care in days, mean (median)	42.6 (28)	55.0 (42)	44.1 (31)	38.1 (19.5)	
Patients admitted from long-term care, n (%)	60 (4.7)	**	**	10 (13.9)	
Dementia, n (%)					
Patients with dementia	167 (13.1)	21 (23.3)	**	10 (13.9)	
Patients with Alzheimer's	41 (3.2)	**	**	**	
Discharge Destinations Following Complex Continuing Care, n (%)					
Inpatient acute care	200 (15.6)	14 (15.6)	7 (12.1)	9 (12.5)	
Inpatient continuing care	21 (1.6)	**	**	**	
Home care service	290 (22.7)	7 (7.8)	12 (20.7)	10 (13.9)	
Private home (no home care)	125 (9.8)	**	**	6 (8.3)	
Long-term care home	279 (21.8)	29 (32.2)	21 (36.2)	12 (16.7)	
Retirement home	65 (5.1)	**	**	9 (12.5)	
Deceased	149 (11.6)	24 (26.7)	10 (17.2)	11 (15.3)	
Other	150 (11.7)	8 (8.9)	7 (12.1)	12 (16.7)	

	27 (16.3)	20 (27.4)	12 (14.0)	19 (13.4)	42 (28.6)	61 (31.1)	**	**	8 (19.5)	**	7 (19.4)
	14 (8.4)	**	18 (20.9)	21 (14.8)	19 (12.9)	17 (8.7)	**	9 (10.7)	**	**	-
	36 (21.7)	23 (31.5)	26 (30.2)	40 (28.2)	33 (22.4)	53 (27.0)	22 (53.7)	20 (23.8)	18 (43.9)	10 (27.0)	14 (38.9)
	15 (9.0)	**	**	**	**	**	**	**	**	**	**
	35 (21.1)	**	10 (11.6)	20 (14.1)	21 (14.3)	21 (10.7)	**	6 (7.1)	**	10 (27.0)	**
	22 (13.3)	16 (21.9)	9 (10.5)	9 (6.3)	13 (8.8)	10 (5.1)	**	25 (29.8)	**	**	**
	Hamilton Niagara Haldimand Brant	**Central West**	**Mississauga Halton**	**Toronto Central**	**Central**	**Central East**	**South East**	**Champlain**	**North Simcoe Muskoka**	**North East**	**North West**
	177	70	75	130	145	201	44	111	37	39	29
	93 (52.5)	34 (48.6)	44 (58.7)	65 (50.0)	78 (53.8)	111 (55.2)	28 (63.6)	67 (60.4)	20 (51.3)	20 (51.3)	19 (65.5)
	75.3 (79)	74.3 (77)	77.2 (78)	74.3 (78)	74.0 (76)	75.2 (78)	77.2 (79)	75.6 (77)	78.7 (81)	74 (76)	77.4 (79)
	19.7 (15)	16.6 (13)	21.9 (17)	29.2 (20.5)	26.7 (19)	17.7 (12)	16.3 (11)	23.3 (18)	25.4 (17)	27.3 (17)	26.3 (15)
	6.6 (3)	6.1 (1)	5.3 (1)	10.1 (6)	9.4 (2)	5.8 (0)	3.3 (0)	7.0 (1)	11.9 (7)	11.3 (0)	13.2 (4)
	91.3 (71)	70.0 (49)	88.5 (71)	109.0 (77.5)	88.9 (71)	70.7 (53)	46.6 (34)	94.7 (57)	58.3 (37)	85.1 (50)	121.6 (59)
	38.1 (22)	34.8 (21)	36.5 (30)	45.5 (33.5)	48.1 (32)	38.1 (24)	34.6 (14)	37.7 (24)	49.4 (33)	63.3 (50)	59.8 (57)
	12 (6.8)	**	**	**	**	**	**	7 (6.3)	7 (100.0)	**	**
	31 (17.5)	13 (18.6)	9 (12.0)	15 (11.5)	15 (10.3)	26 (12.9)	**	8 (7.2)	**	**	**
	8 (4.5)	**	**	**	8 (5.5)	**	**	**	**	**	**
	20 (11.3)	12 (17.1)	9 (12.0)	20 (15.4)	24 (16.6)	33 (16.4)	8 (18.2)	21 (18.9)	**	13 (33.3)	7 (24.1)
	**	**	**	**	**	**	**	**	**	**	**
	42 (23.7)	19 (27.1)	21 (28.0)	26 (20.0)	43 (29.7)	76 (37.8)	9 (20.5)	8 (7.2)	7 (18.9)	6 (15.4)	**
	25 (14.1)	**	10 (13.3)	17 (13.1)	18 (12.4)	20 (10.0)	**	13 (11.7)	**	**	**
	29 (16.4)	15 (21.4)	9 (12.0)	35 (26.9)	34 (23.4)	45 (22.4)	6 (13.6)	18 (16.2)	9 (24.3)	9 (23.1)	8 (27.6)
	19 (10.7)	**	**	6 (4.6)	**	**	**	**	**	**	**
	19 (10.7)	**	17 (22.7)	15 (11.5)	10 (6.9)	15 (7.5)	**	**	7 (18.9)	**	**
	19 (10.7)	11 (15.7)	7 (9.3)	8 (6.2)	10 (6.9)	**	10 (22.7)	44 (39.6)	**	**	**

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), 2008/09–2010/11 and Continuing Care Reporting System, Complex Continuing Care Database (CCRS–CCC), 2007/08–2011/12.

Inclusion criteria: All patients discharged alive following an inpatient stroke/TIA (from CIHI–DAD, 2008/09–2010/11) who appeared in the CCRS–CCC database within 6 months of the acute care discharge date.

1 Based on initial assessment closest to the stroke/TIA inpatient discharge date.

** Cell value suppressed for reasons of privacy and confidentiality.

Note:

Cells in which there were no reported/available data are marked with a hyphen (-).

EXHIBIT 5.6 Characteristics of adult patients admitted to complex continuing care following an acute care inpatient stroke/TIA discharge, in Ontario, 2008/09–2010/11, and assessed 3 months after the initial assessment

Key Findings

- The overall prevalence of possible depression among patients in CCC facilities as measured by the Depression Rating Scale on the RAI-MDS decreased from 17.6% in 2008/09 to 14.8% in 2010/11.
- The proportion of stroke patients considered to be socially engaged in the activities within the facility increased slightly over time (from 35.4% in 2008/09 to 37.6% in 2010/11).
- On the Activities of Daily Living (ADL) scale, stroke patients admitted to CCC typically scored high (median 20), indicating greater difficulty performing ADLs. This remained consistent over the 3 years.
- Among patients who had a 3-month follow-up visit in 2010/11, 26.8% identified a pain scale level of 2 or more at their initial assessment, indicating pain, and 34.0% indicated this after 3 months.
- The prevalence of depression among patients within CCC facilities in 2011/12 also increased from the time of initial assessment to the 3-month follow-up, from 14.6% to 20.1% (p=0.008).
- In 2010/11, 40% of patients received speech therapy, 78.6% received occupational therapy, 87.3% received physiotherapy and 29.8% received recreation therapy, either individually or in a small group setting. There was a minimal increase in the intensity of rehabilitation therapies from 2008/09 onward.

	2008/09	
RAI-MDS Scales	**All**[1]	
Ontario	1,230	
Depression Rating Scale[3]		
Score, mean, median (IQR)	1.3, 0 (0–2)	
≥3, n (%)	215 (17.6)	
≥3 and receiving medication, n (%)	106 (49.3)	
Index of Social Engagement[4]		
≥4, n (%)	435 (35.4)	
Activities of Daily Living[5]		
Score, mean, median (IQR)	18.8, 21 (14–26)	
Cognitive Performance Scale[6]**, n (%)**		
0–2	552 (44.9)	
3	303 (24.6)	
4–6	375 (30.5)	
Pain Scale[7]**, n (%)**		
2 or more	376 (30.6)	
Therapy		
Speech therapy received, n (%)	479 (38.9)	
Amount received (minutes) in 7 days, mean (median)	85.7 (60)	
Occupational therapy received, n (%)	928 (75.4)	
Amount received (minutes) in 7 days, mean (median)	117.0 (90)	
Physiotherapy received, n (%)	1,074 (87.3)	
Amount received (minutes) in 7 days, mean (median)	125.9 (107.5)	
Recreation therapy received, n (%)	464 (37.7)	
Amount received (minutes) in 7 days, mean (median)	83.0 (60)	

2008/09		2009/10			2010/11		
Cohort of patients with 3-month follow-up visit[2]			Cohort of patients with 3-month follow-up visit[2]			Cohort of patients with 3-month follow-up visit[2]	
Initial assessment	Assessment at 3-month follow-up[2]	All[1]	Initial assessment	Assessment at 3-month follow-up[2]	All[1]	Initial assessment	Assessment at 3-month follow-up[2]
363	363	1,292	358	358	1,279	298	298
1.4, 1 (0–2)	1.4, 0 (0–2)	1.3, 0 (0–2)	1.4, 0.5 (0–2)	1.4, 1 (0–2)	1.1, 0 (0–2)	1.1, 0 (0–2)	1.4, 0 (0–2)
64 (17.7)	81 (22.4)	221 (17.3)	68 (19.3)	66 (18.6)	174 (14.8)	39 (14.6)	38 (20.1)
30 (46.9)	48 (59.3)	98 (44.3)	31 (45.6)	36 (54.5)	72 (41.4)	13 (33.3)	21 (55.3)
124 (34.2)	147 (40.5)	499 (38.6)	143 (39.9)	153 (42.7)	481 (37.6)	108 (36.2)	78 (26.2)
20.0, 22 (15–26)	18.1, 20 (12–25)	18.6, 20 (13–25)	20.5, 22 (17–26)	18.7, 20 (13–26)	18.1, 20 (13–25)	20.3, 21.5 (15.5–26)	18.5, 20 (12–26)
145 (39.9)	161 (44.4)	608 (47.1)	174 (48.6)	170 (47.5)	581 (48.7)	113 (41.5)	80 (41.9)
94 (25.9)	90 (24.8)	313 (24.3)	75 (20.9)	80 (22.3)	283 (23.7)	52 (19.1)	47 (24.6)
124 (34.2)	112 (30.9)	369 (28.6)	109 (30.4)	108 (30.2)	328 (27.5)	107 (39.3)	64 (33.5)
96 (26.4)	93 (25.6)	397 (30.8)	97 (27.1)	93 (26.0)	326 (27.3)	73 (26.8)	65 (34.0)
165 (45.5)	138 (38.0)	528 (40.9)	164 (45.8)	129 (36.0)	512 (40.0)	132 (44.3)	113 (37.9)
88.7 (60)	70.2 (50)	89.2 (60)	84.0 (60)	75.4 (60)	85.1 (65)	91.7 (65)	81.8 (60)
296 (81.5)	251 (69.1)	1,008 (78.0)	290 (81.0)	249 (69.6)	1,005 (78.6)	229 (76.8)	218 (73.2)
115.9 (90)	104.5 (80)	122.5 (90)	122.5 (90)	107.9 (90)	123.5 (95)	117.9 (90)	128.8 (90)
320 (88.2)	304 (83.7)	1,123 (86.9)	325 (90.8)	303 (84.6)	1,116 (87.3)	254 (85.2)	238 (79.9)
127.3 (107.5)	121.8 (100)	127.0 (110)	120.4 (100)	104.1 (90)	132.3 (110)	122.8 (102.5)	120.2 (95)
137 (37.7)	161 (44.4)	457 (35.4)	138 (38.5)	159 (44.4)	381 (29.8)	95 (31.9)	128 (43.0)
74.7 (60)	93.5 (60)	79.1 (50)	80.6 (52.5)	102.8 (60)	88.5 (60)	78.1 (60)	98.3 (72.5)

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), 2008/09–2010/11 and Continuing Care Reporting System, Complex Continuing Care Database (CCRS–CCC), 2008/09–2011/12.

Inclusion criteria: All patients discharged alive following an inpatient stroke/TIA (from CIHI–DAD, 2008/09–2010/11) who appeared in the CCRS-CCC database within 6 months of the acute care discharge date.

1 Based on all patients who had an initial assessment in a CCC home; assessment closest to the stroke/TIA inpatient discharge date.

2 Cohort of residents who experienced an acute stroke/TIA and had both an initial assessment and a follow-up assessment at 3 months after the initial assessment.

3 Score range is 0–12; a score of 3 or more indicates possible depression.

4 Score range is 0–6; a higher score indicates greater social engagement.

5 Score range is 0–28; a higher score indicates greater difficulty in performing activities.

6 Score range is 0–6; a higher score indicates greater cognitive impairment.

7 Score range is 0–3; a higher score indicates more pain.

Note:

Therapy time may include individual therapy sessions and group therapy sessions of one therapist to every four patients for occupational therapy and physiotherapy, and one therapist to every eight patients for recreation therapy.

RAI-MDS = Resident Assessment Instrument - Minimum Data Set

IQR = interquartile range (25th–75th percentile).

Complex Continuing Care

CONCLUSIONS

In 2010/11, 1,200 stroke patients with a median age of 78 years were admitted to complex continuing care (CCC) in Ontario for "slow stream" rehabilitation. Women represented 55% of this cohort. Between 2009/10 and 2011/12, the time to CCC admission from acute care decreased by 8 days and the CCC length of stay decreased by 5 days, with a minimal increase in the intensity of rehabilitation therapy provided. Fewer patients are discharged to long-term care, more are discharged home with services, and there has been a rise in the proportion of patients discharged back to an acute care setting. At the same time there has been no change in the acute care stroke inpatient LOS and there has been a decrease in the proportion of patients with Alzheimer's/dementia within CCC. The prevalence of depression consistently increased among patients receiving a three-month follow-up assessment in 2010/11, from 14.6% at the initial assessment to 20.1% at three months (p=0.0079). The Canadian Best Practice Recommendations for Stroke Care recently released an update[34] which advised that all individuals living with stroke should be screened for depression, as its occurrence is significant, but noted that many patients are failing to receive proper care.

Based on the amount of therapy delivered to patients with the potential to return home, the CCC setting is not preferable. However, more investigation is needed to describe the stroke patient population receiving care within CCC in order to identify patients who may benefit from more intensive rehabilitation within an inpatient rehabilitation setting.

RECOMMENDATIONS

1. Further research is required to better understand post-stroke depression and its treatment, as well as the levels of access to specialized mental health services in CCC and across the care continuum.

2. The OSN should continue to advocate for provincial data collection with standardized measurements of rehabilitation intensity and outcomes (i.e., FIM scores) to evaluate stroke rehabilitation in all settings.

3. There has been an increase in the proportion of patients being discharged back to acute care, and this should be monitored as the Stroke-QBP funding initiative is implemented in the next fiscal year.

6 Home Care Services

EXHIBIT 6.1 Length of time to provision of Community Care Access Centre support services to adult home care clients (active and new) following an acute care hospitalization for stroke, in Ontario and by sex and Local Health Integration Network, 2006/07–2011/12

Key Findings

- Of the 7,085 stroke patients who received CCAC services following an acute care stroke hospitalization in 2010/11–2011/12, 14.1% received CCAC services after an inpatient rehabilitation stay, and among these patients, 90% received CCAC rehabilitation services (data not shown).
- There was variation across the LHINs in the number of median days to provision of first CCAC rehabilitation service, ranging from 7 days in the Central West LHIN to 25 days in the North Simcoe Muskoka LHIN in 2010/11–2011/12.
- The proportion of stroke patients receiving CCAC rehabilitation services in 2011/12 varied from 29.0% in the North East LHIN to 73.0% in the South East LHIN.
- The dramatic increase in the delivery of CCAC rehabilitation services in the South East LHIN, from 60.2% in 2006/07–2007/08 to 73.0% in 2010/11–2011/12, likely reflects the enhanced community-based rehabilitation initiative in this region.

	2006/07–2007/08			
		Rehabilitation services (Physiotherapy, Occupational Therapy, Speech Therapy or Social Work)		
Group/Subgroup	No. of clients with stroke[1]	% of clients who received services[1]	Mean no. of days to first service	Median no. of days to first service
Ontario	5,859	57.8	20.7	15
Female	3,231	57.2	20.5	15
Male	2,628	58.5	20.9	16
Local Health Integration Network				
1. Erie St. Clair	365	51.0	18.1	11.5
2. South West	591	52.1	19.5	13.5
3. Waterloo Wellington	337	58.8	23.5	21
4. Hamilton Niagara Haldimand Brant	831	66.7	19.4	14
5. Central West	299	61.9	21.0	16
6. Mississauga Halton	388	68.8	20.3	16
7. Toronto Central	449	52.1	19.7	11.5
8. Central	615	59.8	20.3	16
9. Central East	665	58.6	20.8	14
10. South East[2]	216	60.2	23.2	19
11. Champlain	329	48.9	27.1	26
12. North Simcoe Muskoka	250	39.6	22.1	19
13. North East	368	57.3	22.7	20
14. North West	156	60.3	14.7	9

	2008/09–2009/10				2009/10–2010/11				2010/11–2011/12			
		Rehabilitation services (Physiotherapy, Occupational Therapy, Speech Therapy or Social Work)				Rehabilitation services (Physiotherapy, Occupational Therapy, Speech Therapy or Social Work)				Rehabilitation services (Physiotherapy, Occupational Therapy, Speech Therapy or Social Work)		
	No. of clients with stroke[1]	% of clients who received services[1]	Mean no. of days to first service	Median no. of days to first service	No. of clients with stroke[1]	% of clients who received services[1]	Mean no. of days to first service	Median no. of days to first service	No. of clients with stroke[1]	% of clients who received services[1]	Mean no. of days to first service	Median no. of days to first service
	6,094	57.7	20.5	15	6,394	53.5	19.9	14	7,085	50.6	20.4	15
	3,339	55.7	20.4	15	3,526	52.9	19.3	13	3,888	49.6	20.1	15
	2,755	60.0	20.7	15	2,868	54.2	20.6	15	3,197	51.7	20.8	15
	376	53.2	18.7	13.5	393	41.7	20.1	16	428	42.5	19.7	15
	555	56.2	18.9	13	658	58.5	18.8	12	643	56.1	19.8	15
	429	56.6	18.1	12	441	52.6	19.7	13	462	54.3	21.9	15
	732	62.6	21.6	17	791	57.5	18.1	8	876	58.2	19.8	14
	323	65.9	17.7	10	355	65.9	16.9	6	440	64.1	16.9	7
	475	66.9	17.6	13	423	66.9	19.2	16	478	60.5	19.5	14
	585	49.9	21.8	15	577	45.6	16.7	10	791	34.0	19.3	13
	679	71.1	19.5	14	650	65.1	18.4	13	684	59.5	20.1	14
	628	61.1	20.9	15	755	54.0	22.4	17.5	782	47.4	21.9	17
	230	58.3	26.2	24.5	244	70.1	25.0	24	319	73.0	22.0	18
	328	49.4	22.9	21	379	41.4	24.3	21	420	42.1	22.5	18
	262	34.7	24.3	23	248	25.0	24.8	25	266	30.5	25.5	25
	376	40.4	26.1	21	386	36.5	24.4	22	373	29.0	25.3	20
	116	63.8	22.5	16.5	94	43.6	18.4	10	123	50.4	18.0	8

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), 2006/07–2010/11; Ontario Ministry of Health and Long-Term Care, Home Care Database, 2006/07–2011/12.

Inclusion criteria: All clients aged ≥18 years discharged from an acute care facility in 2006/07, 2007/08, 2008/09, 2009/10 or 2010/11 with a stroke-related diagnosis (based on ICD-10 codes) who received home care services within 60 days of discharge. Active clients included those receiving home care services 90 days before admission to acute care (N = 1,741, 1,689, 1,709, 1,911 and 2,018, respectively). New clients included those not receiving home care services 90 days before acute care hospitalization for stroke (N = 4,118, 4,268, 4,385, 4,483 and 5,067, respectively).

1 Based on patient visits (i.e., includes multiple patient-visits if they occurred in different LHINs).

2 The Home Care Database did not include data related to the community-based rehabilitation services initiative in the South East LHIN in 2009/10. This initiative provided, on average, 12 rehabilitation services per patient over a 60-day period.

Notes:

(1) CCAC-based analysis (i.e., the location of the CCAC is used to report regional performance).

(2) Calculated time in days to first CCAC rehabilitation visit was based on subtracting the acute care stroke/TIA discharge date from the first CCAC rehabilitation service date.

EXHIBIT 6.1A Proportion of adult stroke home care clients receiving Community Care Access Centre support services, in Ontario and by sex, 2006/07 and 2008/09–2011/12

Key Finding

- The total number of stroke patients referred to Community Care Access Centres (CCACs) in the province increased but the proportion receiving CCAC-based rehabilitation services declined from 57.8% in 2006/07–2007/08 to 50.6% in 2010/11–2011/12.

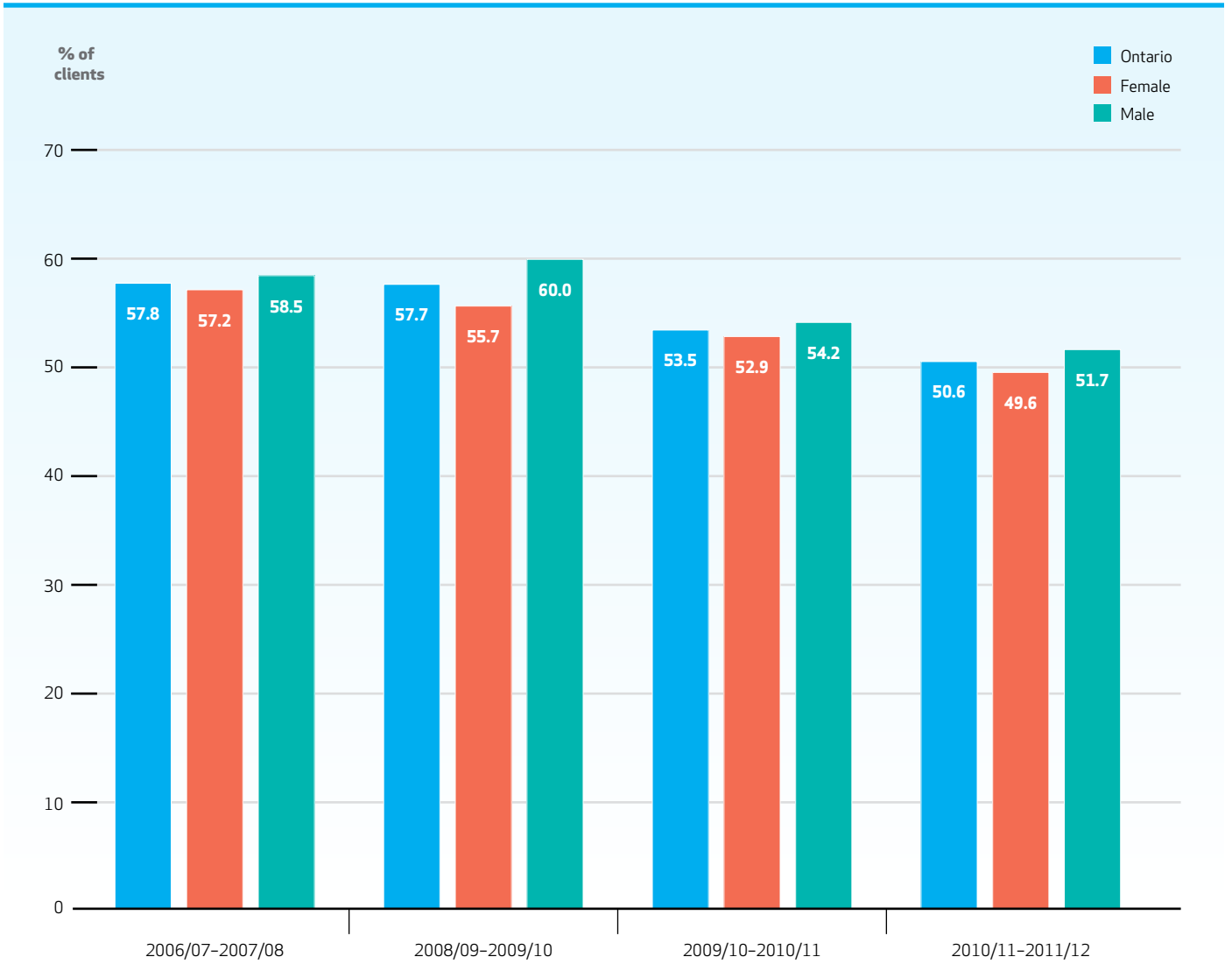
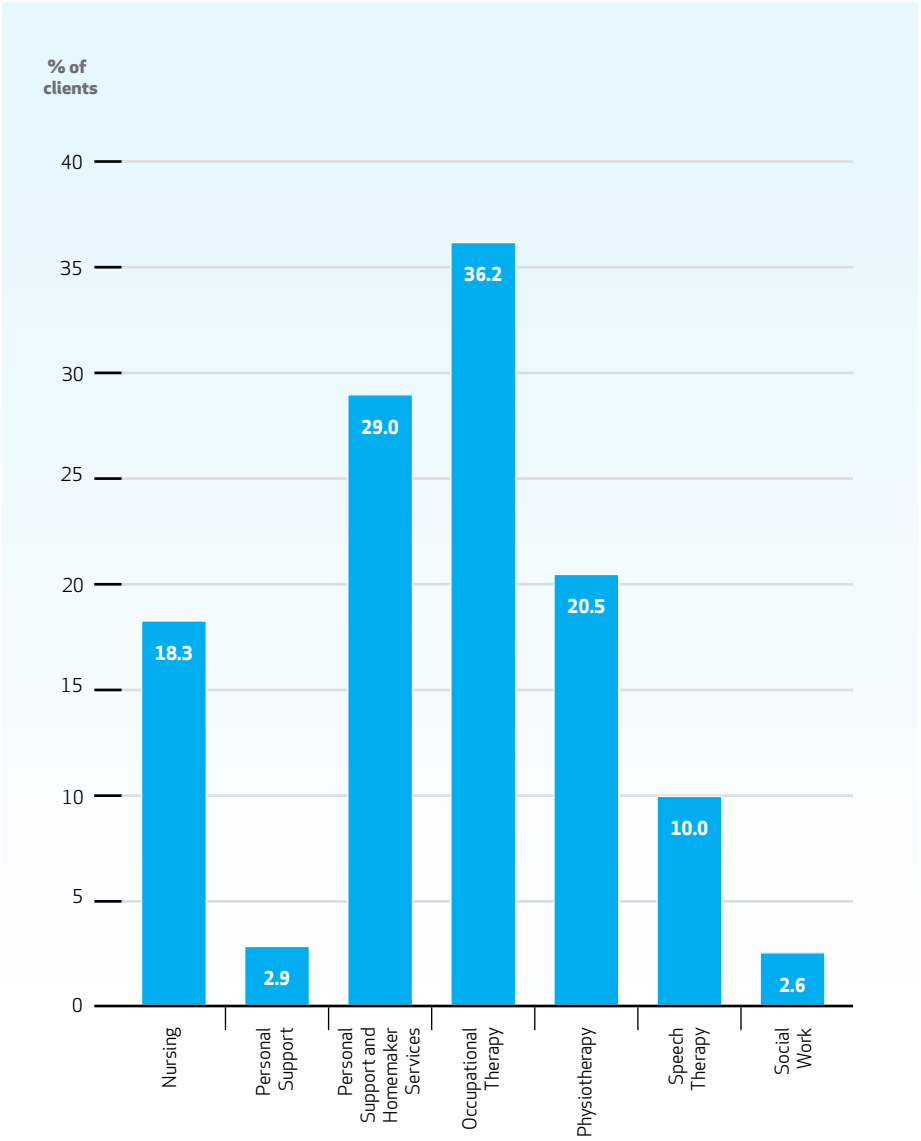


EXHIBIT 6.1B Proportion of adult stroke home care clients receiving Community Care Access Centre rehabilitation services in Ontario, by service type, 2010/11–2011/12

Key Findings

- Less than 1 in 5 stroke/TIA patients received nursing CCAC services and less than 1 in 3 stroke/TIA patients received personal support and homemaking services.
- Only 1 in 5 stroke/TIA patients received physiotherapy services.
- More than 1 in 3 stroke/TIA patients received occupational therapy services.
- One in 10 stroke/TIA patients received speech therapy. All CCAC services to stroke patients have declined over time with the exception of Personal Support Worker care.
- The provision of personal support services dropped from 10 median hours over 60 days in 2008/09–2009/10 to 14 median hours over 60 days in 2010/11–2011/12; however, many LHINs did not provide personal support services to stroke patients. (*See supplementary exhibit 6.2s at* **www.ices.on.ca**.)
- The mean number of rehabilitation service visits (occupational therapy, physiotherapy, speech therapy or social work) per patient declined from 4.4 visits over 60 days in 2006/07–2007/08 to 3.8 visits over 60 days in 2010/11–2011/12 (*See supplementary exhibit 6.2s at* **www.ices.on.ca**.)
- The mean number of CCAC rehabilitation visits in 2011/12 varied from 10.7 in the South East LHIN to 3.8 in the Toronto Central LHIN. (*See supplementary exhibit 6.3s at* **www.ices.on.ca**.)



Home Care Services

CONCLUSIONS AND RECOMMENDATIONS

In 2010/11–2011/12, only half of stroke/TIA patients (50.6%) received rehabilitation services from a Community Care Access Centre (CCAC) after an acute care stroke hospitalization, and only 7 of 14 LHINs provided CCAC rehabilitation services to more than 50% of stroke patients. The variation across LHINs in the proportion of stroke patients receiving CCAC rehabilitation services may reflect health care human resource availability, as well as the variation in meeting patient criteria to receive services.

Although there is wide variation in the proportion of stroke patients accessing CCAC rehabilitation services, the intensity of services provided is not sufficient to have an impact on functional outcomes. The OSN recommends two to three community-based rehabilitation visits per week (per required discipline) for 8 to 12 weeks. Current data reveal that patients receive three to five CCAC rehabilitation visits over an eight-week period.[3]

The OSN should continue to work with the Regional Stroke Networks and LHINs to develop a case for change as outlined in the report *The Impact of Moving to Stroke Rehabilitation Best Practices in Ontario*.[3]

Successful models of community rehabilitation services in the South East and South West LHINs should be shared and used to inform models of care in order to enhance community services.

The OSN should continue to work with Health Quality Ontario and the MOHLTC to develop the Quality Based Procedures funding model for best practice community care and outpatient rehabilitation.

7 Patient Outcomes

EXHIBIT 7.1 Age- and sex-adjusted stroke/TIA-related revisit or readmission rates within 30 days following a stroke or transient ischemic attack, in Ontario and by stroke type, Ontario Stroke System designation and Local Health Integration Network, 2003/04 and 2009/10–2011/12

Key Findings

- Following the first emergency department visit or inpatient admission for stroke/TIA, the rate of a stroke-related revisit or readmission within 30 days remained fairly constant from 2003/04 onward, reaching 4.9% in 2011/12.
- In 2011/12, designated stroke centres had lower age- and sex-adjusted rates of revisits or readmissions (4.2% for regional stroke centres and 4.1% for district stroke centres), compared to 5.7% for non-designated hospitals.
- Consistently, TIA patients had the highest rate of stroke/TIA-related revisits or readmissions, highlighting their need for improved care.
- Across the LHINs in 2011/12, the North East LHIN had the lowest revisit/readmission rate (4.2%) and the North West LHIN had the highest (5.5%).

	2003/04	
Group/Subgroup	**Observed, %**	**Adjusted[1], % (CI)**
Ontario[2]	5.0	5.0 (4.7–5.2)
Stroke Type		
Intracerebral hemorrhage	3.7	3.7 (2.5–4.9)
Ischemic stroke	4.0	4.0 (3.6–4.4)
Subarachnoid hemorrhage	5.1	5.1 (3.4–6.7)
Transient ischemic attack	6.7	6.7 (6.3–7.2)
Ontario Stroke System designation		
Regional stroke centre	4.3	4.3 (3.7–4.9)
District stroke centre	5.0	5.0 (4.3–5.7)
Non-designated	5.2	5.2 (4.8–5.6)
Local Health Integration Network		
1. Erie St. Clair	4.9	4.9 (3.8–6.0)
2. South West	4.7	4.7 (3.7–5.7)
3. Waterloo Wellington	4.5	4.5 (3.2–5.9)
4. Hamilton Niagara Haldimand Brant	4.7	4.7 (3.9–5.5)
5. Central West	5.4	5.4 (3.9–6.8)
6. Mississauga Halton	5.0	5.0 (3.9–6.1)
7. Toronto Central	3.9	3.9 (3.0–4.8)
8. Central	5.0	5.0 (4.0–6.0)
9. Central East	5.6	5.6 (4.8–6.5)
10. South East	5.7	5.7 (4.5–7.0)
11. Champlain	5.4	5.4 (4.5–6.3)
12. North Simcoe Muskoka	5.6	5.6 (4.2–6.9)
13. North East	4.9	4.9 (3.8–6.0)
14. North West	4.1	4.1 (2.3–5.9)

30-Day Revisit/Readmission Rate						
	2009/10		2010/11		2011/12	
	Observed, %	Adjusted[1], % (CI)	Observed, %	Adjusted[1], % (CI)	Observed, %	Adjusted[1], % (CI)
	4.9	4.9 (4.6–5.1)	4.7	4.7 (4.5–5.0)	4.9	4.9 (4.6–5.2)
	3.5	3.4 (2.4–4.5)	3.0	3.0 (1.9–4.0)	2.4	2.4 (1.3–3.5)
	4.0	4.0 (3.6–4.4)	3.9	3.9 (3.6–4.3)	4.1	4.1 (3.7–4.5)
	3.7	3.7 (2.1–5.2)	4.2	4.3 (2.8–5.8)	4.9	4.7 (3.2–6.3)
	6.5	6.5 (6.1–7.0)	6.3	6.4 (6.0–6.8)	6.5	6.5 (6.0–7.0)
	4.0	4.0 (3.5–4.5)	3.7	3.7 (3.2–4.2)	4.2	4.2 (3.6–4.7)
	5.1	5.1 (4.5–5.7)	4.6	4.7 (4.1–5.3)	4.1	4.1 (3.5–4.8)
	5.2	5.2 (4.9–5.6)	5.4	5.4 (5.0–5.7)	5.6	5.7 (5.3–6.1)
	4.9	4.9 (3.8–6.0)	3.7	3.8 (2.7–4.8)	4.3	4.4 (3.2–5.5)
	5.1	5.1 (4.2–6.1)	5.0	5.0 (4.0–5.9)	4.4	4.4 (3.4–5.3)
	6.2	6.2 (5.0–7.4)	5.2	5.3 (4.0–6.5)	4.6	4.6 (3.4–5.8)
	3.9	3.9 (3.1–4.7)	4.7	4.7 (3.9–5.4)	5.3	5.3 (4.5–6.2)
	4.3	4.3 (2.9–5.7)	5.2	5.1 (3.8–6.5)	4.4	4.4 (3.0–5.9)
	4.2	4.2 (3.1–5.2)	4.7	4.7 (3.7–5.7)	4.9	4.8 (3.7–5.9)
	4.9	4.9 (4.1–5.7)	4.4	4.4 (3.6–5.2)	5.1	5.1 (4.2–5.9)
	5.3	5.3 (4.4–6.3)	5.0	5.0 (4.1–5.9)	5.0	5.0 (4.0–6.0)
	5.1	5.1 (4.2–6.0)	5.3	5.3 (4.4–6.1)	5.2	5.2 (4.3–6.1)
	4.3	4.3 (3.0–5.6)	5.5	5.5 (4.2–6.9)	4.7	4.7 (3.3–6.1)
	5.0	5.0 (4.1–5.9)	5.3	5.3 (4.4–6.2)	5.4	5.4 (4.5–6.3)
	5.1	5.1 (3.7–6.5)	4.4	4.4 (3.1–5.8)	4.9	4.9 (3.5–6.3)
	6.0	6.0 (4.8–7.1)	3.8	3.8 (2.6–4.9)	4.3	4.2 (3.1–5.4)
	3.8	3.8 (2.0–5.5)	3.0	3.0 (1.3–4.7)	5.6	5.5 (3.7–7.3)

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD) and National Ambulatory Care Reporting System (NACRS), 2003/04–2011/12.

Inclusion criteria: All patients aged ≥18 years readmitted to an emergency department or acute care inpatient setting with a diagnosis of stroke (ischemic or hemorrhagic) or transient ischemic attack within 30 days of the initial stroke or TIA event in each year (includes April 1, 2011 to February 29, 2012 for 2011/12).

Exclusion criteria: Patients with an elective admission, scheduled emergency department visit or transfer within a facility or between facilities within 24 hours.

1 Indirect standardization based on an age-sex regression model was used to calculate adjusted rates.

2 Based on unique patients (i.e., does not include multiple patient-visits).

Notes:

(1) No washout periods were applied; for example, if a patient's first hospitalization for stroke had a discharge date of March 31, 2009 (fiscal year 2008/09), followed by another hospitalization for stroke/TIA on April 1, 2009 (FY 2009/10), the April 1 hospitalization would be considered the first hospitalization in 2009/10 and not a readmission related to the hospitalization in 2008/09.

(2) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(3) See Appendix E for a list of hospitals designated as regional and district stroke centres by the OSS.

(4) Indicates significant difference from the provincial rate. Significance is based on the 95% confidence interval falling entirely above or below the provincial rate.

CI = confidence interval (5th–95th percentile).

EXHIBIT 7.2 Age- and sex-adjusted stroke/TIA-related revisit or readmission rates within 90 days following a stroke or transient ischemic attack, in Ontario and by stroke type, Ontario Stroke System designation and Local Health Integration Network, 2003/04 and 2008/09–2010/11

Key Findings

- Following the first emergency department visit or inpatient admission for stroke/TIA, the rate of a stroke/TIA-related revisit or admission within 90 days remained at 6.6% for 2009/10 and 2010/11.
- Adjusted revisit/readmission rates for intracerebral hemorrhage patients declined from 5.4% in 2003/04 to 4.5% in 2010/11.
- TIA patients had the highest rate of revisits/readmissions at 8.3%. Non-designated hospitals consistently had the highest rates of readmission within 90 days (7.1%, compared to 5.5% at regional stroke centres and 6.9% at district centres in 2010/11; p=0.0003).
- There was greater variation across the LHINs for 90-day revisit/readmission rates compared to 30-day rates. The North West LHIN had the lowest 90-day revisit/readmission rate in 2010/11 (3.8%) and the Central West LHIN had the highest (7.6%). This may be due to the fact that the Central West LHIN does not have specialized stroke services.

	2003/04	
Group/Subgroup	**Observed, %**	**Adjusted[1], % (CI)**
Ontario[2]	7.0	7.0 (6.6–7.3)
Stroke Type		
Intracerebral hemorrhage	5.3	5.4 (4.0–6.8)
Ischemic stroke	6.0	6.0 (5.6–6.5)
Subarachnoid hemorrhage	5.8	6.0 (4.0–8.0)
Transient ischemic attack	8.9	8.9 (8.3–9.4)
Ontario Stroke System designation		
Regional stroke centre	6.1	6.2 (5.5–6.9)
District stroke centre	7.4	7.4 (6.6–8.2)
Non-designated	7.2	7.2 (6.7–7.6)
Local Health Integration Network		
1. Erie St. Clair	7.7	7.7 (6.4–9.0)
2. South West	6.2	6.2 (5.0–7.4)
3. Waterloo Wellington	6.5	6.5 (4.9–8.1)
4. Hamilton Niagara Haldimand Brant	6.9	6.9 (6.0–7.8)
5. Central West	7.7	7.8 (6.1–9.5)
6. Mississauga Halton	7.1	7.1 (5.8–8.4)
7. Toronto Central	5.7	5.7 (4.7–6.8)
8. Central	7.2	7.2 (6.0–8.3)
9. Central East	7.5	7.5 (6.5–8.5)
10. South East	7.2	7.2 (5.7–8.7)
11. Champlain	7.1	7.1 (6.0–8.1)
12. North Simcoe Muskoka	8.1	8.1 (6.5–9.6)
13. North East	6.8	6.8 (5.5–8.1)
14. North West	6.4	6.4 (4.3–8.5)

90-Day Revisit/Readmission Rate						
	2008/09		2009/10		2010/11	
	Observed, %	Adjusted[1], % (CI)	Observed, %	Adjusted[1], % (CI)	Observed, %	Adjusted[1], % (CI)
	6.4	6.4 (6.1–6.7)	6.6	6.6 (6.3–7.0)	6.6	6.6 (6.3–6.9)
	4.3	4.3 (3.0–5.6)	4.6	4.6 (3.3–5.8)	4.5	4.5 (3.3–5.8)
	5.6	5.6 (5.2–6.0)	5.9	5.9 (5.5–6.3)	5.8	5.8 (5.4–6.2)
	4.0	4.2 (2.4–6.0)	4.0	4.1 (2.3–5.9)	5.1	5.3 (3.6–7.1)
	8.2	8.2 (7.6–8.7)	8.3	8.3 (7.8–8.8)	8.3	8.3 (7.7–8.8)
	5.9	5.9 (5.3–6.5)	5.7	5.7 (5.1–6.3)	5.5	5.5 (5.0–6.2)
	5.4	5.4 (4.7–6.2)	6.8	6.8 (6.1–7.5)	6.9	6.9 (6.2–7.6)
	7.0	7.0 (6.6–7.5)	7.1	7.1 (6.6–7.5)	7.1	7.1 (6.6–7.5)
	5.9	5.8 (4.6–7.1)	7.0	7.0 (5.7–8.2)	6.0	6.1 (4.8–7.3)
	7.2	7.2 (6.1–8.3)	6.7	6.7 (5.6–7.7)	6.9	6.9 (5.8–8.0)
	6.2	6.2 (4.7–7.7)	7.8	7.8 (6.4–9.3)	7.1	7.2 (5.7–8.6)
	6.1	6.1 (5.2–7.0)	5.8	5.8 (4.9–6.7)	6.7	6.7 (5.8–7.6)
	7.6	7.7 (6.1–9.3)	5.9	5.9 (4.3–7.6)	7.6	7.6 (6.0–9.2)
	6.5	6.5 (5.3–7.7)	5.9	5.9 (4.7–7.1)	6.1	6.1 (4.9–7.3)
	6.1	6.1 (5.2–7.1)	6.4	6.4 (5.5–7.3)	6.2	6.2 (5.3–7.2)
	6.8	6.7 (5.7–7.8)	7.2	7.2 (6.1–8.3)	6.4	6.4 (5.3–7.5)
	6.8	6.8 (5.8–7.8)	6.7	6.7 (5.7–7.7)	7.1	7.1 (6.1–8.1)
	5.6	5.6 (4.1–7.1)	6.0	6.0 (4.4–7.5)	7.4	7.3 (5.8–8.9)
	6.5	6.5 (5.4–7.5)	6.6	6.6 (5.6–7.7)	7.0	7.0 (6.0–8.1)
	6.9	6.8 (5.3–8.4)	7.8	7.8 (6.2–9.4)	6.4	6.4 (4.8–8.0)
	5.8	5.8 (4.5–7.1)	8.1	8.1 (6.8–9.4)	6.3	6.3 (5.0–7.7)
	5.8	5.8 (3.8–7.8)	5.8	5.8 (3.8–7.9)	3.8	3.8 (1.9–5.8)

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD) and National Ambulatory Care Reporting System (NACRS), 2003/04–2010/11.

Inclusion criteria: All patients aged ≥18 years readmitted to an emergency department or acute care inpatient setting with a diagnosis of stroke (ischemic or hemorrhagic) or transient ischemic attack within 90 days of the initial stroke or TIA event in each year.

Exclusion criteria: Patients with an elective admission, scheduled emergency department visit or transfer within a facility or between facilities within 24 hours.

1 Indirect standardization based on an age-sex regression model was used to calculate adjusted rates.

2 Based on unique patients (i.e., does not include multiple patient-visits).

Notes:

(1) No washout periods were applied; for example, if a patient's first hospitalization for stroke had a discharge date of March 31, 2009 (fiscal year 2008/09), followed by another hospitalization for stroke/TIA on April 1, 2009 (FY 2009/10), the April 1 hospitalization would be considered the first hospitalization in 2009/10 and not a readmission related to the hospitalization in 2008/09.

(2) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(3) See Appendix E for a list of hospitals designated as regional and district stroke centres by the OSS.

(4) Indicates significant difference from the provincial rate. Significance is based on the 95% confidence interval falling entirely above or below the provincial rate.

CI = confidence interval (5th–95th percentile).

EXHIBIT 7.3 Age- and sex-adjusted all-cause readmission rates within 30 days following a stroke or transient ischemic attack, in Ontario and by stroke type, Ontario Stroke System designation and Local Health Integration Network, 2003/04 and 2009/10–2011/12

Key Findings

- Following the first emergency department visit or inpatient admission for stroke/TIA, the rate of another non-elective inpatient admission for any cause within 30 days declined in Ontario, from 8.8% in 2003/04 to 8.0% in 2011/12 (p<0.0001).
- A decrease in adjusted rates occurred across all stroke types, with TIA patients having the most dramatic decline (from 8.9% to 7.6% between 2003/04 and 2011/12; p=0.0003).
- In 2011/12, patients with ischemic stroke had the highest rate of all-cause non-elective readmissions within 30 days of acute care stroke discharge (8.3%).
- Non-designated hospitals had the highest all-cause readmission rate in 2011/12 (8.3%), followed by regional and district stroke centres at 8.0% and 7.7%, respectively.
- The North East LHIN had the highest all-cause readmission rate in 2011/12 (9.0%). Variation across the LHINs decreased over time.

	2003/04	
Group/Subgroup	**Observed, %**	**Adjusted[1], % (CI)**
Ontario[2]	8.9	8.8 (8.5–9.2)
Stroke Type		
Intracerebral hemorrhage	7.8	8.0 (6.4–9.6)
Ischemic stroke	9.0	8.9 (8.4–9.4)
Subarachnoid hemorrhage	8.4	9.9 (7.5–12.3)
Transient ischemic attack	8.9	8.9 (8.3–9.5)
Ontario Stroke System designation		
Regional stroke centre	7.9	8.1 (7.4–8.9)
District stroke centre	8.7	8.7 (7.8–9.6)
Non-designated	9.3	9.2 (8.7–9.7)
Local Health Integration Network		
1. Erie St. Clair	9.6	9.6 (8.2–11.1)
2. South West	8.9	8.8 (7.5–10.1)
3. Waterloo Wellington	6.9	6.9 (5.1–8.6)
4. Hamilton Niagara Haldimand Brant	8.5	8.5 (7.4–9.5)
5. Central West	10.2	10.3 (8.4–12.2)
6. Mississauga Halton	8.5	8.7 (7.2–10.1)
7. Toronto Central	8.8	9.0 (7.8–10.2)
8. Central	8.9	8.8 (7.5–10.1)
9. Central East	9.6	9.5 (8.4–10.6)
10. South East	8.3	8.2 (6.6–9.9)
11. Champlain	8.4	8.4 (7.2–9.6)
12. North Simcoe Muskoka	9.6	9.5 (7.7–11.2)
13. North East	10.4	10.5 (9.1–12.0)
14. North West	5.9	5.9 (3.5–8.2)

30-Day All-Cause Readmission Rate						
	2009/10		2010/11		2011/12	
	Observed, %	Adjusted[1], % (CI)	Observed, %	Adjusted[1], % (CI)	Observed, %	Adjusted[1], % (CI)
	8.0	8.0 (7.7–8.4)	8.1	8.1 (7.7–8.4)	8.0	8.0 (7.7–8.4)
	7.4	7.5 (6.2–8.9)	8.5	8.6 (7.2–10.0)	7.5	7.6 (6.1–9.0)
	8.3	8.2 (7.8–8.7)	8.2	8.1 (7.6–8.6)	8.4	8.3 (7.9–8.8)
	6.7	7.5 (5.4–9.6)	7.6	8.4 (6.4–10.4)	7.8	8.9 (6.8–11.0)
	7.9	7.9 (7.3–8.5)	8.0	7.9 (7.3–8.5)	7.6	7.6 (7.0–8.2)
	8.2	8.3 (7.7–9.0)	7.8	7.9 (7.3–8.6)	7.8	8.0 (7.3–8.7)
	7.2	7.2 (6.4–8.0)	7.5	7.5 (6.7–8.2)	7.7	7.7 (6.9–8.4)
	8.3	8.2 (7.7–8.7)	8.5	8.4 (7.9–8.9)	8.3	8.3 (7.7–8.8)
	8.3	8.3 (6.9–9.7)	7.7	7.7 (6.3–9.1)	7.9	7.9 (6.4–9.3)
	7.4	7.4 (6.2–8.5)	7.2	7.2 (6.0–8.4)	8.0	8.0 (6.7–9.2)
	6.6	6.6 (5.0–8.2)	7.9	7.9 (6.4–9.5)	7.1	7.0 (5.5–8.6)
	7.6	7.5 (6.5–8.6)	7.4	7.4 (6.4–8.4)	7.9	7.9 (6.8–8.9)
	8.2	8.3 (6.5–10.1)	8.9	9.0 (7.3–10.7)	7.7	7.8 (6.0–9.6)
	8.8	8.8 (7.5–10.1)	7.6	7.6 (6.3–9.0)	8.3	8.4 (7.0–9.8)
	9.2	9.3 (8.3–10.4)	8.6	8.7 (7.7–9.7)	8.3	8.5 (7.4–9.6)
	8.7	8.6 (7.4–9.8)	7.9	7.9 (6.7–9.1)	7.8	7.8 (6.5–9.0)
	7.6	7.5 (6.4–8.6)	8.5	8.5 (7.4–10.0)	8.5	8.4 (7.3–9.5)
	5.7	5.6 (4.0–7.3)	8.4	8.3 (6.6–10.1)	8.1	8.0 (6.3–9.8)
	7.3	7.3 (6.2–8.5)	7.8	7.8 (6.7–9.0)	7.5	7.5 (6.3–8.7)
	8.7	8.7 (6.9–10.4)	9.1	9.0 (7.2–10.7)	8.5	8.4 (6.7–10.2)
	9.2	9.2 (7.8–10.7)	9.2	9.3 (7.8–10.8)	8.9	9.0 (7.5–10.5)
	9.6	9.6 (7.4–11.8)	8.7	8.7 (6.5–10.8)	8.1	8.2 (5.9–10.5)

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD) and National Ambulatory Care Reporting System (NACRS), 2003/04–2011/12.

Inclusion criteria: All patients aged ≥18 years readmitted for any cause to an acute care inpatient setting within 30 days of initial stroke (ischemic or hemorrhagic) or transient ischemic attack event in each year (includes April 1, 2011 to February 29, 2012 for 2011/12).

Exclusion criteria: Patients with an elective admission or transfer within a facility or between facilities within 24 hours.

1 Indirect standardization based on an age-sex regression model was used to calculate adjusted rates.

2 Based on unique patients (i.e., does not include multiple patient-visits).

Notes:

(1) No washout periods were applied; for example, if a patient's first hospitalization for stroke had a discharge date of March 31, 2009 (fiscal year 2008/09), followed by another hospitalization for stroke/TIA on April 1, 2009 (FY 2009/10), the April 1 hospitalization would be considered the first hospitalization in 2009/10 and not a readmission related to the hospitalization in 2008/09.

(2) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(3) See Appendix E for a list of hospitals designated as regional and district stroke centres by the OSS.

(4) Indicates significant difference from the provincial rate. Significance is based on the 95% confidence interval falling entirely above or below the provincial rate.

CI = confidence interval (5th–95th percentile).

EXHIBIT 7.4 Risk-adjusted in-hospital mortality rates among adult patients following a stroke or transient ischemic attack, in Ontario and by Ontario Stroke System designation and Local Health Integration Network, based on a 3-year combined rate for 2003/04–2005/06, 2006/07–2008/09 and 2009/10–2011/12

Key Findings

- Ontario's in-hospital risk-adjusted mortality rate among admitted stroke/TIA patients decreased significantly from 13.8% in 2003/04–2005/06 to 11.3% in 2009/10–2011/12 (p<0.0001).
- From 2003/04–2005/06 to 2009/10–2011/12, a dramatic decline in the in-hospital risk-adjusted mortality rate was observed at district stroke centres (from 13.9% to 10.2%) and at non-designated hospitals (from 14.9% to 12.4%).
- Across LHINs, the 3-year combined adjusted in-hospital mortality rate for the years 2009/10 to 2011/12 varied substantially, ranging from 9.4% in the Waterloo Wellington LHIN to 14.9% in the North East LHIN.
- Improvements in mortality rates were observed in all LHINs from 2003/04 to 2011/12. Facilities within the Waterloo Wellington LHIN had the most dramatic decline in in-hospital mortality, from 15.2% of stroke/TIAs in 2003/04–2005/06 to 9.4% in 2009/10–2011/12.

	Three-year combined 2003/04 to 2005/06	
Group/Subgroup	**Observed, %**	**Adjusted[1], % (CI)**
Ontario[2]	15.0	13.8 (13.5–14.0)
Ontario Stroke System designation		
Regional stroke centre	15.0	13.0 (12.5–13.5)
District stroke centre	14.3	13.9 (13.3–14.6)
Non-designated	15.2	14.9 (14.5–15.3)
Local Health Integration Network		
1. Erie St. Clair	12.7	13.6 (12.4–14.8)
2. South West	14.7	14.7 (13.6–15.7)
3. Waterloo Wellington	16.4	15.2 (13.8–16.5)
4. Hamilton Niagara Haldimand Brant	15.0	13.8 (13.0–14.5)
5. Central West	10.8	10.0 (8.4–11.5)
6. Mississauga Halton	14.8	13.5 (12.4–14.6)
7. Toronto Central	14.7	12.5 (11.7–13.3)
8. Central	17.9	16.2 (15.3–17.2)
9. Central East	16.2	14.2 (13.3–15.0)
10. South East	18.2	17.0 (15.7–18.3)
11. Champlain	16.0	14.0 (13.1–14.9)
12. North Simcoe Muskoka	11.8	13.5 (12.0–15.0)
13. North East	13.3	16.2 (14.9–17.5)
14. North West	12.0	13.7 (11.8–15.6)

In-hospital Mortality Rate				
	Three-year combined 2006/07 to 2008/09		Three-year combined 2009/10 to 2011/12	
	Observed, %	Adjusted[1], % (CI)	Observed, %	Adjusted[1], % (CI)
	14.7	13.3 (13.0–13.5)	12.2	11.3 (11.1–11.6)
	14.6	12.4 (11.9–12.9)	13.8	11.6 (11.2–12.0)
	13.6	13.4 (12.7–14.1)	10.3	10.2 (9.6–10.8)
	15.2	15.0 (14.6–15.5)	11.9	12.4 (12.0–12.8)
	12.7	12.7 (11.5–14.0)	11.7	11.7 (10.5–12.8)
	15.8	14.9 (13.9–15.9)	14.1	13.1 (12.2–14.0)
	16.9	15.6 (14.3–17.0)	9.2	9.4 (8.1–10.7)
	14.5	13.4 (12.6–14.2)	12.8	11.4 (10.7–12.1)
	10.4	9.7 (8.2–11.2)	9.6	9.6 (8.2–11.0)
	14.9	14.2 (13.3–15.2)	13.6	12.4 (11.5–13.4)
	14.7	12.5 (11.7–13.2)	11.6	10.3 (9.5–11.0)
	15.3	15.1 (14.1–16.0)	10.6	11.4 (10.4–12.4)
	15.6	14.6 (13.6–15.5)	11.0	10.8 (9.9–11.8)
	18.0	15.8 (14.5–17.2)	16.0	14.0 (12.7–15.2)
	15.5	13.5 (12.5–14.5)	13.6	12.1 (11.1–12.9)
	13.5	13.4 (12.0–14.9)	11.7	11.6 (10.2–13.0)
	14.2	16.4 (15.1–17.6)	12.8	14.9 (13.7–16.0)
	9.6	10.9 (9.1–12.7)	9.4	10.5 (8.8–12.3)

Data source: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), 2003/04–2011/12.

Inclusion criteria: All patients aged ≥18 years who died in an inpatient setting of an acute care hospital in Ontario with a diagnosis of stroke (ischemic or hemorrhagic) or transient ischemic attack in each fiscal year.

1 Adjusted rate is the observed mortality rate adjusted for risk [age + sex + ambulance arrival + atrial fibrillation + stroke/TIA + (coronary artery disease or percutaneous coronary intervention or coronary artery bypass graft) + (carotid disease or carotid endarterectomy/ carotid artery stenting) + diabetes + hypertension + peripheral vascular disease + hyperlipidemia + stroke type].

2 Based on unique patients (i.e., does not include multiple patient-visits).

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) See Appendix E for a list of hospitals designated as regional and district stroke centres by the OSS.

(3) Indicates significant difference from the provincial rate. Significance is based on the 95% confidence interval falling entirely above or below the provincial rate."

(4) See Appendix K for risk-adjusted mortality models.

CI = confidence interval (5th–95th percentile).

EXHIBIT 7.5 Risk-adjusted mortality rates at 30 days following a stroke or transient ischemic attack, in Ontario and by Ontario Stroke System designation and Local Health Integration Network, based on a 3-year combined rate for 2003/04–2005/06, 2006/07–2008/09 and 2009/10–2011/12

Key Findings

- The 3-year combined 30-day risk-adjusted mortality rate among patients admitted for stroke or TIA in Ontario declined from 15.8% in 2003/04–2005/06 to 13.5% in 2009/10–2011/12 (p<0.0001).
- The Central West LHIN had the lowest 30-day risk-adjusted mortality rate (11.4%) and the North East LHIN had the highest (16.1%) in 2011/12.
- Mortality rates did not vary substantially across hospital designations in 2009/10–2011/12. Regional stroke centres had the lowest rate (12.9%), followed by district stroke centres (13.5%) and non-designated hospitals (14.0%) (p<0.0001).

	30-Day Mortality Rate					
	Three-year combined 2003/04 to 2005/06		Three-year combined 2006/07 to 2008/09		Three-year combined 2009/10 to 2011/12	
Group/Subgroup	Observed, %	Adjusted[1], % (CI)	Observed, %	Adjusted[1], % (CI)	Observed, %	Adjusted[1], % (CI)
Ontario[2]	16.6	15.8 (15.5–16.1)	16.3	15.2 (14.9–15.5)	13.9	13.5 (13.2–13.8)
Ontario Stroke System designation						
Regional stroke centre	16.1	14.1 (13.6–14.7)	15.7	13.7 (13.2–14.3)	14.8	12.9 (12.4–13.3)
District stroke centre	16.9	16.5 (15.8–17.2)	16.4	16.3 (15.6–17.0)	13.6	13.5 (12.9–14.1)
Non-designated	16.7	16.5 (16.1–17.0)	16.7	16.8 (16.4–17.3)	13.5	14.0 (13.6–14.5)
Local Health Integration Network						
1. Erie St. Clair	15.7	16.8 (15.6–18.0)	15.5	15.8 (14.5–17.1)	14.2	14.5 (13.2–15.7)
2. South West	17.4	17.5 (16.5–18.6)	17.3	16.5 (15.4–17.5)	15.6	14.6 (13.6–15.5)
3. Waterloo Wellington	18.5	17.1 (15.8–18.5)	18.3	17.2 (15.8–18.6)	13.1	13.3 (11.9–14.7)
4. Hamilton Niagara Haldimand Brant	16.7	15.4 (14.6–16.2)	16.8	15.9 (15.0–16.7)	15.2	13.8 (13.0–14.5)
5. Central West	15.1	14.0 (12.4–15.6)	15.9	15.0 (13.4–16.5)	11.3	11.4 (9.9–13.0)
6. Mississauga Halton	15.9	14.5 (13.4–15.7)	15.9	15.7 (14.5–16.8)	15.5	14.4 (13.3–15.4)
7. Toronto Central	15.3	13.4 (12.6–14.3)	15.7	13.8 (13.0–14.7)	12.9	11.8 (11.0–12.6)
8. Central	18.7	17.0 (16.0–18.0)	16.3	16.4 (15.3–17.4)	11.9	12.9 (11.8–13.9)
9. Central East	17.6	16.0 (15.1–16.9)	16.5	15.9 (14.9–16.8)	12.4	12.4 (11.4–13.3)
10. South East	18.7	17.4 (16.0–18.8)	18.6	16.4 (15.0–17.8)	17.7	15.7 (14.4–17.0)
11. Champlain	17.4	15.4 (14.5–16.4)	16.6	14.8 (13.8–15.8)	15.1	13.5 (12.5–14.5)
12. North Simcoe Muskoka	13.5	15.2 (13.6–16.8)	16.1	15.9 (14.4–17.4)	13.8	13.6 (12.1–15.0)
13. North East	14.8	17.7 (16.4–19.1)	15.3	17.6 (16.3–18.9)	13.9	16.1 (14.9–17.3)
14. North West	14.2	16.3 (14.3–18.3)	12.6	14.7 (12.8–16.6)	10.2	11.6 (9.7–13.4)

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), 2003/04–2011/12; Ontario Ministry of Health and Long-Term Care, Registered Persons Database (RPDB), 2003/04–2011/12.

Inclusion criteria: All patients aged >18 years who died either in hospital or following discharge within 30 days of admission to an inpatient setting of an acute care hospital with a diagnosis of stroke (ischemic or hemorrhagic) or transient ischemic attack, in each fiscal year (includes April 1, 2011, to February 29, 2012, for 2011/12).

1 Adjusted rate is the observed mortality rate adjusted for risk [age + sex + ambulance arrival + atrial fibrillation + stroke/TIA + (coronary artery disease or percutaneous coronary intervention or coronary artery bypass graft) + (carotid disease or carotid endarterectomy/carotid artery stenting) + diabetes + hypertension + peripheral vascular disease + hyperlipidemia + stroke type].

2 Based on unique patients (i.e., does not include multiple patient-visits).

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) See Appendix E for a list of hospitals designated as regional and district stroke centres by the OSS.

(3) Indicates significant difference from the provincial rate. Significance is based on the 95% confidence interval falling entirely above or below the provincial rate.

(4) See Appendix K for risk-adjusted mortality models.

CI = confidence interval (5th–95th percentile).

EXHIBIT 7.5A Risk-adjusted in-hospital mortality rates at 30 days following a stroke or transient ischemic attack in Ontario, 2003/04 and 2009/10–2011/12

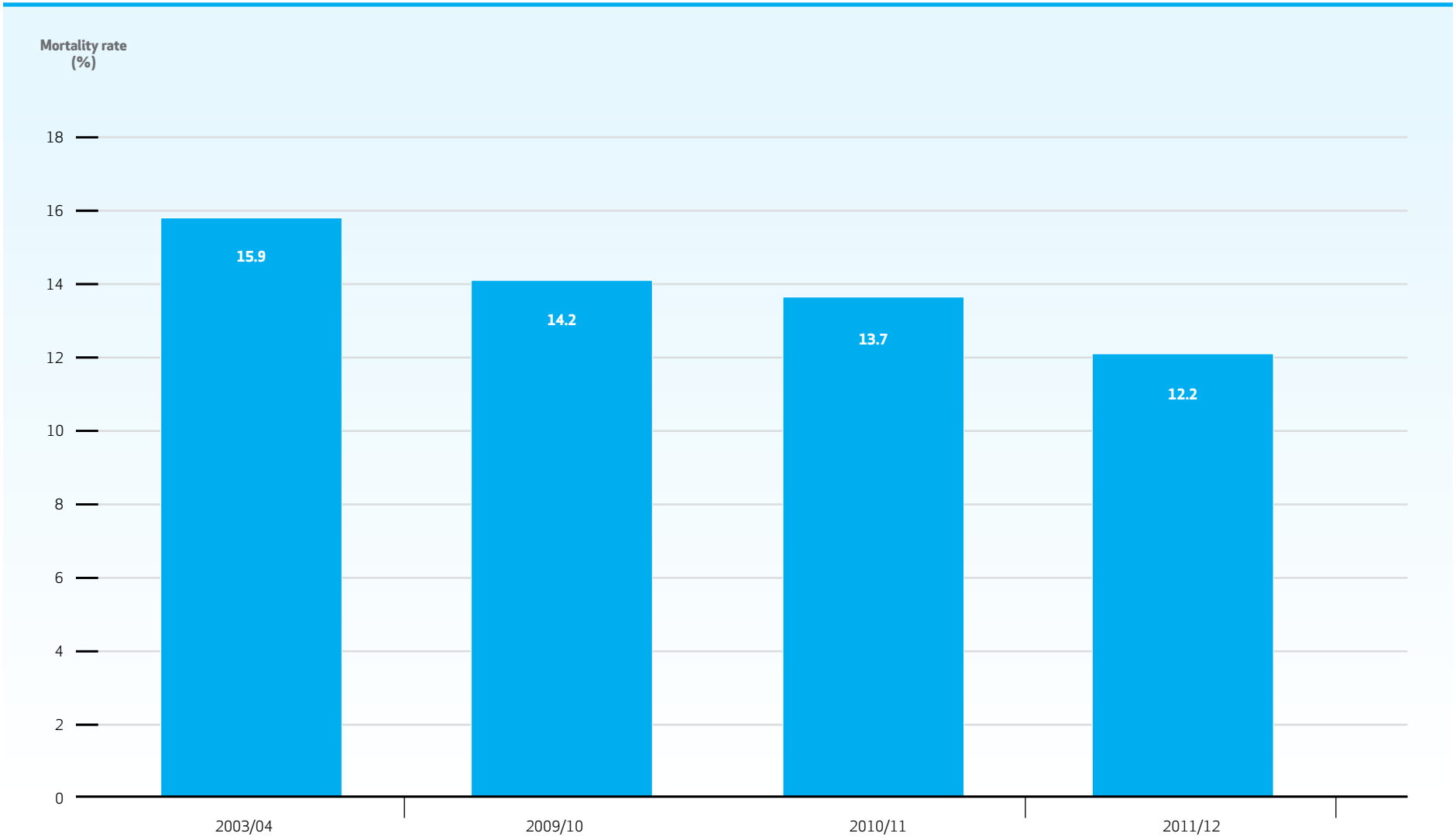


EXHIBIT 7.6 Risk-adjusted mortality rates at 1 year following a stroke or transient ischemic attack, in Ontario and by Ontario Stroke System designation and Local Health Integration Network, based on a 3-year combined rate for 2003/04–2005/06 and 2006/07–2008/09 and a 2-year combined rate for 2009/10–2010/11

Key Findings

- Provincially, the 3-year combined risk-adjusted mortality rate at 1 year following stroke/TIA declined from 27.5% in 2003/04–2005/06 to 25.3% in 2009/10–2011/12 (p<0.0001). This trend was observed across all LHINs.
- In 2009/10–2011/12, regional stroke centres had the lowest 1-year risk-adjusted mortality rate (23.8%), compared to district stroke centres (25.4%) and non-designated hospitals (26.2%) (p<0.0001).

	One-Year Mortality Rate					
	Three-year combined 2003/04 to 2005/06		Three-year combined 2006/07 to 2008/09		Two-year combined 2009/10 to 2010/11	
Group/Subgroup	Observed, %	Adjusted[1], % (CI)	Observed, %	Adjusted[1], % (CI)	Observed, %	Adjusted[1], % (CI)
Ontario[2]	28.0	27.5 (27.1–27.9)	27.5	26.6 (26.2–26.9)	25.5	25.3 (24.8–25.7)
Ontario Stroke System designation						
Regional stroke centre	26.0	25.4 (24.7–26.2)	25.4	24.3 (23.6–25.0)	24.7	23.8 (23.0–24.6)
District stroke centre	28.0	27.7 (26.9–28.6)	27.2	26.8 (26.0–27.6)	25.4	25.4 (24.4–26.3)
Non-designated	29.0	28.6 (28.1–29.1)	28.8	28.5 (28.0–29.0)	26.0	26.2 (25.5–26.8)
Local Health Integration Network						
1. Erie St. Clair	27.0	28.4 (26.9–29.9)	27.8	27.5 (26.0–29.0)	27.4	28.1 (26.3–29.9)
2. South West	27.8	28.3 (27.0–29.6)	28.8	27.9 (26.6–29.2)	26.9	25.3 (23.9–26.7)
3. Waterloo Wellington	31.1	29.1 (27.5–30.8)	29.6	27.9 (26.2–29.5)	25.0	25.0 (22.9–27.0)
4. Hamilton Niagara Haldimand Brant	28.7	27.5 (26.5–28.5)	28.7	27.6 (26.6–28.7)	27.3	25.9 (24.7–27.1)
5. Central West	27.2	26.4 (24.4–28.4)	27.5	26.5 (24.6–28.4)	23.3	23.6 (21.3–25.8)
6. Mississauga Halton	26.6	26.0 (24.6–27.4)	26.4	26.6 (25.2–28.0)	25.5	24.8 (23.2–26.4)
7. Toronto Central	26.1	25.4 (24.3–26.5)	25.7	25.0 (24.0–26.1)	23.5	23.8 (22.5–25.0)
8. Central	30.0	28.2 (27.1–29.4)	27.5	27.3 (26.1–28.5)	24.8	26.0 (24.4–27.5)
9. Central East	30.0	27.7 (26.6–28.8)	28.8	27.7 (26.5–28.9)	24.7	24.2 (22.8–25.6)
10. South East	30.7	29.1 (27.4–30.7)	29.5	26.9 (25.2–28.6)	28.7	26.2 (24.1–28.2)
11. Champlain	29.5	27.6 (26.4–28.8)	27.9	25.7 (24.5–26.9)	27.0	25.1 (23.6–26.6)
12. North Simcoe Muskoka	25.7	27.3 (25.4–29.1)	27.3	26.6 (24.8–28.4)	25.4	24.8 (22.7–27.0)
13. North East	25.4	29.7 (28.1–31.3)	25.2	28.2 (26.6–29.7)	23.9	26.9 (25.0–28.7)
14. North West	23.2	26.5 (24.1–28.9)	20.9	23.6 (21.3–25.9)	21.1	23.1 (20.3–25.9)

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), 2003/04–2010/11; Ontario Ministry of Health and Long-Term Care, Registered Persons Database (RPDB), 2003/04–2011/12.

Inclusion criteria: All patients aged ≥18 years who died either in hospital or following discharge within 365 days of admission to an inpatient setting of an acute care hospital with a diagnosis of stroke (ischemic or hemorrhagic) or transient ischemic attack, in each fiscal year.

1 Adjusted rate is the observed mortality rate adjusted for risk [age + sex + ambulance arrival + atrial fibrillation + stroke/TIA + (coronary artery disease or percutaneous coronary intervention or coronary artery bypass graft) + (carotid disease or carotid endarterectomy/carotid artery stenting) + diabetes + hypertension + peripheral vascular disease + hyperlipidemia + stroke type].

2 Based on unique patients (i.e., does not include multiple patient-visits).

Notes:

(1) Facility-based analysis (i.e., the location of the facility is used to report regional performance).

(2) See Appendix E for a list of hospitals designated as regional and district stroke centres by the OSS.

(3) Indicates significant difference from the provincial rate. Significance is based on the 95% confidence interval falling entirely above or below the provincial rate.

(4) See Appendix K for risk-adjusted mortality models.

CI = confidence interval (5th–95th percentile).

EXHIBIT 7.6A Risk-adjusted mortality rates at 1 year following a stroke or transient ischemic attack, in Ontario and by Ontario Stroke System designation, 2003/04–2005/06, 2006/07–2008/09 and 2009/10–2010/11

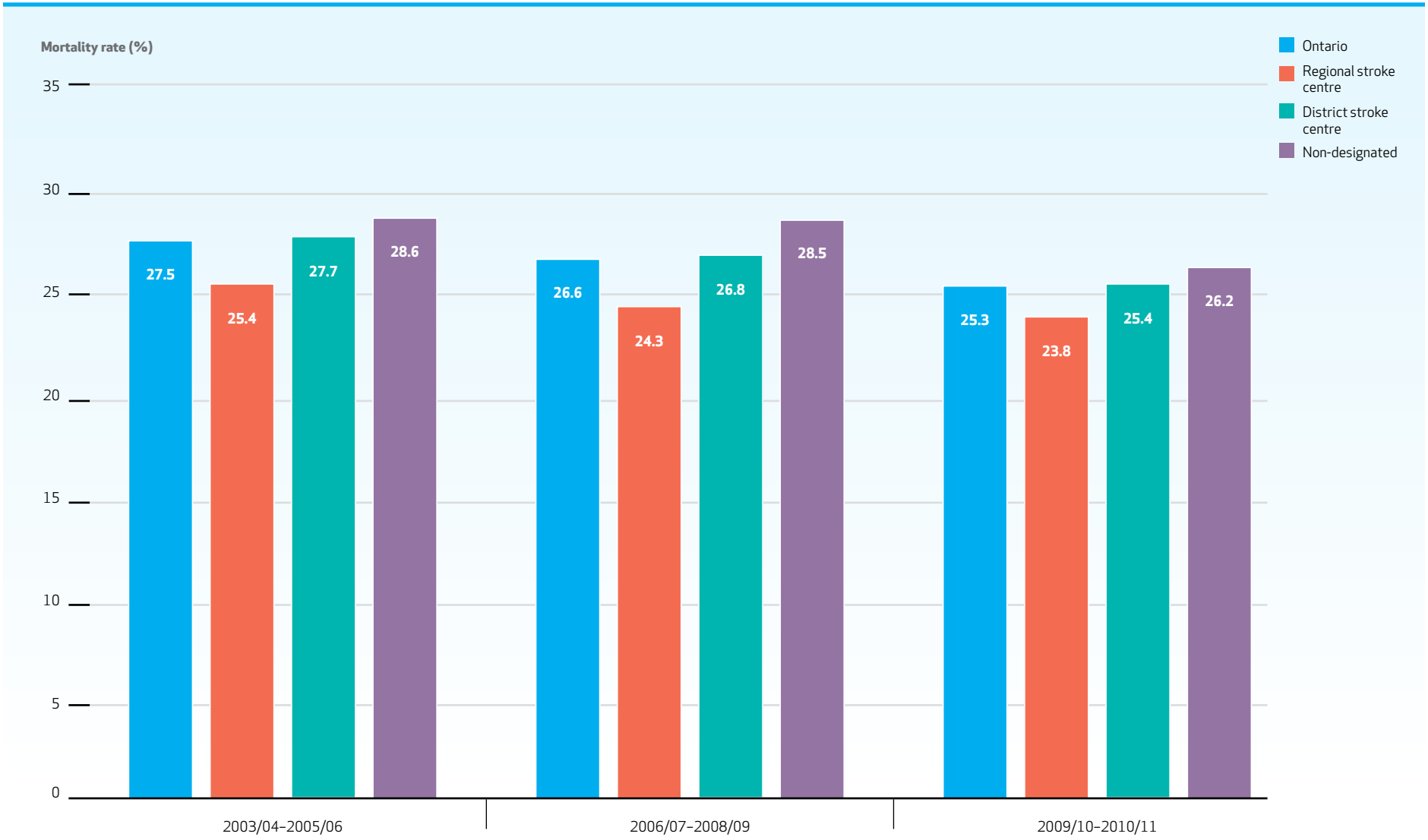
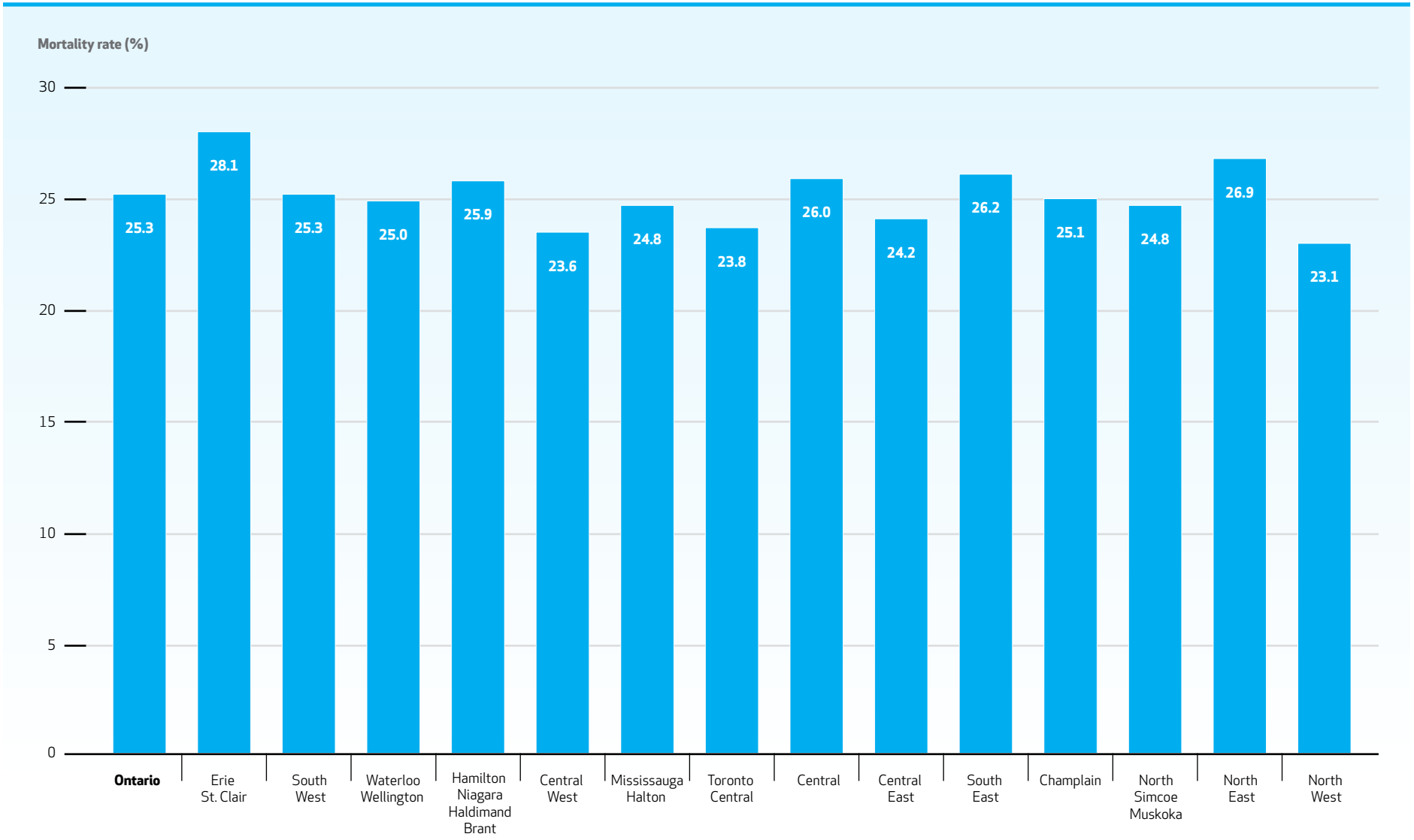


EXHIBIT 7.6B Risk-adjusted mortality rates at 1 year following a stroke or transient ischemic attack, in Ontario and by Local Health Integration Network, 2009/10–2010/11



Patient Outcomes

CONCLUSIONS AND RECOMMENDATIONS

Calculating 3-year combined mortality rates allows for a more stable rate to be estimated for smaller regions and at the facility level. There has been a 16.8%, 14.6% and 8.0% relative decline in the in-hospital, 30-day and 1-year mortality rates, respectively, following a stroke/TIA. The in-hospital mortality rate at non-designated hospitals is significantly higher than the provincial rate of 12.4% (95% confidence interval, 12.0%–12.8%).

There has been a 2.2% decrease in the 1-year risk-adjusted mortality rate following stroke/TIA since 2003/04. With approximately 15,000 stroke admissions per year, the absolute decrease in 1-year mortality of 2.2% would be expected to reflect 330 deaths avoided annually.

The Ontario Stroke Network should continue to work with the Canadian Institute for Health Information to develop a common risk-adjustment model for stroke mortality using administrative data.

List of Exhibits – Paediatric Stroke

8. Paediatric Emergency Department Care

EXHIBIT 8.1 Number and proportion of paediatric patients with stroke or transient ischemic attack arriving at the emergency department, in Ontario and by sex, age group and stroke type, 2003/04–2011/12

EXHIBIT 8.2 Age- and sex-adjusted rates of paediatric patients with stroke or transient ischemic attack arriving at the emergency department per 100,000 LHIN population under 18 years, in Ontario and by Local Health Integration Network, 2003/04–2011/12

EXHIBIT 8.3 Number and proportion of paediatric patients with stroke or transient ischemic attack arriving at the emergency department, in Ontario and by facility and age group, 2003/04–2011/12

9. Paediatric Acute Inpatient Care

EXHIBIT 9.1 Number and proportion of paediatric patients with stroke or transient ischemic attack admitted to acute care hospitals, in Ontario and by sex, age group and stroke type, 2003/04–2011/12

EXHIBIT 9.2 Number and proportion of paediatric patients with stroke or transient ischemic attack admitted to acute care hospitals, in Ontario and by facility and age group, 2003/04–2011/12

EXHIBIT 9.3 Age- and sex-adjusted paediatric inpatient admission rates per 100,000 LHIN population under 18 years, in Ontario and by Local Health Integration Network, 2003/04–2011/12

EXHIBIT 9.4 Paediatric inpatient length of stay for stroke or transient ischemic attack, in Ontario and by stroke type and facility, 2003/04–2011/12

EXHIBIT 9.5 Discharge destination of paediatric patients with stroke or transient ischemic attack following an acute care hospitalization, in Ontario and by stroke type and facility, 2003/04–2011/12

10. Paediatric Patient Outcomes

EXHIBIT 10.1 Age- and sex-adjusted stroke/TIA-related revisit or readmission rates within 30 days following a stroke or transient ischemic attack, in Ontario and by stroke type and facility, 2003/04–2010/11

EXHIBIT 10.2 Age- and sex-adjusted stroke/TIA-related revisit or readmission rates within 90 days following a stroke or transient ischemic attack, in Ontario and by stroke type and facility, 2003/04–2010/11

EXHIBIT 10.3 Age- and sex-adjusted stroke/TIA-related revisit or readmission rates within one year following a stroke or transient ischemic attack, in Ontario and by stroke type and facility, 2003/04–2010/11

EXHIBIT 10.4 Age- and sex-adjusted all-cause readmission rates within 30 days following a stroke or transient ischemic attack, in Ontario and by stroke type and facility, 2003/04–2010/11

EXHIBIT 10.5 Age- and sex-adjusted in-hospital mortality rates of paediatric patients following a stroke or transient ischemic attack, in Ontario and by stroke type, 2003/04–2010/11

EXHIBIT 10.6 Age- and sex-adjusted mortality rates of paediatric patients at 30 days following a stroke or transient ischemic attack, in Ontario and by stroke type, 2003/04–2010/11

EXHIBIT 10.7 Age- and sex-adjusted mortality rates of paediatric patients at one year following a stroke or transient ischemic attack, in Ontario and by stroke type, 2003/04–2010/11

Paediatric Stroke

Background and Purpose

For childhood stroke, reported incidence rates have ranged widely, from 2 to 13 per 100,000 children per year, supporting a need for more robust paediatric stroke data.[36,37] The 2012 Ontario Stroke Evaluation Report published the first-ever province-wide paediatric stroke data with administrative database diagnoses *validated by chart review* (2010/11 Ontario Stroke Audit). The study estimated a minimum Ontario paediatric stroke incidence of 5.9 per 100,000 LHIN population under the age of 18.[26]

We report on the reliability of ICD-10 codes to capture paediatric stroke using the 2010/11 OSA.

The 2013 Ontario Stroke Evaluation Report relies on administrative databases to assess paediatric stroke care across the province, as the Ontario Stroke Audit of Acute Care Facilities was not conducted for 2011/12 data. The paediatric stroke data in this report were calculated based on patients identified solely by ICD-10 code searches (*see* **Appendix D**) in any of the diagnostic code fields contained in the Canadian Institute for Health Information's Discharge Abstract Database (CIHI–DAD) and National Ambulatory Care Reporting System (NACRS). Although these data are not sufficient to provide an in-depth look at a larger number of stroke care indicators, they do enable a preliminary understanding of changes regarding paediatric stroke in Ontario from 2003/04 to 2011/12 in comparable cohorts of children.

8 Paediatric Emergency Department Care

EXHIBIT 8.1 Number and proportion of paediatric patients with stroke or transient ischemic attack arriving at the emergency department, in Ontario and by sex, age group and stroke type, 2003/04–2011/12

Key Findings

- Annually, there were less than 200 paediatric stroke/TIA-related ED visits, with a total of 1,243 visits over the 9 years from 2003/04 to 2011/12.
- The median patient age was 11 years. The age distribution was 7.5% under 1 year, 20.4% from 1 to 6 years, 28.0% from 7 to 12 years and 44.2% from 13 to 17 years.
- A male predominance (54.5%) was observed in all years, which is consistent with the current literature; however, in 2011 the proportion of females and males was almost the same (49.7% and 50.3%, respectively).[38]
- The median age across all years was higher for females than males (12 years vs. 10 years).
- Among paediatric stroke/TIA patients arriving at the ED, arterial ischemic stroke was the most common stroke type (66.9%) followed by hemorrhagic stroke (29.5%) and cerebral sinovenous thrombosis (3.6%).

Group/Subgroup	All Years	2003/04
Ontario,[1,2] N	1,243	145
Sex, n (%)		
Female	565 (45.5)	65 (44.8)
Male	678 (54.5)	80 (55.2)
Age		
Mean ± SD	10.3 ± 5.6	9.3 ± 5.9
Median (IQR)	11 (6–15)	10 (4–15)
Age Group, n (%)		
0–28 days	7 (0.6)	**
29 days–<1 year	86 (6.9)	12 (8.3)
1–6 years	253 (20.4)	33 (22.8)
7–12 years	348 (28.0)	42 (29.0)
13–<18 years	549 (44.2)	54 (37.2)
Female Age		
Mean ± SD	11.1 ± 5.3	9.8 ± 5.8
Median (IQR)	12 (8–16)	11 (4–15)
Female Age Group, n (%)		
0–28 days	**	**
29 days–<1 year	24 (4.2)	**
1–6 years	95 (16.8)	16 (24.6)
7–12 years	172 (30.4)	20 (30.8)
13–<18 years	271 (48.0)	25 (38.5)
Male Age		
Mean ± SD	9.6 ± 5.7	9.0 ± 6.0
Median (IQR)	10 (5–15)	10 (3.5–15)
Male Age Group, n (%)		
0–28 days	**	**
29 days–<1 year	62 (9.1)	9 (11.3)
1–6 years	158 (23.3)	17 (21.3)
7–12 years	176 (26.0)	22 (27.5)
13–<18 years	278 (41.0)	29 (36.3)
Stroke Type, n (%)		
Arterial ischemic stroke	831 (66.9)	99 (68.3)
Cerebral sinovenous thrombosis	45 (3.6)	**
Hemorrhagic stroke	367 (29.5)	44 (30.3)

Data source: Canadian Institute for Health Information, National Ambulatory Care Reporting System (NACRS), 2003/04 – 2011/12.

Inclusion criteria: All patients aged <18 years discharged from an emergency department with a diagnosis of stroke (arterial ischemic stroke or cerebral sinovenous thrombosis or hemorrhagic stroke) or TIA.

1 Based on unique patients (i.e., does not include multiple patient-visits).

2 Of these patients, 564 (45.4%) were admitted to hospital and are represented in exhibits 9.1 to 9.5.

** Cell value suppressed for reasons of privacy and confidentiality.

Notes:

(1) Excludes all NACRS records with ICD codes that include the prefix "Q" (suspected, questionable diagnoses) starting in 2008/09.

(2) Cells in which there were no reported/available data are marked with a hyphen (-).

SD = standard deviation.

IQR = interquartile range (25th–75th percentile).

	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
	127	131	118	127	138	142	162	153
	49 (38.6)	58 (44.3)	53 (44.9)	59 (46.5)	68 (49.3)	62 (43.7)	75 (46.3)	76 (49.7)
	78 (61.4)	73 (55.7)	65 (55.1)	68 (53.5)	70 (50.7)	80 (56.3)	87 (53.7)	77 (50.3)
	9.7 ± 5.5	10.0 ± 5.7	10.4 ± 5.6	10.4 ± 5.6	9.8 ± 5.8	10.9 ± 5.3	11.2 ± 5.5	10.8 ± 5.4
	10 (5–15)	11 (5–16)	12 (6–15)	12 (5–15)	11 (5–15)	12 (7–16)	13 (7–16)	12 (7–16)
	-	**	-	-	**	-	-	-
	9 (7.1)	11 (8.4)	12 (10.2)	11 (8.7)	10 (7.2)	**	9 (5.6)	7 (4.6)
	28 (22.0)	27 (20.6)	21 (17.8)	25 (19.7)	31 (22.5)	27 (19.0)	31 (19.1)	30 (19.6)
	44 (34.6)	37 (28.2)	30 (25.4)	35 (27.6)	36 (26.1)	42 (29.6)	39 (24.1)	43 (28.1)
	46 (36.2)	54 (41.2)	55 (46.6)	56 (44.1)	60 (43.5)	68 (47.9)	83 (51.2)	73 (47.7)
	11.3 ± 4.9	11.6 ± 5.4	11.6 ± 5.3	10.9 ± 5.6	9.5 ± 5.8	11.1 ± 4.8	12.3 ± 4.6	12.1 ± 5.1
	12 (8–15)	13.5 (9–16)	14 (8–16)	12 (7–16)	10 (4–14.5)	12 (8–15)	13 (10–16)	14 (8–16)
	-	**	-	-	**	-	-	-
	-	**	**	**	**	**	**	**
	9 (18.4)	10 (17.2)	7 (13.2)	10 (16.9)	16 (23.5)	11 (17.7)	9 (12.0)	7 (9.2)
	18 (36.7)	15 (25.9)	15 (28.3)	17 (28.8)	22 (32.4)	22 (35.5)	23 (30.7)	20 (26.3)
	22 (44.9)	30 (51.7)	28 (52.8)	28 (47.5)	25 (36.8)	27 (43.5)	41 (54.7)	45 (59.2)
	8.7 ± 5.6	8.8 ± 5.6	9.4 ± 5.7	9.9 ± 5.6	10.1 ± 5.8	10.8 ± 5.7	10.2 ± 6.0	9.5 ± 5.5
	9 (4–14)	10 (5–14)	10 (5–14)	11.5 (5–15)	12.5 (5–15)	13 (7–16)	12 (5–16)	10 (5–15)
	-	**	-	-	-	-	-	-
	9 (11.5)	9 (12.3)	9 (13.8)	7 (10.3)	6 (8.6)	**	7 (8.0)	**
	19 (24.4)	17 (23.3)	14 (21.5)	15 (22.1)	15 (21.4)	16 (20.0)	22 (25.3)	23 (29.9)
	26 (33.3)	22 (30.1)	15 (23.1)	18 (26.5)	14 (20.0)	20 (25.0)	16 (18.4)	23 (29.9)
	24 (30.8)	24 (32.9)	27 (41.5)	28 (41.2)	35 (50.0)	41 (51.3)	42 (48.3)	28 (36.4)
	87 (68.5)	83 (63.4)	85 (72.0)	72 (56.7)	89 (64.5)	99 (69.7)	111 (68.5)	106 (69.3)
	**	6 (4.6)	**	**	7 (5.1)	7 (4.9)	8 (4.9)	**
	36 (28.3)	42 (32.1)	29 (24.6)	50 (39.4)	42 (30.4)	36 (25.4)	43 (26.5)	45 (29.4)

EXHIBIT 8.2 Age- and sex-adjusted rates of paediatric patients with stroke or transient ischemic attack arriving at the emergency department per 100,000 LHIN population under 18 years, in Ontario and by Local Health Integration Network, 2003/04–2011/12

Key Finding

- The provincial age- and sex-adjusted rate of ED visits for paediatric stroke/TIA per 100,000 population aged under 18 increased from 5.2 to 5.6 between 2003/04 and 2011/12 despite a steady decline between 2003/04 and 2007/08 (from 5.2 to 4.6).

Group/Subgroup	2003/04	2004/05	2005/06	
Ontario[2]	5.2 (145)	4.6 (127)	4.7 (131)	
Local Health Integration Network				
1. Erie St. Clair	4.7 (7)	2.7 (**)	5.5 (8)	
2. South West	3.8 (8)	6.6 (14)	5.3 (11)	
3. Waterloo Wellington	5.5 (9)	3.0 (**)	1.8 (**)	
4. Hamilton Niagara Haldimand Brant	6.7 (20)	5.1 (15)	4.4 (13)	
5. Central West	4.5 (8)	2.2 (**)	4.2 (8)	
6. Mississauga Halton	3.3 (8)	3.7 (9)	4.0 (10)	
7. Toronto Central	5.5 (13)	4.4 (10)	4.8 (11)	
8. Central	4.9 (17)	3.7 (13)	5.7 (20)	
9. Central East	5.5 (18)	5.3 (17)	3.7 (12)	
10. South East	3.9 (**)	7.9 (8)	7.0 (7)	
11. Champlain	4.9 (13)	5.4 (14)	6.2 (16)	
12. North Simcoe Muskoka	7.3 (7)	4.1 (**)	2.0 (**)	
13. North East	9.0 (11)	8.4 (10)	6.9 (8)	
14. North West	3.4 (**)	-	3.5 (**)	

	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
	Age- and Sex-Adjusted Rate[1], % (n)					
	4.2 (118)	4.6 (127)	5.0 (138)	5.2 (142)	6.0 (162)	5.6 (153)
	4.8 (7)	5.7 (8)	2.8 (**)	5.1 (7)	5.9 (8)	8.9 (12)
	5.3 (11)	2.5 (**)	4.0 (8)	8.5 (17)	7.6 (15)	6.2 (12)
	1.2 (**)	3.7 (6)	6.7 (11)	5.6 (9)	5.5 (9)	3.1 (**)
	3.7 (11)	4.8 (14)	3.2 (9)	2.1 (6)	3.2 (9)	5.7 (16)
	3.1 (6)	4.0 (8)	4.1 (8)	1.5 (**)	9.1 (18)	5.1 (10)
	4.0 (10)	3.2 (8)	3.5 (9)	5.4 (14)	7.2 (19)	2.7 (7)
	4.4 (10)	6.8 (15)	6.0 (13)	4.6 (10)	4.7 (10)	7.6 (16)
	3.7 (13)	5.3 (19)	7.2 (26)	5.8 (21)	3.5 (13)	5.4 (20)
	5.0 (16)	5.0 (16)	6.0 (19)	5.4 (17)	7.3 (23)	7.0 (22)
	7.2 (7)	4.2 (**)	10.7 (10)	5.4 (**)	5.5 (**)	4.5 (**)
	3.5 (9)	3.5 (9)	4.8 (12)	5.2 (13)	5.2 (13)	6.8 (17)
	8.3 (8)	11.3 (11)	2.1 (**)	4.3 (**)	7.7 (7)	6.6 (6)
	6.0 (7)	2.6 (**)	4.6 (**)	9.2 (10)	9.4 (10)	4.8 (**)
	1.8 (**)	1.9 (**)	3.7 (**)	11.5 (6)	5.9 (**)	2.0 (**)

Data sources: Canadian Institute for Health Information, National Ambulatory Care Reporting System (NACRS), 2003/04 – 2011/12; Statistics Canada, Ontario census data, 1996.

Inclusion criteria: Patients aged <18 years with a diagnosis of stroke (arterial ischemic stroke or cerebral sinovenous thrombosis or hemorrhagic stroke) or TIA.

1 Age- and sex-adjusted rates were determined using each year's Ontario population as the standard.

2 Based on unique patients (i.e., does not include multiple patient-visits).

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Notes:

(1) Population-based analysis (i.e., the location of the patient's residence is used to report regional performance).

(2) Excludes all NACRS records with ICD codes that include the prefix "Q" (suspected, questionable diagnoses) starting in 2008/09.

(3) Cells in which there were no reported/available data are marked with a hyphen (-).

(4) Indicates a significant difference from the provincial rate.

(5) LHIN/sub-LHIN populations were determined using POPLHIN 2003–2010, POPLHIN_PROJECTED 2011 and POPSUBLHIN VERSION 9 2006–2008 files from Ontario Ministry of Health and Long-Term Care: IntelliHealth Ontario.

EXHIBIT 8.3 Number and proportion of paediatric patients with stroke or transient ischemic attack arriving at the emergency department, in Ontario and by facility and age group, 2003/04–2011/12

Key Findings

- Almost half (49.2%) of Ontario's paediatric stroke patients presented at tertiary care centres, with The Hospital for Sick Children treating nearly one-third of them. By comparison, non-tertiary care hospitals saw more paediatric stroke patients aged 7 years and older.

Group/Subgroup	All Years	2003/04	2004/05	
Ontario[1,2]	1,243	145	127	
Facility (Site)				
Children's Hospital of Eastern Ontario	86 (6.9)	11 (7.6)	12 (9.4)	
0–28 days	**	**	-	
29 days–<1 year	**	-	**	
1–6 years	16 (1.3)	**	**	
7–12 years	27 (2.2)	6 (4.1)	**	
13–<18 years	37 (3.0)	**	6 (4.7)	
Hamilton Health Sciences Corp (McMaster)	59 (4.7)	11 (7.6)	6 (4.7)	
0–28 days	**	**	-	
29 days–<1 year	6 (0.5)	**	**	
1–6 years	13 (1.0)	**	**	
7–12 years	15 (1.2)	**	**	
13–<18 years	24 (1.9)	**	**	
Hospital for Sick Children	399 (32.1)	40 (27.6)	37 (29.1)	
0–28 days	**	**	-	
29 days–<1 year	40 (3.2)	6 (4.1)	**	
1–6 years	114 (9.2)	12 (8.3)	10 (7.9)	
7–12 years	133 (10.7)	15 (10.3)	19 (15.0)	
13–<18 years	109 (8.8)	**	6 (4.7)	
London Health Sciences Centre (University)	68 (5.5)	9 (6.2)	9 (7.1)	
0–28 days	**	-	-	
29 days–<1 year	**	**	-	
1–6 years	15 (1.2)	**	**	
7–12 years	15 (1.2)	-	6 (4.7)	
13–<18 years	32 (2.6)	7 (4.8)	**	
All other acute care facilities[3]	631 (50.8)	74 (51.0)	63 (49.6)	
0–28 days	**	-	-	
29 days–<1 year	30 (2.4)	**	**	
1–6 years	95 (7.6)	14 (9.7)	13 (10.2)	
7–12 years	158 (12.7)	19 (13.1)	15 (11.8)	
13–<18 years	347 (27.9)	37 (25.5)	30 (23.6)	

Data source: Canadian Institute for Health Information, National Ambulatory Care Reporting System (NACRS), 2003/04 – 2011/12.

Inclusion criteria: All patients aged <18 years discharged from an emergency department with a diagnosis of stroke (arterial ischemic stroke or cerebral sinovenous thrombosis or hemorrhagic stroke) or TIA.

1 Based on unique patients (i.e., does not include multiple patient-visits).

2 Of these patients, 564 (45.4%) were admitted to hospital and are represented in exhibits 9.1 to 9.5.

3 Number of adult acute care facilities included in NACRS varied across each year (N = 48 in 2003/04; 43 in 2004/05; 47 in 2005/06; 44 in 2006/07; 46 in 2007/08; 42 in 2008/09; 48 in 2009/10; 42 in 2010/11; and 49 in 2011/12).

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
		n (%)					
	131	118	127	138	142	162	153
	10 (7.6)	6 (5.1)	7 (5.5)	11 (8.0)	7 (4.9)	12 (7.4)	10 (6.5)
	-	-	-	-	-	-	-
	-	**	-	-	-	**	-
	**	-	**	**	-	**	**
	**	**	**	**	**	**	**
	**	**	**	7 (5.1)	**	**	**
	6 (4.6)	**	**	**	**	7 (4.3)	10 (6.5)
	-	-	-	-	-	-	-
	**	-	-	**	-	-	**
	-	**	**	**	**	**	**
	**	**	-	**	-	**	**
	**	**	**	**	**	**	**
	39 (29.8)	43 (36.4)	42 (33.1)	50 (36.2)	47 (33.1)	53 (32.7)	48 (31.4)
	**	-	-	-	-	-	-
	**	8 (6.8)	**	**	**	**	**
	12 (9.2)	9 (7.6)	18 (14.2)	18 (13.0)	11 (7.7)	13 (8.0)	11 (7.2)
	10 (7.6)	12 (10.2)	13 (10.2)	14 (10.1)	17 (12.0)	17 (10.5)	16 (10.5)
	11 (8.4)	14 (11.9)	7 (5.5)	15 (10.9)	15 (10.6)	18 (11.1)	18 (11.8)
	10 (7.6)	**	**	8 (5.8)	8 (5.6)	13 (8.0)	**
	**	-	-	-	-	-	-
	**	-	**	-	-	-	**
	**	-	**	**	**	**	**
	**	**	**	**	-	**	-
	**	**	**	**	**	8 (4.9)	**
	66 (50.4)	63 (53.4)	69 (54.3)	64 (46.4)	75 (52.8)	77 (47.5)	80 (52.3)
	-	-	-	**	-	-	-
	**	**	6 (4.7)	6 (4.3)	**	**	**
	12 (9.2)	11 (9.3)	**	9 (6.5)	11 (7.7)	10 (6.2)	11 (7.2)
	19 (14.5)	15 (12.7)	18 (14.2)	15 (10.9)	22 (15.5)	15 (9.3)	20 (13.1)
	33 (25.2)	35 (29.7)	41 (32.3)	33 (23.9)	41 (28.9)	50 (30.9)	47 (30.7)

** Cell value suppressed for reasons of privacy and confidentiality.

Notes:

(1) Excludes all NACRS records with ICD codes that include the prefix "Q" (suspected, questionable diagnoses) starting in 2008/09.

(2) Cells in which there were no reported/available data are marked with a hyphen (-).

Paediatric Emergency Department Care

CONCLUSIONS AND RECOMMENDATIONS

Paediatric stroke occurs in every region of the province, with approximately 140 patients seen in the ED annually. Available administrative data are limited to volumes and demographical characteristics of paediatric stroke patients presenting in an ED, without care details or outcomes. To adequately monitor and assess the care of paediatric stroke patients in Ontario, data not available in administrative databases are needed: for example, imaging within 24 hours of presentation and misdiagnosis rate. Currently, the Ministry of Health and Long-Term Care has mandated the data collection of key acute stroke care indicators among adult stroke patients. It is recommended that large tertiary care hospitals also participate in this data collection for the paediatric patient population in order to provide a better understanding of acute stroke care best practice adherence among the paediatric health care population.

9 Paediatric Acute Inpatient Care

EXHIBIT 9.1 Number and proportion of paediatric patients with stroke or transient ischemic attack admitted to acute care hospitals, in Ontario and by sex, age group and stroke type, 2003/04–2011/12

Key Findings

- Between 301 and 386 paediatric stroke patients were admitted to acute care hospitals in Ontario each year from 2003/04 to 2011/12, and over half (56.8%) were male. The median age was 7 years.
- These patients were evenly distributed by age group: under 1 year, 23.3%; 1–6 years, 24.8%; 7–12 years, 23.8%; and 13–17 years, 28.1%. The median age among females was higher than among males (8 years vs. 6 years).
- Among the 3,211 children admitted for stroke in this period, the majority were coded as cases of arterial ischemic stroke (71.7%), followed by hemorrhagic stroke (21.1%) and cerebral sinovenous thrombosis (7.2%).

Group/Subgroup		All Years	2003/04	2004/05	
Ontario[1]		3,211	375	349	
Sex	Female	1,387 (43.2)	150 (40.0)	152 (43.6)	
	Male	1,824 (56.8)	225 (60.0)	197 (56.4)	
Age	Mean ± SD	7.4 ± 6.1	6.7 ± 6.1	7.7 ± 6.2	
	Median (IQR)	7 (1–13)	6 (0–12)	8 (1–14)	
Age Group	0–28 days	393 (12.2)	58 (15.5)	39 (11.2)	
	29 days–<1 year	358 (11.1)	50 (13.3)	38 (10.9)	
	1–6 years	795 (24.8)	93 (24.8)	87 (24.9)	
	7–12 years	763 (23.8)	85 (22.7)	79 (22.6)	
	13–<18 years	902 (28.1)	89 (23.7)	106 (30.4)	
Female Age	Mean ± SD	7.9 ± 6.0	7.5 ± 6.2	8.3 ± 6.0	
	Median (IQR)	8 (1–14)	7 (1–14)	8 (2–14)	
Female Age Group	0–28 days	143 (10.3)	19 (12.7)	12 (7.9)	
	29 days–<1 year	129 (9.3)	18 (12.0)	12 (7.9)	
	1–6 years	323 (23.3)	34 (22.7)	39 (25.7)	
	7–12 years	380 (27.4)	36 (24.0)	42 (27.6)	
	13–<18 years	412 (29.7)	43 (28.7)	47 (30.9)	
Male Age	Mean ± SD	6.9 ± 6.1	6.1 ± 5.9	7.2 ± 6.3	
	Median (IQR)	6 (0–13)	4 (0–12)	6 (0–14)	
Male Age Group	0–28 days	250 (13.7)	39 (17.3)	27 (13.7)	
	29 days–<1 year	229 (12.6)	32 (14.2)	26 (13.2)	
	1–6 years	472 (25.9)	59 (26.2)	48 (24.4)	
	7–12 years	383 (21.0)	49 (21.8)	37 (18.8)	
	13–<18 years	490 (26.9)	46 (20.4)	59 (29.9)	
Stroke Type					
Arterial ischemic stroke		2,303 (71.7)	260 (69.3)	260 (74.5)	
Cerebral sinovenous thrombosis		232 (7.2)	32 (8.5)	19 (5.4)	
Hemorrhagic stroke		676 (21.1)	83 (22.1)	70 (20.1)	

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
		n (%)					
	375	328	362	368	301	386	367
	175 (46.7)	135 (41.2)	147 (40.6)	167 (45.4)	128 (42.5)	178 (46.1)	155 (42.2)
	200 (53.3)	193 (58.8)	215 (59.4)	201 (54.6)	173 (57.5)	208 (53.9)	212 (57.8)
	7.0 ± 6.3	7.1 ± 6.2	7.4 ± 6.2	7.2 ± 5.9	7.9 ± 5.9	8.0 ± 6.2	7.5 ± 6.0
	6 (0–13)	6.5 (0–13)	7 (0–13)	7 (1–12)	8 (2–14)	8 (1–14)	7 (1–13)
	61 (16.3)	53 (16.2)	52 (14.4)	28 (7.6)	30 (10.0)	35 (9.1)	37 (10.1)
	41 (10.9)	39 (11.9)	39 (10.8)	43 (11.7)	26 (8.6)	41 (10.6)	41 (11.2)
	96 (25.6)	72 (22.0)	80 (22.1)	108 (29.3)	74 (24.6)	95 (24.6)	90 (24.5)
	70 (18.7)	73 (22.3)	88 (24.3)	98 (26.6)	82 (27.2)	90 (23.3)	98 (26.7)
	107 (28.5)	91 (27.7)	103 (28.5)	91 (24.7)	89 (29.6)	125 (32.4)	101 (27.5)
	7.3 ± 6.1	7.8 ± 6.3	7.1 ± 6.0	7.8 ± 5.7	8.5 ± 5.6	8.8 ± 6.1	8.3 ± 6.0
	6 (1–13)	9 (0–14)	7 (1–12)	9 (2–13)	9.5 (3.5–13.5)	10 (3–15)	9 (2–14)
	25 (14.3)	21 (15.6)	20 (13.6)	11 (6.6)	13 (10.2)	16 (9.0)	6 (3.9)
	15 (8.6)	14 (10.4)	14 (9.5)	13 (7.8)	**	16 (9.0)	23 (14.8)
	49 (28.0)	25 (18.5)	36 (24.5)	47 (28.1)	31 (24.2)	34 (19.1)	28 (18.1)
	35 (20.0)	32 (23.7)	41 (27.9)	53 (31.7)	43 (33.6)	47 (26.4)	51 (32.9)
	51 (29.1)	43 (31.9)	36 (24.5)	43 (25.7)	37 (28.9)	65 (36.5)	47 (30.3)
	6.7 ± 6.4	6.6 ± 6.0	7.6 ± 6.3	6.7 ± 5.9	7.4 ± 6.2	7.3 ± 6.2	6.8 ± 5.9
	5 (0–13)	6 (0–12)	8 (0–14)	5 (1–12)	7 (1–14)	6 (1–13)	6 (1–13)
	36 (18.0)	32 (16.6)	32 (14.9)	17 (8.5)	17 (9.8)	19 (9.1)	31 (14.6)
	26 (13.0)	25 (13.0)	25 (11.6)	30 (14.9)	22 (12.7)	25 (12.0)	18 (8.5)
	47 (23.5)	47 (24.4)	44 (20.5)	61 (30.3)	43 (24.9)	61 (29.3)	62 (29.2)
	35 (17.5)	41 (21.2)	47 (21.9)	45 (22.4)	39 (22.5)	43 (20.7)	47 (22.2)
	56 (28.0)	48 (24.9)	67 (31.2)	48 (23.9)	52 (30.1)	60 (28.8)	54 (25.5)
	275 (73.3)	231 (70.4)	264 (72.9)	259 (70.4)	219 (72.8)	282 (73.1)	253 (68.9)
	24 (6.4)	22 (6.7)	21 (5.8)	26 (7.1)	18 (6.0)	37 (9.6)	33 (9.0)
	76 (20.3)	75 (22.9)	77 (21.3)	83 (22.6)	64 (21.3)	67 (17.4)	81 (22.1)

Data source: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), 2003/04 – 2011/12.

Inclusion criteria: Patients aged <18 years admitted to hospital with a diagnosis of stroke (arterial ischemic stroke or cerebral sinovenous thrombosis or hemorrhagic stroke) or TIA.

1 Based on unique patients (i.e., does not include multiple patient-visits).

** Cell value suppressed for reasons of privacy and confidentiality.

SD = standard deviation.

IQR = interquartile range (25th–75th percentile).

EXHIBIT 9.2 Number and proportion of paediatric patients with stroke or transient ischemic attack admitted to acute care hospitals, in Ontario and by facility and age group, 2003/04–2011/12

Key Findings

- Provincially across all years, 83.7% of paediatric stroke patients were admitted to tertiary care hospitals, with over half (56.8%) admitted to The Hospital for Sick Children. More than half (54.2%) of newborn stroke patients (those 0–28 days old) were admitted to SickKids.
- Almost one-quarter (23.2%) of newborn stroke patients were admitted to non-tertiary care hospitals in Ontario.

Group/Subgroup	All Years	2003/04	2004/05	
Ontario[1]	3,211	375	349	
Facility (Site)				
Children's Hospital of Eastern Ontario	333 (10.4)	28 (7.5)	29 (8.3)	
0–28 days	30 (0.9)	**	**	
29 days–<1 year	31 (1.0)	**	**	
1–6 years	76 (2.4)	**	**	
7–12 years	94 (2.9)	10 (2.7)	7 (2.0)	
13–<18 years	102 (3.2)	8 (2.1)	11 (3.2)	
Hamilton Health Sciences (McMaster)	242 (7.5)	27 (7.2)	25 (7.2)	
0–28 days	33 (1.0)	**	**	
29 days–<1 year	29 (0.9)	6 (1.6)	**	
1–6 years	67 (2.1)	9 (2.4)	7 (2.0)	
7–12 years	52 (1.6)	**	6 (1.7)	
13–<18 years	61 (1.9)	7 (1.9)	6 (1.7)	
The Hospital for Sick Children	1,825 (56.8)	210 (56.0)	179 (51.3)	
0–28 days	213 (6.6)	28 (7.5)	17 (4.9)	
29 days–<1 year	231 (7.2)	35 (9.3)	21 (6.0)	
1–6 years	493 (15.4)	61 (16.3)	49 (14.0)	
7–12 years	469 (14.6)	50 (13.3)	46 (13.2)	
13–<18 years	419 (13)	36 (9.6)	46 (13.2)	
London Health Sciences Centre (University)	287 (8.9)	38 (10.1)	43 (12.3)	
0–28 days	26 (0.8)	**	**	
29 days–<1 year	30 (0.9)	**	6 (1.7)	
1–6 years	67 (2.1)	**	17 (4.9)	
7–12 years	66 (2.1)	9 (2.4)	9 (2.6)	
13–<18 years	98 (3.1)	14 (3.7)	9 (2.6)	
All other acute care facilities[2]	524 (16.3)	72 (19.2)	73 (20.9)	
0–28 days	91 (2.8)	19 (5.1)	13 (3.7)	
29 days–<1 year	37 (1.2)	**	**	
1–6 years	92 (2.9)	13 (3.5)	10 (2.9)	
7–12 years	82 (2.6)	13 (3.5)	11 (3.2)	
13–<18 years	222 (6.9)	24 (6.4)	34 (9.7)	

	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
		n (%)					
	375	328	362	368	301	386	367
	36 (9.6)	32 (9.8)	28 (7.7)	42 (11.4)	35 (11.6)	58 (15.0)	45 (12.3)
	**	**	**	**	**	**	6 (1.6)
	**	6 (1.8)	**	**	**	**	**
	7 (1.9)	**	6 (1.7)	10 (2.7)	9 (3.0)	13 (3.4)	17 (4.6)
	9 (2.4)	11 (3.4)	7 (1.9)	13 (3.5)	15 (5.0)	13 (3.4)	9 (2.5)
	12 (3.2)	9 (2.7)	8 (2.2)	12 (3.3)	6 (2.0)	25 (6.5)	11 (3.0)
	34 (9.1)	26 (7.9)	25 (6.9)	31 (8.4)	29 (9.6)	25 (6.5)	20 (5.4)
	**	6 (1.8)	7 (1.9)	**	**	**	**
	**	**	**	**	**	**	**
	8 (2.1)	8 (2.4)	**	10 (2.7)	8 (2.7)	7 (1.8)	**
	7 (1.9)	6 (1.8)	6 (1.7)	9 (2.4)	**	7 (1.8)	**
	11 (2.9)	**	**	**	12 (4.0)	**	6 (1.6)
	199 (53.1)	194 (59.1)	211 (58.3)	211 (57.3)	164 (54.5)	229 (59.3)	228 (62.1)
	33 (8.8)	37 (11.3)	25 (6.9)	15 (4.1)	17 (5.6)	20 (5.2)	21 (5.7)
	26 (6.9)	25 (7.6)	25 (6.9)	28 (7.6)	14 (4.7)	26 (6.7)	31 (8.4)
	58 (15.5)	47 (14.3)	53 (14.6)	66 (17.9)	43 (14.3)	61 (15.8)	55 (15.0)
	41 (10.9)	42 (12.8)	56 (15.5)	51 (13.9)	47 (15.6)	65 (16.8)	71 (19.3)
	41 (10.9)	43 (13.1)	52 (14.4)	51 (13.9)	43 (14.3)	57 (14.8)	50 (13.6)
	39 (10.4)	29 (8.8)	31 (8.6)	26 (7.1)	32 (10.6)	21 (5.4)	28 (7.6)
	7 (1.9)	**	**	**	**	**	**
	**	**	**	**	**	**	**
	8 (2.1)	**	7 (1.9)	8 (2.2)	8 (2.7)	**	**
	**	9 (2.7)	6 (1.7)	10 (2.7)	9 (3.0)	**	6 (1.6)
	16 (4.3)	12 (3.7)	12 (3.3)	**	11 (3.7)	9 (2.3)	11 (3.0)
	67 (17.9)	47 (14.3)	67 (18.5)	58 (15.8)	41 (13.6)	53 (13.7)	46 (12.5)
	12 (3.2)	8 (2.4)	12 (3.3)	7 (1.9)	6 (2.0)	9 (2.3)	**
	**	**	7 (1.9)	**	**	**	**
	15 (4.0)	8 (2.4)	9 (2.5)	14 (3.8)	6 (2.0)	9 (2.3)	8 (2.2)
	8 (2.1)	**	13 (3.6)	15 (4.1)	8 (2.7)	**	7 (1.9)
	27 (7.2)	23 (7.0)	26 (7.2)	19 (5.2)	17 (5.6)	29 (7.5)	23 (6.3)

Data source: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), 2003/04 – 20011/12.

Inclusion criteria: Patients aged <18 years admitted to hospital with a diagnosis of stroke (arterial ischemic stroke or cerebral sinovenous thrombosis or hemorrhagic stroke) or TIA.

1 Based on unique patients (i.e., does not include multiple patient-visits).

2 Number of adult acute care facilities included in DAD varied across years (N = 36 in 2003/04; 30 in 2004/05; 31 in 2005/06; 24 in 2006/07; 32 in 2007/08; 28 in 2008/09; 17 in 2009/10; 31 in 2010/11; and 26 in 2011/12).

** Cell value suppressed for reasons of privacy and confidentiality.

EXHIBIT 9.3 Age- and sex-adjusted paediatric inpatient admission rates per 100,000 LHIN population under 18 years, in Ontario and by Local Health Integration Network, 2003/04–2011/12

Key Findings

- The provincial age- and sex-adjusted hospital admission rate for paediatric stroke or TIA per 100,000 population under 18 years fluctuated across the years; however, rates in 2003/04 and 2011/12 were similar (13.4 and 13.5).
- Rates of paediatric hospitalization per 100,000 population under 18 years varied across the LHINs in 2011/12, ranging from 4.0 in the North West LHIN to 19.3 in the North East LHIN.

Group/Subgroup	2003/04	2004/05	2005/06	
Ontario[2]	13.4 (373)	12.4 (347)	13.4 (372)	
Local Health Integration Network				
1. Erie St. Clair	9.5 (14)	10.9 (16)	17.1 (25)	
2. South West	14.8 (31)	14.8 (31)	13.7 (28)	
3. Waterloo Wellington	9.7 (16)	13.3 (22)	13.9 (23)	
4. Hamilton Niagara Haldimand Brant	10.8 (32)	10.1 (30)	10.8 (32)	
5. Central West	14.9 (27)	15.0 (28)	13.1 (25)	
6. Mississauga Halton	12.4 (30)	12.2 (30)	9.9 (25)	
7. Toronto Central	15.5 (37)	13.3 (31)	12.2 (29)	
8. Central	14.2 (50)	12.8 (45)	13.5 (48)	
9. Central East	14.6 (47)	12.1 (39)	15.6 (50)	
10. South East	16.1 (16)	14.0 (14)	11.1 (11)	
11. Champlain	11.0 (29)	12.2 (32)	16.2 (42)	
12. North Simcoe Muskoka	17.6 (16)	8.3 (8)	15.6 (15)	
13. North East	17.5 (21)	14.6 (17)	14.1 (16)	
14. North West	12.0 (7)	7.0 (**)	5.3 (**)	

	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
			Inpatient Admission Rates,[1] % (n)			
	11.8 (327)	13.1 (361)	13.4 (367)	11.0 (300)	14.2 (386)	13.5 (367)
	6.9 (10)	11.4 (16)	10.1 (14)	13.8 (19)	10.3 (14)	16.7 (22)
	13.2 (27)	12.3 (25)	13.9 (28)	12.1 (24)	10.7 (21)	13.9 (27)
	8.4 (14)	10.2 (17)	12.2 (20)	11.7 (19)	7.4 (12)	9.8 (16)
	11.7 (34)	9.0 (26)	11.2 (32)	9.2 (26)	9.3 (26)	8.6 (24)
	12.7 (25)	18.4 (37)	12.1 (24)	10.4 (21)	16.6 (33)	14.0 (28)
	13.1 (33)	12.5 (32)	8.5 (22)	9.6 (25)	16.8 (44)	12.8 (34)
	12.6 (30)	12.8 (29)	13.5 (30)	10.6 (23)	12.3 (27)	16.2 (35)
	10.1 (36)	12.8 (46)	15.2 (55)	9.4 (34)	15.5 (57)	14.3 (53)
	13.7 (44)	17.6 (56)	18.0 (57)	12.7 (40)	15.2 (48)	13.9 (44)
	12.3 (12)	18.8 (18)	16.0 (15)	12.0 (11)	6.7 (6)	13.5 (12)
	11.4 (29)	10.3 (26)	14.0 (35)	10.4 (26)	19.7 (49)	13.7 (34)
	7.1 (7)	16.8 (16)	14.9 (14)	11.8 (11)	17.8 (16)	17.8 (16)
	22.4 (25)	11.8 (13)	13.7 (15)	16.8 (18)	21.8 (23)	19.3 (20)
	1.8 (**)	7.6 (**)	11.6 (6)	5.9 (**)	19.8 (10)	4.0 (**)

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), 2003/04 – 2011/12; Statistics Canada, Ontario census data, 1996.

Inclusion criteria: Patients aged <18 years admitted to hospital with a diagnosis of stroke (arterial ischemic stroke or cerebral sinovenous thrombosis or hemorrhagic stroke) or TIA.

1 Age- and sex-adjusted rates were determined using each year's Ontario population as the standard.

2 Based on unique patients (i.e., does not include multiple patient-visits).

** Cell value suppressed for reasons of privacy and confidentiality.

Notes:

(1) Population-based analysis (i.e., the location of the patient's residence is used to report regional performance).

(2) Indicates a significant difference from the provincial rate.

(3) LHIN/sub-LHIN populations were determined using POPLHIN 2003–2010, POPLHIN_PROJECTED 2011 and POPSUBLHIN VERSION 9 2006–2008 files from Ontario Ministry of Health and Long-Term Care: IntelliHealth Ontario.

EXHIBIT 9.4 Paediatric inpatient length of stay for stroke or transient ischemic attack, in Ontario and by stroke type and facility, 2003/04–2011/12

Key Findings

- The median length of stay (LOS) for paediatric stroke patients in Ontario fluctuated with each year, and was 7 days over the study period.
- Patients with cerebral sinovenous thrombosis had the longest LOS, a median of 11 days, compared to 7 days for hemorrhagic and arterial ischemic strokes.
- The median LOS for cerebral sinovenous thrombosis dramatically declined from 18 days in 2003/04 to 9 days in 2011/12.
- Tertiary care centres had longer LOS than non-tertiary care hospitals (8–11 days vs. 3 days).

Group/ Subgroup	All Years			2003/04			2004/05			2005/06		
	No. of patients[1]	Mean length of stay (days)	Median length of stay (days)	No. of patients[1]	Mean length of stay (days)	Median length of stay (days)	No. of patients[1]	Mean length of stay (days)	Median length of stay (days)	No. of patients[1]	Mean length of stay (days)	Median length of stay (days)
Ontario	3,211	18	7	375	18.1	7	349	18.3	8	375	19.0	9
Stroke Type												
Arterial ischemic stroke	2,303	17.8	7	260	17.6	7	260	17.8	8	275	19.6	9
Cerebral sinovenous thrombosis	232	19.0	11	32	22.7	18	19	18.5	12	24	21.0	11
Hemorrhagic stroke	676	18.3	7	83	17.6	6	70	20.0	7	76	16.1	8
Facility												
Children's Hospital of Eastern Ontario	333	21.5	9	28	16.1	7.5	29	16.9	9	36	16.7	7
Hamilton Health Sciences (McMaster)	242	19.4	9	27	15.7	9	25	15.7	9	34	24.3	10.5
The Hospital for Sick Children	1,825	18.7	8	210	19.5	9	179	20.8	8	199	20.9	11
London Health Sciences Centre (University)	287	21.9	11	38	26.5	11	43	21.8	15	39	16.4	9
All other acute care facilities[2]	524	10.5	3	72	11.0	3	73	11.5	4	67	13.4	4

	2006/07			2007/08			2008/09			2009/10			2010/11			2011/12		
	No. of patients[1]	Mean length of stay (days)	Median length of stay (days)	No. of patients[1]	Mean length of stay (days)	Median length of stay (days)	No. of patients[1]	Mean length of stay (days)	Median length of stay (days)	No. of patients[1]	Mean length of stay (days)	Median length of stay (days)	No. of patients[1]	Mean length of stay (days)	Median length of stay (days)	No. of patients[1]	Mean length of stay (days)	Median length of stay (days)
	328	18.9	8	362	18.4	8	368	18.2	7	301	17.4	8	386	18.6	7	367	15.1	6
	231	19.7	8	264	17.1	8	259	17.4	7	219	17.2	8	282	18.5	7	253	15.4	5
	22	16.6	10	21	16.8	11	26	31.2	16	18	9.6	7	37	18.7	10	33	13.1	9
	75	17.1	7	77	23.2	8	83	16.9	7	64	20.2	9	67	19.1	7	81	14.9	6
	32	30.0	16	28	25.8	12	42	21.9	9.5	35	23.0	15	58	20.7	7.5	45	22.5	8
	26	7.7	5	25	20.9	13	31	19.8	8	29	24.2	8	25	31.7	21	20	10.9	5.5
	194	20.0	8	211	17.8	8	211	19.4	8	164	15.6	7.5	229	18.5	7	228	16.1	5
	29	23.7	10	31	27.6	17	26	23.9	12.5	32	23.6	17	21	24.4	9	28	10.0	7.5
	47	10.1	3	67	12.1	5	58	8.1	2	41	10.1	4	53	8.3	3	46	7.5	3

Data source: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), 2003/04 – 2011/12.

Inclusion criteria: Patients aged <18 years admitted to hospital with a diagnosis of stroke (arterial ischemic stroke or cerebral sinovenous thrombosis or hemorrhagic stroke) or TIA.

1 Based on unique patients (i.e., does not include multiple patient-visits).

2 Number of adult acute care facilities included in DAD varied across years (N = 36 in 2003/04; 30 in 2004/05; 31 in 2005/06; 24 in 2006/07; 32 in 2007/08; 28 in 2008/09; 17 in 2009/10; 31 in 2010/11; and 26 in 2011/12).

EXHIBIT 9.5 Discharge destination of paediatric patients with stroke or transient ischemic attack following an acute care hospitalization, in Ontario and by stroke type and facility, 2003/04–2011/12

Key Findings

- In 2011/12, 65.2% of paediatric stroke patients were discharged home without services, 20.4% were discharged home with services, 8.0% were transferred to an acute care facility, 3.7% were discharged to a rehabilitation facility and 2.0% were discharged to a complex continuing care facility.
- There was little difference in the discharge destination by stroke type. From 2003/04 to 2011/12, 62.6% of arterial ischemic stroke patients, 42.9% of cerebral sinovenous thrombosis patients and 63.8% of hemorrhagic stroke patients were discharged home without services.

Group/Subgroup	Year	Sample size	Acute care	
Ontario				
	All Years	3,016	262 (8.7)	
	2003/04	347	39 (11.2)	
	2004/05	333	26 (7.8)	
	2005/06	350	40 (11.4)	
	2006/07	303	27 (8.9)	
	2007/08	338	29 (8.6)	
	2008/09	346	27 (7.8)	
	2009/10	279	18 (6.5)	
	2010/11	372	28 (7.5)	
	2011/12	348	28 (8.0)	
Stroke Type				
Arterial ischemic stroke	All Years	2,201	158 (7.2)	
	2003/04	247	23 (9.3)	
	2004/05	255	16 (6.3)	
	2005/06	259	21 (8.1)	
	2006/07	220	14 (6.4)	
	2007/08	248	21 (8.5)	
	2008/09	247	17 (6.9)	
	2009/10	206	12 (5.8)	
	2010/11	276	17 (6.2)	
	2011/12	243	17 (7.0)	
Cerebral sinovenous thrombosis	All Years	219	31 (14.2)	
	2003/04	29	10 (34.5)	
	2004/05	19	**	
	2005/06	21	**	
	2006/07	20	**	
	2007/08	21	**	
	2008/09	26	**	
	2009/10	17	-	
	2010/11	35	**	
	2011/12	31	**	

	Complex continuing care	Home with services	Home without services	Rehabilitation	Other[2]
			Patients,[1] n (%)		
	119 (3.9)	667 (22.1)	1,851 (61.4)	79 (2.6)	38 (1.3)
	23 (6.6)	60 (17.3)	216 (62.2)	**	6 (1.7)
	12 (3.6)	69 (20.7)	212 (63.7)	11 (3.3)	**
	8 (2.3)	70 (20.0)	220 (62.9)	7 (2.0)	**
	12 (4.0)	88 (29.0)	162 (53.5)	7 (2.3)	7 (2.3)
	16 (4.7)	73 (21.6)	204 (60.4)	12 (3.6)	**
	18 (5.2)	79 (22.8)	210 (60.7)	7 (2.0)	**
	13 (4.7)	59 (21.1)	178 (63.8)	8 (2.9)	**
	10 (2.7)	98 (26.3)	222 (59.7)	11 (3.0)	**
	7 (2.0)	71 (20.4)	227 (65.2)	13 (3.7)	**
	98 (4.5)	482 (21.9)	1,377 (62.6)	64 (2.9)	22 (1.0)
	19 (7.7)	40 (16.2)	161 (65.2)	**	**
	11 (4.3)	53 (20.8)	161 (63.1)	11 (4.3)	**
	**	55 (21.2)	170 (65.6)	6 (2.3)	**
	9 (4.1)	71 (32.3)	118 (53.6)	**	**
	12 (4.8)	54 (21.8)	146 (58.9)	12 (4.8)	**
	15 (6.1)	47 (19.0)	160 (64.8)	**	**
	12 (5.8)	44 (21.4)	131 (63.6)	**	**
	8 (2.9)	71 (25.7)	169 (61.2)	9 (3.3)	**
	7 (2.9)	47 (19.3)	161 (66.3)	9 (3.7)	**
	**	87 (39.7)	94 (42.9)	**	**
	**	12 (41.4)	**	-	**
	-	6 (31.6)	10 (52.6)	-	-
	-	7 (33.3)	12 (57.1)	-	-
	**	8 (40.0)	10 (50.0)	-	-
	-	7 (33.3)	11 (52.4)	-	-
	**	16 (61.5)	6 (23.1)	**	-
	-	6 (35.3)	11 (64.7)	-	-
	-	15 (42.9)	13 (37.1)	**	**
	-	10 (32.3)	16 (51.6)	-	-

EXHIBIT 9.5 *continued*

- The proportion of patients sent home with services was higher for cerebral sinovenous thrombosis (CSVT) patients (39.7%) compared to arterial ischemic stroke (AIS) and hemorrhagic stroke patients (21.9% and 16.4%, respectively). Not unexpectedly, the proportion of hemorrhagic stroke patients discharged to another facility (acute care, complex continuing care, rehabilitation or palliative care) was higher (19.7%) than for CSVT and AIS patients (17.4% and 15.6%, respectively).

- There were differences in patient discharge destinations among tertiary care facilities in 2011/12. More than 75% of patients admitted to the Children's Hospital of Eastern Ontario and London Health Sciences Centre were discharged home without services, compared to 60% of those seen at The Hospital for Sick Children and 50% of those seen at Hamilton Health Sciences (McMaster campus).

Group/Subgroup	Year	Sample size	Acute care	
Hemorrhagic stroke	All Years	596	73 (12.2)	
	2003/04	71	6 (8.5)	
	2004/05	59	7 (11.9)	
	2005/06	70	17 (24.3)	
	2006/07	63	12 (19.0)	
	2007/08	69	**	
	2008/09	73	8 (11.0)	
	2009/10	56	6 (10.7)	
	2010/11	61	6 (9.8)	
	2011/12	74	6 (8.1)	
Facility (Site)				
Children's Hospital of Eastern Ontario	All Years	322	18 (5.6)	
	2003/04	28	**	
	2004/05	29	-	
	2005/06	35	**	
	2006/07	31	**	
	2007/08	25	**	
	2008/09	39	**	
	2009/10	33	**	
	2010/11	57	**	
	2011/12	45	**	
Hamilton Health Sciences (McMaster)	All Years	227	18 (7.9)	
	2003/04	25	-	
	2004/05	24	**	
	2005/06	33	**	
	2006/07	22	**	
	2007/08	25	**	
	2008/09	29	-	
	2009/10	27	**	
	2010/11	24	-	
	2011/12	18	**	

	Complex continuing care	Home with services	Home without services	Rehabilitation	Other[2]
			Patients,[1] n (%)		
	18 (3.0)	98 (16.4)	380 (63.8)	13 (2.2)	14 (2.3)
	**	8 (11.3)	50 (70.4)	**	**
	**	10 (16.9)	41 (69.5)	-	-
	**	8 (11.4)	38 (54.3)	**	**
	**	9 (14.3)	34 (54.0)	**	**
	**	12 (17.4)	47 (68.1)	-	**
	**	16 (21.9)	44 (60.3)	**	**
	**	9 (16.1)	36 (64.3)	**	**
	**	12 (19.7)	40 (65.6)	**	-
	-	14 (18.9)	50 (67.6)	**	-
	-	41 (12.7)	252 (78.3)	**	10 (3.1)
	-	-	25 (89.3)	-	-
	-	7 (24.1)	21 (72.4)	-	**
	-	**	30 (85.7)	-	-
	-	**	21 (67.7)	-	**
	-	**	20 (80.0)	-	**
	-	7 (17.9)	29 (74.4)	-	**
	-	**	24 (72.7)	-	**
	-	8 (14.0)	46 (80.7)	**	-
	-	**	36 (80.0)	-	**
	**	43 (18.9)	156 (68.7)	7 (3.1)	-
	**	**	21 (84.0)	**	-
	-	**	16 (66.7)	-	-
	-	6 (18.2)	26 (78.8)	-	-
	-	**	16 (72.7)	-	-
	**	**	14 (56.0)	**	-
	-	6 (20.7)	22 (75.9)	**	-
	-	**	21 (77.8)	**	-
	**	12 (50.0)	11 (45.8)	-	-
	-	**	9 (50.0)	**	-

EXHIBIT 9.5 *continued*

- In 2011/12, paediatric stroke patients seen at non-tertiary care hospitals were either discharged home without services (73.3%) or transferred to acute care facilities (20.0%).

Group/Subgroup	Year	Sample size	Acute care	
The Hospital for Sick Children	All Years	1,700	96 (5.6)	
	2003/04	192	11 (5.7)	
	2004/05	168	8 (4.8)	
	2005/06	185	18 (9.7)	
	2006/07	178	12 (6.7)	
	2007/08	194	11 (5.7)	
	2008/09	198	10 (5.1)	
	2009/10	152	**	
	2010/11	219	13 (5.9)	
	2011/12	214	8 (3.7)	
London Health Sciences Centre (University)	All Years	273	17 (6.2)	
	2003/04	35	**	
	2004/05	42	-	
	2005/06	37	-	
	2006/07	27	**	
	2007/08	31	**	
	2008/09	25	**	
	2009/10	30	**	
	2010/11	20	-	
	2011/12	26	**	
All other acute care facilities[3]	All Years	494	113 (22.9)	
	2003/04	67	20 (29.9)	
	2004/05	70	14 (20.0)	
	2005/06	60	19 (31.7)	
	2006/07	45	7 (15.6)	
	2007/08	63	11 (17.5)	
	2008/09	55	14 (25.5)	
	2009/10	37	6 (16.2)	
	2010/11	52	13 (25.0)	
	2011/12	45	9 (20.0)	

	Complex continuing care	Home with services	Home without services	Rehabilitation	Other[2]
			Patients,[1] n (%)		
	114 (6.7)	513 (30.2)	940 (55.3)	24 (1.4)	13 (0.8)
	22 (11.5)	49 (25.5)	105 (54.7)	-	**
	11 (6.5)	53 (31.5)	95 (56.5)	-	**
	8 (4.3)	53 (28.6)	103 (55.7)	**	**
	12 (6.7)	71 (39.9)	81 (45.5)	-	**
	15 (7.7)	56 (28.9)	111 (57.2)	**	-
	18 (9.1)	57 (28.8)	110 (55.6)	**	**
	12 (7.9)	42 (27.6)	90 (59.2)	**	-
	9 (4.1)	72 (32.9)	116 (53.0)	7 (3.2)	**
	7 (3.3)	60 (28.0)	129 (60.3)	10 (4.7)	-
	**	45 (16.5)	180 (65.9)	26 (9.5)	**
	-	6 (17.1)	22 (62.9)	**	**
	-	**	34 (81.0)	**	**
	-	**	30 (81.1)	**	-
	-	9 (33.3)	12 (44.4)	**	-
	-	**	16 (51.6)	6 (19.4)	**
	-	**	16 (64.0)	**	-
	**	6 (20.0)	17 (56.7)	**	**
	-	**	13 (65.0)	**	-
	-	**	20 (76.9)	**	-
	**	25 (5.1)	323 (65.4)	21 (4.3)	11 (2.2)
	-	**	43 (64.2)	**	-
	**	**	46 (65.7)	8 (11.4)	-
	-	**	31 (51.7)	**	**
	-	**	32 (71.1)	**	**
	-	6 (9.5)	43 (68.3)	**	**
	-	**	33 (60.0)	**	**
	-	**	26 (70.3)	**	**
	-	**	36 (69.2)	**	**
	-	**	33 (73.3)	**	-

Data source: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), 2003/04 – 2011/12.

Inclusion criteria: Patients aged <18 years admitted to hospital with a diagnosis of stroke (arterial ischemic stroke or cerebral sinovenous thrombosis or hemorrhagic stroke) or TIA and discharged alive.

1 Based on unique patients (i.e., does not include multiple patient-visits).

2 Palliative care and other are combined.

3 Number of adult acute care facilities included in DAD varied across years (N = 36 in 2003/04; 30 in 2004/05; 31 in 2005/06; 24 in 2006/07; 32 in 2007/08; 28 in 2008/09; 17 in 2009/10; 31 in 2010/11; and 26 in 2011/12).

** Cell value suppressed for reasons of privacy and confidentiality.

Note:

Cells in which there were no reported/available data are marked with a hyphen (-).

Paediatric Inpatient Care

CONCLUSIONS AND RECOMMENDATIONS

According to administrative databases, less than 400 paediatric stroke patients are admitted annually to Ontario hospitals. The 12% rate of stroke prevalence among neonates is lower than expected. Neonatal stroke prevalence is commonly referred to as 1 per 4,000 live births.[39] We estimate that half of all cases are not recorded with the current coding strategy. The use of ICD codes for cerebral palsy and chart review are required to ascertain the true prevalence of neonatal stroke.[40]

The variability across LHINs, despite a stable provincial rate, likely reflects variability in the availability of specialized resources. The majority of patients were admitted to The Hospital for Sick Children, the only Ontario facility to have paediatric stroke-trained neurologists and a defined stroke program.

The median length of stay in 2011/12 (6 days) was lower than in previous years (7–9 days). Continued trend analysis would be beneficial in assessing the stability of progress.

Compared to adults, paediatric stroke patients are less likely to be discharged to inpatient rehabilitation and more likely to be sent home with services (24.4% and 13.9%, respectively, among adults compared to 3.7% and 20.4%, respectively, among paediatric patients in 2011/12). Resources are needed to implement acute care paediatric stroke best practice guidelines and to monitor adherence.

10 Paediatric Patient Outcomes

EXHIBIT 10.1 Age- and sex-adjusted stroke/TIA-related revisit or readmission rates within 30 days following a stroke or transient ischemic attack, in Ontario and by stroke type and facility, 2003/04–2010/11

Key Findings

- Thirty-day age- and sex-adjusted stroke/TIA-related revisit and readmission rates increased in Ontario from 2.9% in 2003/04 to 3.4% in 2010/11.
- Over the 8-year study period, the age- and sex-adjusted revisit/readmission rate for stroke/TIA at 30 days was highest for patients with hemorrhagic stroke (3.4%), followed by those with cerebral sinovenous stroke (3.3%) and arterial ischemic stroke (2.7%).
- Rates of stroke/TIA-related revisits or readmissions were higher over the 8 years for patients admitted to non-tertiary care centres compared to tertiary care centres (4.6% vs. 1.4%–3.0%).

Group/Subgroup	Age- and Sex-Adjusted[1] 30-Day Revisit or Readmission Rate (%)								
	All Years	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Ontario[2]		2.9	2.5	2.4	3.8	2.4	3.2	2.4	3.4
Stroke Type									
Arterial ischemic stroke	2.7	2.2	2.9	2.7	3.8	2.0	3.3	2.9	2.6
Cerebral sinovenous thrombosis	3.3	-	-	-	-	4.3	4.1	-	8.7
Hemorrhagic stroke	3.4	5.1	1.5	1.3	5.4	3.8	2.3	1.5	6.2
Facility (Site)									
Children's Hospital of Eastern Ontario	3.0	-	5.3	2.1	6.3	6.1	2.0	-	3.1
Hamilton Health Sciences (McMaster)	1.4	-	-	3.0	4.2	-	-	-	4.2
The Hospital for Sick Children	2.1	1.8	2.9	0.6	3.3	3.3	2.0	0.6	1.8
London Health Sciences Centre (University)	2.4	4.1	-	-	2.9	-	7.0	6.2	-
All other acute care facilities[3]	4.6	4.4	2.6	5.5	4.1	1.0	5.4	5.5	7.8

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), and National Ambulatory Care Reporting System (NACRS), 2003/04 – 2010/11.

Inclusion criteria: All patients aged <18 years readmitted to an emergency department or inpatient setting of an acute care hospital in Ontario with a diagnosis of stroke (arterial ischemic stroke or cerebral sinovenous thrombosis or hemorrhagic stroke) or TIA on both admissions within 30 days of the initial stroke event in each fiscal year.

Exclusion criteria: Patients with an elective or scheduled emergency department visit, or inpatients who are transferred within a facility or between facilities within 24 hours.

1 Indirect standardization based on an age-sex regression model was used to calculate adjusted rates.

2 Based on unique patients (i.e., does not include multiple patient-visits).

3 Number of adult acute care facilities included in NACRS and/or DAD varied across years (N = 48 in 2003/04; 43 in 2004/05; 47 in 2005/06; 44 in 2006/07; 46 in 2007/08; 42 in 2008/09; 48 in 2009/10; and 42 in 2010/11).

Notes:

(1) No washout periods were applied; for example, if a patient's first hospitalization for stroke had a discharge date of March 31, 2009 (fiscal year 2008/09), followed by another hospitalization for stroke/TIA on April 1, 2009 (FY 2009/10), the April 1 hospitalization would be considered the first hospitalization in 2009/10 and not a readmission related to the hospitalization in 2008/09.

(2) Cells in which there were no reported/available data are marked with a hyphen (-).

EXHIBIT 10.2 Age- and sex-adjusted stroke/TIA-related revisit or readmission rates within 90 days following a stroke or transient ischemic attack, in Ontario and by stroke type and facility, 2003/04–2010/11

Key Findings

- Ninety-day age- and sex-adjusted stroke/TIA-related revisit and readmission rates increased in Ontario from 3.1% in 2003/04 to 5.3% in 2010/11.
- Over the 8-year study period, the age- and sex-adjusted revisit/readmission rate for stroke/TIA at 90 days was highest for patients with cerebral sinovenous stroke (6.2%), followed by those with hemorrhagic stroke (4.7%) and arterial ischemic stroke (3.6%).
- Rates of stroke/TIA-related revisits or readmissions over the 8 years were higher for patients admitted to non-tertiary care centres compared to tertiary care centres (5.4% vs. 2.2%–3.5%).

Group/Subgroup	Age- and Sex-Adjusted[1] 90-Day Revisit or Readmission Rate (%)								
	All Years	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Ontario[2]		3.1	3.3	3.5	4.9	4.4	3.2	3.2	5.3
Stroke Type									
Arterial ischemic stroke	3.6	2.5	3.4	3.6	5.2	3.3	3.3	3.7	3.7
Cerebral sinovenous thrombosis	6.2	-	-	-	-	8.6	4.1	5.8	17.5
Hemorrhagic stroke	4.7	5.1	3.1	3.9	5.1	7.1	2.3	1.4	8.8
Facility (Site)									
Children's Hospital of Eastern Ontario	3.3	-	5.2	4.3	6.2	6.4	2.0	-	3.1
Hamilton Health Sciences (McMaster)	2.2	-	-	3.0	4.3	3.3	-	-	8.1
The Hospital for Sick Children	3.5	2.3	2.9	3.0	5.4	5.2	2.0	2.4	4.4
London Health Sciences Centre (University)	3.4	4.2	2.2	-	3.1	6.7	7.0	5.7	-
All other acute care facilities[3]	5.4	4.6	4.3	5.6	4.1	1.9	5.4	6.4	9.8

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), and National Ambulatory Care Reporting System (NACRS), 2003/04 – 2010/11.

Inclusion criteria: All patients aged <18 years readmitted to an emergency department or inpatient setting of an acute care hospital in Ontario with a diagnosis of stroke (arterial ischemic stroke or cerebral sinovenous thrombosis or hemorrhagic stroke) or TIA on both admissions within 90 days of the initial stroke event in each fiscal year.

Exclusion criteria: Patients with an elective or scheduled emergency department visit, or inpatients who are transferred within a facility or between facilities within 24 hours.

1 Indirect standardization based on an age-sex regression model was used to calculate adjusted rates.

2 Based on unique patients (i.e., does not include multiple patient-visits).

3 Number of adult acute care facilities included in NACRS and/or DAD varied across years (N = 48 in 2003/04; 43 in 2004/05; 47 in 2005/06; 44 in 2006/07; 46 in 2007/08; 42 in 2008/09; 48 in 2009/10; and 42 in 2010/11).

Notes:

(1) No washout periods were applied; for example, if a patient's first hospitalization for stroke had a discharge date of March 31, 2009 (fiscal year 2008/09), followed by another hospitalization for stroke/TIA on April 1, 2009 (FY 2009/10), the April 1 hospitalization would be considered the first hospitalization in 2009/10 and not a readmission related to the hospitalization in 2008/09.

(2) Cells in which there were no reported/available data are marked with a hyphen (-).

EXHIBIT 10.3 Age- and sex-adjusted stroke/TIA-related revisit or readmission rates within one year following a stroke or transient ischemic attack, in Ontario and by stroke type and facility, 2003/04–2010/11

Key Findings

- Age- and sex-adjusted stroke/TIA-related revisit and readmission rates at 1 year increased in Ontario from 4.3% in 2003/04 to 6.6% in 2010/11.
- Over the 8-year study period, the age- and sex-adjusted revisit/readmission rate for stroke/TIA at 1 year was highest for patients with cerebral sinovenous stroke (6.7%), followed by those with hemorrhagic stroke (5.5%) and arterial ischemic stroke (5.2%).
- Rates of stroke/TIA-related revisits or readmissions were higher for patients admitted to non-tertiary care centres compared to tertiary care centres (6.3% vs. 2.2%–5.7%).

Group/Subgroup	Age- and Sex-Adjusted[1] One-Year Revisit or Readmission Rate (%)								
	All Years	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Ontario[2]		4.3	4.3	5.0	5.7	5.8	5.4	5.4	6.6
Stroke Type									
Arterial ischemic stroke	5.2	3.4	4.7	4.9	6.1	5.3	5.5	6.6	5.4
Cerebral sinovenous thrombosis	6.7	-	-	-	-	8.8	7.8	5.7	17.7
Hemorrhagic stroke	5.5	7.2	3.0	6.4	5.3	7.4	3.4	1.4	8.8
Facility (Site)									
Children's Hospital of Eastern Ontario	5.7	-	5.2	4.3	6.1	6.2	6.2	8.4	7.7
Hamilton Health Sciences (McMaster)	2.2	-	-	3.0	4.6	3.4	-	-	8.0
The Hospital for Sick Children	5.3	4.4	4.7	5.3	7.0	6.6	4.8	4.1	5.7
London Health Sciences Centre (University)	4.2	4.4	4.4	2.1	3.2	6.9	6.6	5.8	-
All other acute care facilities[3]	6.3	5.7	4.3	6.4	4.0	4.7	6.9	8.6	9.9

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), and National Ambulatory Care Reporting System (NACRS), 2003/04–2010/11.

Inclusion criteria: All patients aged <18 years readmitted to an emergency department or inpatient setting of an acute care hospital in Ontario with a diagnosis of stroke (arterial ischemic stroke or cerebral sinovenous thrombosis or hemorrhagic stroke) or TIA on both admissions within one year of the initial stroke event in each fiscal year.

Exclusion criteria: Patients with an elective or scheduled emergency department visit, or inpatients who are transferred within a facility or between facilities within 24 hours.

1 Indirect standardization based on an age-sex regression model was used to calculate adjusted rates.

2 Based on unique patients (i.e., does not include multiple patient-visits).

3 Number of adult acute care facilities included in NACRS and/or DAD varied across years (N = 48 in 2003/04; 43 in 2004/05; 47 in 2005/06; 44 in 2006/07; 46 in 2007/08; 42 in 2008/09; 48 in 2009/10; and 42 in 2010/11).

Notes:

(1) No washout periods were applied; for example, if a patient's first hospitalization for stroke had a discharge date of March 31, 2009 (fiscal year 2008/09), followed by another hospitalization for stroke/TIA on April 1, 2009 (FY 2009/10), the April 1 hospitalization would be considered the first hospitalization in 2009/10 and not a readmission related to the hospitalization in 2008/09.

(2) Cells in which there were no reported/available data are marked with a hyphen (-).

EXHIBIT 10.4 Age- and sex-adjusted all-cause readmission rates within 30 days following a stroke or transient ischemic attack, in Ontario and by stroke type and facility, 2003/04–2010/11

Key Findings

- Thirty-day all-cause readmission rates following a stroke/TIA increased over time (from 10.8% in 2003/04 to 14.9% in 2010/11).
- There was little difference in readmission rates by stroke type (12.9% for arterial ischemic stroke, 14.6% for cerebral sinovenous thrombosis and 13.4% for hemorrhagic stroke).
- All-cause readmissions were lowest among patients admitted to non-tertiary care hospitals.

Group/Subgroup	Age- and Sex-Adjusted[1] 30-Day All-Cause Readmission Rate (%)								
	All Years	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Ontario[2]		10.8	13.8	9.2	14.3	13.8	14.7	13.4	14.9
Stroke Type									
Arterial ischemic stroke	12.9	10.4	14.7	8.9	15.1	12.0	14.6	13.5	13.7
Cerebral sinovenous thrombosis	14.6	11.0	9.2	14.4	13.2	12.2	14.1	10.0	26.7
Hemorrhagic stroke	13.4	13.1	11.2	9.3	11.5	19.7	15.5	13.5	13.7
Facility (Site)									
Children's Hospital of Eastern Ontario	13.3	2.9	16.8	7.0	9.1	17.3	21.0	13.9	16.0
Hamilton Health Sciences Corp. (McMaster)	9.5	9.5	9.9	5.7	4.1	9.8	5.9	10.4	21.2
The Hospital for Sick Children	15.3	14.0	15.9	10.7	20.1	16.3	15.0	13.0	16.9
London Health Sciences Centre (University)	15.2	9.9	18.6	7.0	13.7	12.3	28.9	19.6	11.6
All other acute care facilities[3]	8.8	9.0	7.8	9.5	6.7	8.9	9.3	11.9	7.7

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), and National Ambulatory Care Reporting System (NACRS), 2003/04 – 2010/11.

Inclusion criteria: All patients aged <18 years readmitted to an inpatient setting of an acute care hospital in Ontario within 30 days of initial diagnosis of stroke (arterial ischemic stroke or cerebral sinovenous thrombosis or hemorrhagic stroke) or TIA event in each fiscal year.

Exclusion criteria: Patients with an elective or scheduled emergency department visit, or inpatients who are transferred within a facility or between facilities within 24 hours.

1 Indirect standardization based on an age-sex regression model was used to calculate adjusted rates.

2 Based on unique patients (i.e., does not include multiple patient-visits).

3 Number of adult acute care facilities included in NACRS and/or DAD varied across years (N = 48 in 2003/04; 43 in 2004/05; 47 in 2005/06; 44 in 2006/07; 46 in 2007/08; 42 in 2008/09; 48 in 2009/10; and 42 in 2010/11).

Note:

No washout periods were applied; for example, if a patient's first hospitalization for stroke had a discharge date of March 31, 2009 (fiscal year 2008/09), followed by another hospitalization for stroke/TIA on April 1, 2009 (FY 2009/10), the April 1 hospitalization would be considered the first hospitalization in 2009/10 and not a readmission related to the hospitalization in 2008/09.

Paediatric Readmission Rates

CONCLUSIONS AND RECOMMENDATIONS

Readmission rates among paediatric stroke patients have been increasing. It is necessary to determine the proportion of readmissions that are due to stroke and its sequelae rather than a primary condition. The observation of higher revisit/readmission rates for stroke/TIA at 30 days, 90 days and 1 year at non-tertiary care hospitals supports efforts to have paediatric stroke patients admitted to specialized centres where there is stroke care infrastructure. Future reporting should combine multiple years of data to provide stable outcome rates, given the low prevalence. Development of an appropriate risk-adjustment model to allow for better comparisons is also essential for outcome assessment and monitoring.

EXHIBIT 10.5 Age- and sex-adjusted in-hospital mortality rates of paediatric patients following a stroke or transient ischemic attack, in Ontario and by stroke type, 2003/04–2010/11

Key Findings

- The age- and sex-adjusted in-hospital mortality rate declined from 7.1% in 2003/04 to 3.8% in 2010/11.
- As expected, across all years hemorrhagic stroke patients had the highest in-hospital mortality rate among stroke types (11.5%, compared to 4.7% for arterial ischemic stroke and 4.6% for cerebral sinovenous thrombosis).

	Age- and Sex-Adjusted[1] In-Hospital Mortality Rate (%)								
Group/Subgroup	**All Years**	**2003/04**	**2004/05**	**2005/06**	**2006/07**	**2007/08**	**2008/09**	**2009/10**	**2010/11**
Ontario[2]		7.1	4.7	6.5	7.5	6.7	6.0	7.6	3.8
Stroke Type									
Arterial ischemic stroke	4.7	5.2	2.1	6.1	5.3	6.3	4.7	6.0	2.2
Cerebral sinovenous thrombosis	4.6	7.9	-	10.4	8.5	-	-	5.4	4.5
Hemorrhagic stroke	11.5	14.1	13.6	7.3	12.6	9.9	11.5	12.1	8.6

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), and National Ambulatory Care Reporting System (NACRS); Ontario Ministry of Health and Long-Term Care, Registered Persons Database (RPDB); 2003/04 – 2010/11.

Inclusion criteria: All patients aged <18 years who died either in hospital or following discharge within 30 days or one year of admission to an inpatient setting of an acute care hospital in Ontario with a diagnosis of stroke (arterial ischemic stroke or cerebral sinovenous thrombosis or hemorrhagic stroke) or TIA, in each fiscal year.

Exclusion criteria: Patients with an elective or scheduled emergency department visit, or inpatients who are transferred within a facility or between facilities within 24 hours.

1 All rates were statistically adjusted for age and sex; rates were not adjusted for stroke severity or comorbidities; indirect standardization based on an age-sex regression model was used to calculate adjusted rates.

2 Based on unique patients (i.e., does not include multiple patient-visits).

Note:

Cells in which there were no reported/available data are marked with a hyphen (-).

EXHIBIT 10.6 Age- and sex-adjusted mortality rates of paediatric patients at 30 days following a stroke or transient ischemic attack, in Ontario and by stroke type, 2003/04–2010/11

Key Findings

- The 30-day age- and sex-adjusted mortality rate among paediatric stroke patients declined from 4.9% in 2003/04 to 2.8% in 2010/11.
- Over the 8-year study period, the age- and sex-adjusted mortality rate at 30 days following admission for stroke/TIA was higher for patients with hemorrhagic stroke (8.4%) than for patients with ischemic stroke, including arterial ischemic stroke (3.1%) and cerebral sinovenous thrombosis (2.8%).

Group/Subgroup	Age- and Sex-Adjusted[1] 30-Day Mortality Rate (%)								
	All Years	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Ontario[2]		4.9	2.9	3.5	5.7	6.5	3.8	4.6	2.8
Stroke Type									
Arterial ischemic stroke	3.1	3.5	1.3	3.1	4.2	5.9	3.0	3.2	1.1
Cerebral sinovenous thrombosis	2.8	2.4	-	7.4	7.1	-	-	4.7	2.3
Hemorrhagic stroke	8.4	10.8	8.5	4.1	9.5	9.9	7.4	8.4	9.0

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), and National Ambulatory Care Reporting System (NACRS); Ontario Ministry of Health and Long-Term Care, Registered Persons Database (RPDB); 2003/04 – 2010/11.

Inclusion criteria: All patients aged <18 years who died either in hospital or following discharge within 30 days or 365 days of admission to an inpatient setting of an acute care hospital in Ontario with a diagnosis of stroke (arterial ischemic stroke or cerebral sinovenous thrombosis or hemorrhagic stroke) or TIA, in each fiscal year.

Exclusion criteria: Patients with an elective or scheduled emergency department visit, or inpatients who are transferred within a facility or between facilities within 24 hours.

1 All rates were statistically adjusted for age and sex; rates were not adjusted for stroke severity or comorbidities; indirect standardization based on an age-sex regression model was used to calculate adjusted rates.

2 Based on unique patients (i.e., does not include multiple patient-visits).

Note:

Cells in which there were no reported/available data are marked with a hyphen (-).

EXHIBIT 10.7 Age- and sex-adjusted mortality rates of paediatric patients at one year following a stroke or transient ischemic attack, in Ontario and by stroke type, 2003/04–2010/11

Key Findings

- The one-year age- and sex-adjusted mortality rate among paediatric stroke patients declined from 9.5% in 2003/04 to 6.1% in 2010/11.
- Over the 8-year study period, the age- and sex-adjusted mortality rate at 1 year following admission for stroke/TIA was higher for patients with hemorrhagic stroke (14.8%) than for patients with ischemic stroke, including arterial ischemic stroke (6.8%) and cerebral sinovenous thrombosis (5.7%).

Group/Subgroup	Age- and Sex-Adjusted[1] One-Year Mortality Rate (%)								
	All Years	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Ontario[2]		9.5	7.7	8.1	10.5	9.8	8.5	8.2	6.1
Stroke Type									
Arterial ischemic stroke	6.8	7.6	5.4	7.5	8.9	8.8	6.2	6.5	4.0
Cerebral sinovenous thrombosis	5.7	12.5	-	7.2	7.4	-	7.2	4.8	4.5
Hemorrhagic stroke	14.8	15.6	17.3	11.1	15.5	15.0	15.9	13.2	13.5

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD), and National Ambulatory Care Reporting System (NACRS); Ontario Ministry of Health and Long-Term Care, Registered Persons Database (RPDB); 2003/04 – 2010/11.

Inclusion criteria: All patients aged <18 years who died either in hospital or following discharge within 30 days or one year of admission to an inpatient setting of an acute care hospital in Ontario with a diagnosis of stroke (arterial ischemic stroke or cerebral sinovenous thrombosis or hemorrhagic stroke) or TIA, in each fiscal year.

Exclusion criteria: Patients with an elective or scheduled emergency department visit, or inpatients who are transferred within a facility or between facilities within 24 hours.

1 All rates were statistically adjusted for age and sex; rates were not adjusted for stroke severity or comorbidities; indirect standardization based on an age-sex regression model was used to calculate adjusted rates.

2 Based on unique patients (i.e., does not include multiple patient-visits).

Note:

Cells in which there were no ereported/available data are marked with a hyphen (-).

Paediatric Mortality Rates

CONCLUSIONS AND RECOMMENDATIONS

With overall paediatric stroke mortality rates below 7%, children are clearly more likely than adults to survive a stroke. Hemorrhagic stroke has emerged as an important sub-type of childhood stroke, with a mortality rate higher than for ischemic stroke. A long-term cohort study of paediatric hemorrhagic stroke in Ontario with validated outcomes is needed to supplement the only hemorrhagic stroke registry in Ontario, currently located at The Hospital for Sick Children in Toronto.

Future reporting should combine multiple years of data to provide stable outcome rates, given the low prevalence. Finally, an appropriate risk-adjustment model is required to make valid mortality rate comparisons across facilities and over time.

Accuracy of ICD-10-CA Codes

The 2012 Stroke Evaluation and Quality Committee Report published the first-ever province-wide paediatric stroke data with diagnoses *validated by chart review* (2010/11 Ontario Stroke Audit (OSA)). The study estimated a minimum Ontario paediatric stroke incidence of 5.9 per 100,000 LHIN population under the age of 18.[26] Further work was done using the OSA data (cases with chart-validated diagnoses) to conduct an analysis of ICD code accuracy and yield for paediatric ischemic and hemorrhagic stroke. For each code, accuracy was defined as the percentage of patients with true stroke among all patients identified by that code, and yield was defined as the percentage of true stroke patients captured by that code.

Preliminary results found that the accuracy and yield of ICD-10 codes in paediatric stroke were low. Investigators used ICD-10-CA codes that were both stroke-specific (ischemic stroke, TIA and hemorrhagic stroke) and non-specific stroke (e.g., I65–I67, I69, G81). The accuracy rates of stroke-specific codes ranged from 6.7% to 76.6%, and yield ranged from 1.8% to 29.5%; the highest accuracy and yield were achieved using code I63. Results for non-specific codes ranged widely, between 0 and 66.7% for accuracy and between 0 and 10.2% for yield. For example, hemiplegia (code G81) generated a 10.2% yield with 22.1% accuracy, while occlusion not resulting in infarction (code I66) contributed a 3.6% yield with 66.7% accuracy.

Variability in these results underlines the necessity for prospective data collection and for the re-examination of ICD-10-CA codes and processes for identifying paediatric stroke. Publication of further analyses and outcomes from the OSA validation of paediatric ICD-10-CA codes is planned for later this year.

Summary

The 2013 Ontario Stroke Evaluation Report provides an overview of paediatric stroke care in Ontario over a nine-year period (2003/04 to 2011/12) using administrative databases. Although data derived from these sources have significant limitations, they do allow for examination of trends over time.

Across the nine years (2003/04 to 2011/12), no significant changes in paediatric stroke outcomes were detected, likely reflecting the limitations of the ICD-10-CA codes used to identify paediatric stroke patients. A slight reduction in length of stay was observed (from a median of 7 days in 2005/06 to 6 days in 2011/12). Future outcome reporting should combine additional years of data for more stable outcome estimates. More work is needed to identify other data sources, codes or enhanced search strategies to capture paediatric stroke information. Additionally, the use of the Canadian Institute of Health Information's Special Project 340 stroke elements in DAD and NACRS (e.g., tPA administration, neuroimaging completed within 24 hours) should be considered at tertiary care settings using ICD-10-CA codes with the highest yield. Funding is needed for prospective data collection to provide more accurate data on incidence and care in order to accurately assess and monitor improvements in paediatric stroke care.

References

1. Fonarow GC, Reeves MJ, Smith EE, et al. Characteristics, performance measures, and in-hospital outcomes of the first one million stroke and transient ischemic attack admissions in Get With The Guidelines – Stroke. *Circ Cardiovasc Qual Outcomes*. 2010; 3(3):291–302.

2. Statistics Canada. Table 105-0501. Health indicator profile, annual estimates, by age group and sex, Canada, provinces, territories, health regions (2011 boundaries) and peer groups. Accessed April 12, 2013 at **www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=1050501&tabMode=dataTable&srchLan=-1&p1=-1&p2=9**.

3. Meyer M, O'Callaghan C, Kelloway L, et al. *The Impact of Moving to Stroke Rehabilitation Best Practices in Ontario. Final Report*. Toronto: Ontario Stroke Network; 2012. Accessed April 15, 2013 at **www.ontariostrokenetwork.ca/pdf/The_impact_of_moving_to_stroke_rehabilitation_best_practices_in_Ontario_OSN_Final_Report_Sept_14_2012.pdf**.

4. Lovett JK, Dennis MS, Sandercock PA, Bamford J, Warlow CP, Rothwell PM. Very early risk of stroke after a first transient ischemic attack. *Stroke* 2003; 34(8):e138–40.

5. Coull AJ, Rothwell PM. Underestimation of the early risk of recurrent stroke: evidence of the need for a standard definition. *Stroke* 2004; 35(8):1925–9.

6. Rothwell PM, Warlow CP. Timing of TIAs preceding stroke: time window for prevention is very short. *Neurology* 2005; 64(5):817–20.

7. Gladstone DJ, Kapral MK, Fang J, Laupacis A, Tu JV. Management and outcomes of transient ischemic attacks in Ontario. *CMAJ* 2004; 170(7):1099–104.

8. Rothwell PM, Giles MF, Flossmann E, et al. A simple score (ABCD) to identify individuals at high early risk of stroke after transient ischaemic attack. *Lancet* 2005; 366(9479):29–36.

9. Lindsay P, Gladstone D, Silver D, et al. *Canadian Stroke Quality of Care Study: Secondary Stroke Prevention Quality Indicators and Literature Review*. Toronto: Institute for Clinical Evaluative Sciences; 2005.

10. Rothwell PM, Coull AJ, Giles MF, et al. P. Change in stroke incidence, mortality, case-fatality, severity, and risk factors in Oxfordshire, UK from 1981 to 2004 (Oxford Vascular Study). *Lancet* 2004; 363(9425):1925–33.

11. Luengo-Fernandez R, Gray AM, Rothwell PM. Effect of urgent treatment for transient ischaemic attack and minor stroke on disability and hospital costs (EXPRESS Study): a prospective population-based sequential comparison. *Lancet Neurol* 2009; 8(3):235–43.

12. Webster F, Saposnik G, Kapral MK, Fang J, O'Callaghan C, Hachinski V. Organized outpatient care: stroke prevention clinic referrals are associated with reduced mortality after transient ischemic attack and ischemic stroke. *Stroke* 2011; 42(11):3176–82.

13. Heart and Stroke Foundation of Canada. Attachment 3: Secondary stroke prevention clinic designation guidelines. In: *A Guide to Developing Stroke Prevention Clinics*. Toronto: HSFC; 2001. p. 45. Accessed April 12, 2013 at **www.heartandstroke.on.ca/atf/cf/%7B33C6FA68-B56B-4760-ABC6-D85B2D02EE71%7D/Prevention_Clinic_Attachments_2001FIN.pdf**.

14. Lim SS, Vos T, Flaxman AD, et al. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 2012; 380(9859):2224–60.

15. Hand PJ, Kwan J, Lindley RI, Dennis MS, Wardlaw JM. Distinguishing between stroke and mimic at the bedside: the brain attack study. *Stroke* 2006; 37(3):769–75.

16. Libman RB, Wirkowski E, Alvir J, Rao TH. Conditions that mimic stroke in the emergency department. Implications for acute stroke trials. *Arch Neurol* 1995; 52(11):1119–22.

17. Lindsay MP, Gubitz G, Bayley M, et al. *Canadian Best Practice Recommendations for Stroke Care (Update 2010)*. Ottawa: Canadian Stroke Network; 2010. Accessed April 15, 2013 at **www.strokebestpractices.ca/wp-content/uploads/2011/04/2010BPR_ENG.pdf**.

18. Prevention of Stroke Task Group and the Canadian Best Practice Recommendations for Stroke Care Working Group for the Fourth Edition Update 2012. *Taking Action in Stroke Prevention: A Quick Response Guide*. Ottawa: Canadian Stroke Network; 2012. Accessed April 15, 2013 at **www.canadianstrokenetwork.ca/wp-content/uploads/2012/10/CSN-Taking-Action-Poster_WEBFFF.pdf**.

19. Kapral MK, Ben-Yakov M, Fang J, et al. Gender differences in carotid imaging and revascularization following stroke. *Neurology* 2009; 73(23):1969–74.

20. Coutts S, Kelloway L, on behalf of the Prevention of Stroke Best Practices Writing Group. Chapter 2: Prevention of stroke. In: Lindsay MP, Gubitz G, Bayley M, and Phillips S, editors. *Canadian Best Practice Recommendations for Stroke Care*. 4th ed. Ottawa: Canadian Stroke Network; 2012. Accessed April 15, 2013 at **www.strokebestpractices.ca/wp-content/uploads/2012/10/20120BPR_Ch2_Prevention_Final-Version_20Sept-2012F-12.pdf.**

21. Mai LM, Oczkowski W, Mackenzie G, et al. Screening for cognitive impairment in a stroke prevention clinic using the MoCA. *Can J Neurol Sci* 2013; 40(2):192–7.

22. Madureira S, Guerreiro M, Ferro JM. Dementia and cognitive impairment three months after stroke. *Eur J Neurol* 2001; 8(6):621–7.

23. Teasell R, Foley N, Salter K, Bhogal S, Jutai J, Speechley M. Evidence-based review of stroke rehabilitation: executive summary, 12th edition. *Top Stroke Rehabil* 2009; 16(6):463–88.

24. Black SE. Therapeutic issues in vascular dementia: studies, designs, and approaches. *Can J Neurol Sci* 2007; 34(suppl 1):S125–30.

25. Eskes G. Chapter 7: Mood and cognition in patients following stroke (update March 2013). In: Lindsay MP, Gubitz G, Bayley M, Phillips S, editors. *Canadian Best Practice Recommendations for Stroke Care*. 4th ed. Ottawa: Canadian Stroke Network; 2013. Accessed April 15, 2013 at **www.strokebestpractices.ca/wp-content/uploads/2013/03/Ch7MoodandCog-EN.pdf**.

26. Hall R, Khan F, O'Callaghan C, et al. *Ontario Stroke Evaluation Report 2012: Prescribing System Solutions to Improve Stroke Outcomes*. Toronto: Institute for Clinical Evaluative Sciences; 2012. Accessed April 12, 2013 at **www.ices.on.ca/file/Stroke_Evaluation_Report_2012_01.pdf**.

27. Mittmann N, Seung SJ, Hill MD, et al. Impact of disability status on ischemic stroke costs in Canada in the first year. *Can J Neuro Sci* 2012; 39(6):793–800.

28. Heart and Stroke Foundation of Canada. *The Growing Burden of Heart Disease and Stroke in Canada 2003*. Ottawa: HSFC; 2003. Accessed April 12, 2013 at **www.cvdinfobase.ca/cvdbook/CVD_En03.pdf**.

29. Shields M, Conner Gorber S, Tremblay MS. Estimates of obesity based on self report versus direct measures. *Health Rep* 2008; 19(2):61–76.

30. Tanuseputro P, Manuel DG, Leung M, Nguyen K, Johansen H. Risk factors for cardiovascular disease in Canada. *Can J Cardiol* 2003; 19(11):1249–59.

31. Dudgeon S. *Rising Tide: The Impact of Dementia on Canadian Society*. Toronto: Alzheimer Society of Canada; 2010. Accessed April 12, 2013 at **www.riskanalytica.com/Library/Papers/Rising%20Tide%20Full%20Version.pdf**.

32. Pendlebury ST, Rothwell PM. Prevalence, incidence and factors associated with pre-stroke and post-stroke dementia: a systematic review and meta-analysis. *Lancet Neurol* 2009; 8(11):1006–18.

33. Canadian Best Practice Recommendations for Stroke Care. New Stroke Best Practices update focus on mood and cognition. Accessed April 12, 2013 at **www.strokebestpractices.ca/index.php/news/new-stroke-best-practices-update-focus-on-mood-and-cognition/**.

34. Kapral MK, Hall R, Stamplecoski M, et al. *Registry of the Canadian Stroke Network – Report on the 2008/09 Ontario Stroke Audit*. Toronto: Institute for Clinical Evaluative Sciences; 2011. Accessed April 12, 2013 at **www.ices.on.ca/file/RCSN_Stroke_Audit_2011.pdf**.

35. Ontario Ministry of Health and Long-Term Care. Ontario Wait Times. Accessed April 12, 2013 at **www.health.gov.on.ca/en/public/programs/waittimes/strategy.aspx**.

36. deVeber G. Stroke and the child's brain: an overview of epidemiology, syndromes and risk factors. *Curr Opin Neurol* 2002; 15(2):133–8.

37. Fullerton HJ, Wu YW, Zhao S, Johnston SC. Risk of stroke in children: ethnic and gender disparities. *Neurology* 2003; 61(2):189–94.

38. Golomb MR, Fullerton HJ, Nowak-Gottl U, deVeber G, International Pediatric Stroke Study Group. Male predominance in childhood ischemic stroke: findings from the International Pediatric Stroke Study. *Stroke* 2009; 40(1):52–7.

39. Adén U. Neonatal stroke is not a harmless condition. *Stroke* 2009; 40(6):1948–9.

40. Agrawal N, Johnston SC, Wu YW, Sidney S, Fullerton HJ. Imaging data reveal a higher pediatric stroke incidence than prior US estimates. *Stroke* 2009; 40(11):3415–21.

Appendices

APPENDIX A Stroke Evaluation and Quality Committee Stroke Care Performance Indicators, 2011–2013

No.	Indicator	Exhibit No.	Report Card Indicator No.
Public Awareness and Patient Education			
1	Proportion of patients who sought medical attention within 3.5 hours of stroke symptom onset	n/a	1
2	Proportion of suspected/confirmed stroke patients who arrived in ED via EMS	3.4, 3.4s	-
Prevention of Stroke			
3 (A)	Annual emergency department admissions of stroke/TIA by stroke type (age- and sex-adjusted)	3.1 – 3.3, 3.2s – 3.3s	-
3 (B)	Annual inpatient admissions of stroke/TIA by stroke type (age- and sex- adjusted)	4.1 – 4.3, 4.2s – 4.3s	2
4 (A)	Risk-adjusted in-hospital stroke mortality rates	7.4, 7.4s	-
4 (B)	Risk-adjusted 30-day stroke mortality rates	7.5, 7.5s	3
4 (C)	Risk-adjusted 1-year stroke mortality rates	7.6, 7.6s	-
5 (A)	Proportion of ischemic stroke/TIA patients who were prescribed 3 recommended secondary prevention medications on discharge from acute care	n/a	-
5 (B)	Proportion of eligible stroke/TIA patients with atrial fibrillation who were prescribed or recommended anticoagulant therapy on discharge from acute care	n/a	4
6 (A)	Proportion of ischemic stroke patients without atrial fibrillation who received carotid imaging prior to hospital discharge	n/a	5
6 (B)	Proportion of ischemic stroke patients without atrial fibrillation who did not undergo carotid imaging in hospital and had an appointment booked before discharge for carotid imaging as an outpatient	n/a	-
Hyperacute/Acute Stroke Management			
7 (A)	Proportion of stroke/TIA patients who received a brain CT/MRI scan within 24 hours of hospital arrival (ED)	n/a	6
7 (B)	Proportion of stroke/TIA patients admitted as inpatients who received a brain CT/MRI scan before discharge	n/a	-
8 (A)	Proportion of eligible patients who received acute thrombolytic therapy (tPA)	n/a	7
8 (B)	Door-to-needle time: Median time in minutes from patient arrival in the ED to administration of acute thrombolytic agent	n/a	-
9	Number of stroke/TIA patients treated on a stroke unit at any time during their inpatient stay	n/a	8
10	Proportion of ALC days to total length of stay in acute care (Active LOS + ALC)	4.4 – 4.5, 4.4s-1 – 4.5s	10
11	Proportion of stroke patients with documentation that an initial dysphagia screening was performed during admission to acute care	n/a	9
Stroke Rehabilitation			
12	Number of stroke patients treated on a stroke unit at any time during their inpatient rehabilitation stay	n/a	-
13	Proportion of ALC days to total length of stay in inpatient rehabilitation (Active LOS + ALC)	5.1	15
14 (A)	Proportion of stroke patients discharged from acute care who received a referral for outpatient/community rehabilitation	n/a	12
14 (B)	Proportion of stroke inpatient rehabilitation patients who received a referral for outpatient/community rehabilitation	n/a	-
15 (A)	Length of time between stroke onset and admission to stroke inpatient rehabilitation	5.9s-1 – 5.9s-5	13
15 (B)	Length of time between stroke onset and delivery of first CCAC rehabilitation service	6.1	-
15 (C)	Access to rehabilitation therapy: Rehabilitation therapy staff/bed ratio for inpatient stroke rehabilitation	-	14
16 (A)	Length of stay (days) in rehabilitation stratified by RPG (i.e., stratified by admission RPG/FIM)	5.4, 5.4s	16
16 (B)	Mean number of rehabilitation visits provided to CCAC patients	6.2, 6.2s, 6.3s	17
16 (C)	FIM efficiency for moderately disabled stroke patients in inpatient rehabilitation (mean)	5.8s	16
17	Inpatient rehabilitation admissions by stroke severity (RPG)	5.7s	18
18	AlphaFIM assessments	n/a	-
19	Complex continuing care patient profiles	5.5, 5.6	-
20	Long-term care patient profiles	n/a	-

No.	Indicator	Exhibit No.	Report Card Indicator No.
System Integration			
21	Time to carotid intervention within 6 months of hospitalization for stroke or transient ischemic attack	4.7, 4.7s	-
22 (A)	Proportion of patients discharged alive from acute care to each discharge destination: 1) Home 2) Home with services 3) Inpatient rehabilitation 4) Complex continuing care 5) Long-term care	4.6, 4.6s	19*
22 (B)	Proportion of patients discharged alive from acute care and admitted to inpatient rehabilitation	5.3, 5.3s	11
22 (C)	Proportion of patients discharged alive from inpatient rehabilitation to each discharge destination: 1) Home 2) Home with services 3) Acute care facility 4) Complex continuing care 5) Long-term care	5.1 – 5.3, 5.9s-1 – 5.9s-5	-
23	Degree of functional ability at discharge	n/a	-
24 (A)	Readmission/revisit for stroke or transient ischemic attack within 30 days following an initial stroke-related event	7.1, 7.1s	-
24 (B)	Readmission/revisit for stroke or transient ischemic attack within 90 days following an initial stroke-related event	7.2, 7.2s-1	-
24 (C)	Readmission/revisit for stroke or transient ischemic attack within 1 year following an initial stroke-related event	7.2s-2	-
24 (D)	Readmission for any cause within 30 days following an initial stroke-related event	7.3, 7.3s-1, 7.3s-2	20

* The report card indicator excludes patients who originated from long-term care and complex continuing care facilities, but the exhibit does not.

Note:
Regional and facility data for Ontario Stroke Report Card indicators 12 and 14 are not included in this report.

n/a = not available

APPENDIX B Stroke Evaluation and Quality Committee Secondary Prevention Performance Indicators, 2012–2013

No.	Indicator	Exhibit No.	SPC Report Card Indicator No.
1	Proportion of patients with suspected or confirmed stroke or transient ischemic attack who were discharged home from the ED and had a completed referral and initial visit in an SPC	2.3	1
2	Proportion of SPC visits that were scheduled for an initial visit within the time frame guidelines for each triage level	2.7	2
3	Proportion of SPC visits where a cognitive functioning screen was completed at the initial visit	2.8	5
4	Proportion of SPC visits in which neuroimaging (CT or MRI) was ordered or completed at any time	2.11	-
5	Proportion of SPC visits in which vascular imaging was ordered or completed at any time	2.12	3
6	Proportion of SPC patients who received carotid intervention (CEA/CAS) and the time to CEA/CAS	2.13	-
7	Proportion of SPC visits in which antiplatelet therapy was prescribed or recommended at any time for ischemic stroke/TIA patients	2.14	-
8	Proportion of SPC visits in which antithrombotic therapy (i.e., anticoagulant) was prescribed or recommended at any time for patients with a history or new diagnosis of atrial fibrillation	2.14	4
9	Proportion of SPC visits in which antihypertensive agents were prescribed or recommended at any time for patients with a history or new diagnosis of hypertension	2.14	-
10	Proportion of SPC visits in which lipid-lowering agents were prescribed or recommended at any time for patients with a history or new diagnosis of hyperlipidemia	2.14	-
11	Proportion of SPC visits in which smoking cessation medications or referrals to cessation programs were prescribed or recommended at any time for current smokers	2.14	-
12	Thirty-day age- and sex-adjusted readmission or revisit rates	2.15	-
13	Ninety-day age- and sex-adjusted readmission or revisit rates	2.16	-

APPENDIX C SPC Advisory Committee Membership, 2010/2011

Name	Position*
Christina O'Callaghan	Executive Director, Ontario Stroke Network
Linda Kelloway	Best Practice Lead, Ontario Stroke Network
Dr. Ruth Hall	Evaluation Specialist, Ontario Stroke Network
Ferhana Khan	Project Manager, Ontario Stroke Registry
Sharon Mytka	Regional Director, Southwest Stroke Region
Dr. Frank Silver	Neurologist, Toronto Western Hospital; Co-Principal Investigator, Ontario Stroke Registry
Dr. Jeffrey Scott Sloka	Neurologist, Grand River Hospital
Betty Rowley	District Stroke Coordinator, North Bay General Hospital
Dr. Oliver Jenkins	District Stroke Centre Physician, Sault Area Hospital
Angela Small-Sekeris	SPC Nurse, Bluewater Health
Donna Thorp	SPC Data Abstractor and RN, Royal Victoria Hospital
Annie Rioux	SPC Data Abstractor and RN, Hawkesbury and District General Hospital

*Position held at the time of the SPC indicator selection and Case Record Form development

APPENDIX D ICD-10 Codes Used in the Report

Adult codes

Category	ICD-10 Code
Stroke Type	
Transient ischemic attack	G45 (excl. G45.4)
Acute stroke	H34.0, H34.1, I60 (excl. I60.8), I61, I63 (excl. I63.6), I64[1]
Subarachnoid hemorrhage	I60 (excl. I60.8)
Intracerebral hemorrhage	I61
Ischemic stroke	I63 (excl. I63.6), H34.0, H34.1
Stroke type not specified/undetermined	I64[1]
Vascular Surgery	
Carotid artery stenting	1JE50
Carotid endarterectomy	1JE57, 1JE87

Paediatric codes

Category	ICD-10 Code
Stroke Type	
Arterial ischemic stroke	G45.0–45.9 (excl. G45.4), H34.0, H34.1, I63 (excl. I63.6, I63.7), I64[1], I65 (excl. I65.4–I65.7), I66 (excl. I66.5, I66.7), I67 (excl. I67.1–I67.4), I69 (excl. I69.0–I69.2, I69.5–I69.7), G81, R47.1, G97
Cerebral sinovenous thrombosis	G08, I63.6, I67.6
Hemorrhagic stroke	I60, I61 (excl. I61.7), I62.0, I62.1, I62.9, I69 (excl. I69.4–I69.9)

1 I64 (stroke type not specified/undetermined) is included as ischemic stroke in cases where it is not shown as a separate stroke type.

APPENDIX E Institutional Resources for Stroke in Ontario, 2011/12[1]

Legend	
Regional stroke centre	A facility that meets all the requirements of a district stroke centre, plus neurosurgical facilities and interventional radiology.
Enhanced district stroke centre	A facility established to provide leadership integration in the regions of Ontario where the designation of a regional stroke centre cannot be met. Enhanced district stroke centres were not established until after the 2002/03 audit had been completed. For the purposes of analysis, calculations for these centres were included in the district stroke centre designation.
District stroke centre	A facility with written stroke protocols (e.g., transport and triage, thrombolytic therapy, neuroimaging), clinicians with stroke expertise, and linkages to rehabilitation and secondary prevention.
Non-designated	An acute care hospital that does not fit the definition of district or regional stroke centre.

LHIN/Institution (Site)	Location	OSS region	Stroke unit	CT scanner	MRI scanner	Telestroke centre[2]	Stroke prevention clinic[3]	AlphaFIM	Outpatient/ ambulatory rehabilitation clinics
Ontario			**38***	**97**	**58**	**20**	**46****	**90**	**1**
1. Erie St. Clair									
Bluewater Health (Petrolia)	Petrolia	Southwest							
Bluewater Health (Sarnia General)	Sarnia	Southwest	X	X	X		X	X	
Chatham Kent Health Alliance (Chatham)	Chatham	Southwest	X	X	X		X	X[4]	
Chatham Kent Health Alliance (Sydenham)	Wallaceburg	Southwest						X	
Hôtel-Dieu Grace Hospital (St. Joseph)[5]	Windsor	Southwest	X	X	X		X	X	
Leamington District Memorial Hospital	Leamington	Southwest		X					
Windsor Regional Hospital (Western)	Windsor	Southwest	X[6,7]	X	X			X[4]	
2. South West									
Alexandra Hospital	Ingersoll	Southwest						X[4]	
Alexandra Marine and General Hospital	Goderich	Southwest		X		X		X	
Clinton Public Hospital	Clinton	Southwest							
Four Counties Health Services Corporation	Newbury	Southwest						X	
Grey Bruce Health Services (Lion's Head)	Lion's Head	Southwest						X	
Grey Bruce Health Services (Markdale)	Markdale	Southwest						X	
Grey Bruce Health Services (Meaford)	Meaford	Southwest						X	
Grey Bruce Health Services (Owen Sound)	Owen Sound	Southwest		X	X		X	X[4]	
Grey Bruce Health Services (Southampton)	Southampton	Southwest						X[4]	
Grey Bruce Health Services (Wiarton)	Wiarton	Southwest						X	
Hanover and District Hospital	Hanover	Southwest							
Listowel Memorial Hospital	Listowel	Southwest							
London Health Sciences Centre (University)	London	Southwest	X	X	X		X		
London Health Sciences Centre (Victoria)	London	Southwest		X	X				
Seaforth Community Hospital	Seaforth	Southwest							
South Bruce Grey Health Centre (Chesley)	Chesley	Southwest						X[4]	
South Bruce Grey Health Centre (Durham)	Durham	Southwest						X[4]	
South Bruce Grey Health Centre (Kincardine)	Kincardine	Southwest							

LHIN/Institution (Site)	Location	OSS region	Stroke unit	CT scanner	MRI scanner	Telestroke centre[2]	Stroke prevention clinic[3]	AlphaFIM	Outpatient/ ambulatory rehabilitation clinics
South Bruce Grey Health Centre (Walkerton)	Walkerton	Southwest		X					
South Huron Hospital	Exeter	Southwest							
St. Joseph's Health Care (London)	London	Southwest		X	X				
St. Marys Memorial Hospital	St. Marys	Southwest							
St. Thomas-Elgin General Hospital	St. Thomas	Southwest		X				X[4]	
Stratford General Hospital	Stratford	Southwest		X			X	X[4]	
Strathroy Middlesex General Hospital	Strathroy	Southwest		X				X	
Tillsonburg District Memorial Hospital	Tillsonburg	Southwest		X				X	
Wingham and District Hospital	Wingham	Southwest							
Woodstock General Hospital	Woodstock	Southwest		X	X			X	
3. Waterloo Wellington									
Cambridge Memorial Hospital	Cambridge	Central South		X					
Grand River Hospital Corporation (Waterloo)	Kitchener	Central South	X	X	X		X	X	
Groves Memorial Community Hospital	Fergus	Central South							
Guelph General Hospital	Guelph	Central South		X	X				
North Wellington Health Care (Mount Forest)	Mount Forest	Central South							
North Wellington Health Care (Palmerston)	Palmerston	Central South							
St. Mary's General Hospital	Kitchener	Central South		X					
4. Hamilton Niagara Haldimand Brant									
Brant Community Health Care System (Brantford General)	Brantford	Central South	X[7]	X	X	X	X	X[4]	
Haldimand War Memorial Hospital	Dunnville	Central South							
Hamilton Health Sciences Corp. (General)	Hamilton	Central South	X	X	X		X	X[4]	
Hamilton Health Sciences Corp. (Juravinski)	Hamilton	Central South		X	X			X	
Hamilton Health Sciences Corp. (McMaster)	Hamilton	Central South		X	X				
Joseph Brant Memorial Hospital	Burlington	Central South	X[7]	X	X			X[4]	
Niagara Health System (Douglas Memorial)	Fort Erie	Central South							
Niagara Health System (Greater Niagara)	Niagara Falls	Central South	X	X	X	X	X	X[4]	
Niagara Health System (Port Colborne)	Port Colborne	Central South							
Niagara Health System (St. Catharines General)	St. Catharines	Central South		X	X			X[4]	
Niagara Health System (Welland County)	Welland	Central South		X					
Norfolk General Hospital	Simcoe	Central South		X			X	X	
St. Joseph's Health Care (Hamilton)	Hamilton	Central South		X	X		X	X	
West Haldimand General Hospital	Hagersville	Central South							
West Lincoln Memorial Hospital	Grimsby	Central South							
5. Central West									
Headwaters Health Care Centre (Dufferin)	Orangeville	West GTA		X				X	
William Osler Health Centre (Brampton)	Brampton	West GTA	X[7]	X	X		X[8]		
William Osler Health Centre (Etobicoke)	Etobicoke	West GTA	X[7]	X	X		X[8]		
6. Mississauga Halton									
Halton Healthcare Services (Georgetown)	Georgetown	West GTA						X[4]	

LHIN/Institution (Site)	Location	OSS region	Stroke unit	CT scanner	MRI scanner	Telestroke centre[2]	Stroke prevention clinic[3]	AlphaFIM	Outpatient/ ambulatory rehabilitation clinics
Halton Healthcare Services (Milton)	Milton	West GTA		X				X[4]	
Halton Healthcare Services (Oakville)	Oakville	West GTA		X	X			X[4]	
The Credit Valley Hospital	Mississauga	West GTA	X[7]	X	X			X	
Trillium Health Centre (Mississauga)	Mississauga	West GTA	X	X	X		X	X[4]	
7. Toronto Central									
The Hospital for Sick Children	Toronto	Toronto West		X	X		X[9]		
Mount Sinai Hospital	Toronto	Toronto West		X	X			X	
St. Joseph's Health Centre	Toronto	Toronto West		X	X			X	
St. Michael's Hospital	Toronto	Toronto – Southeast	X	X	X		X[9]	X[4]	
Sunnybrook Health Sciences Centre	Toronto	Toronto – North and East	X	X	X		X	X[4]	
The Toronto East General Hospital	Toronto	Toronto – Southeast	X[7]	X	X		X[9,10]		
University Health Network (General)	Toronto	Toronto West		X	X			X	
University Health Network (Western)	Toronto	Toronto West	X	X	X		X	X[4]	
8. Central									
Humber River Regional Hospital (Humber Memorial – Church)	Weston	Toronto West	X[7]	X				X	
Humber River Regional Hospital (York-Finch)	Downsview	Toronto West	X[7]	X	X		X[9,10]	X	
North York General Hospital	Toronto	Toronto – North and East	X	X	X		X[9]	X[4]	
Southlake Regional Health Centre	Newmarket	Central East	X	X	X		X[9]	X	
Stevenson Memorial Hospital (Alliston)	Alliston (New Tecumseth Township)	Central East		X				X[4]	
Mackenzie Richmond Hill Hospital	Richmond Hill	Central East	X	X	X		X[9]	X[4]	
Markham Stouffville Hospital (Markham)	Markham	Central East		X	X		X		
9. Central East									
Campbellford Memorial Hospital	Campbellford	Central East		X				X	
Haliburton Highlands Health Services Corp. (Haliburton)	Haliburton	Central East							
Lakeridge Health Corporation (Bowmanville)	Clarington	Central East		X				X	
Lakeridge Health Corporation (Oshawa)	Oshawa	Central East	X	X	X	X	X	X[4]	
Lakeridge Health Corporation (Port Perry)	Port Perry	Central East						X[4]	
Lakeridge Health Corporation (Whitby)	Whitby	Central East							X
Markham Stouffville Hospital (Uxbridge)	Uxbridge	Central East		X	X				
Northumberland Hills Hospital	Cobourg	Central East		X	X				
Peterborough Regional Health Centre	Peterborough	Central East	X[7]	X	X	X	X[9]	X[4]	
Ross Memorial Hospital	Lindsay	Central East		X				X	
Rouge Valley Health System (Ajax)	Ajax	Toronto – Southeast		X	X	X		X	
Rouge Valley Health System (Centenary)	Scarborough	Toronto – Southeast		X	X	X		X	
The Scarborough Hospital (Birchmount)	Scarborough	Toronto – North and East		X				X	
The Scarborough Hospital (Scarborough General)	Scarborough	Toronto – North and East	X	X	X			X[4]	
10. South East									
Brockville General Hospital	Brockville	South East		X			X		
Hotel Dieu Hospital*	Kingston	South East		X					
Kingston General Hospital	Kingston	South East	X	X	X		X	X[4]	

LHIN/Institution (Site)	Location	OSS region	Stroke unit	CT scanner	MRI scanner	Telestroke centre[2]	Stroke prevention clinic[3]	AlphaFIM	Outpatient/ ambulatory rehabilitation clinics
Lennox and Addington County General Hospital	Napanee	South East						X	
Perth and Smiths Falls District Hospital (Perth Site)	Perth	South East		X[11]			X		
Perth and Smiths Falls District Hospital (Smiths Falls)	Smiths Falls	South East		X[11]					
Quinte Healthcare Corporation (Belleville)	Belleville	South East	X[7]	X	X	X	X	X[4]	
Quinte Healthcare Corporation (Bancroft)	Bancroft	South East						X	
Quinte Healthcare Corporation (Picton)	Picton	South East						X	
Quinte Healthcare Corporation (Trenton)	Trenton	South East		X				X	
11. Champlain									
Almonte General Hospital	Almonte	Champlain						X	
Carleton Place & District Memorial Hospital	Carleton Place	Champlain							
Children's Hospital of Eastern Ontario	Ottawa	Champlain		X	X				
Cornwall Community Hospital (McConnell)	Cornwall	Champlain		X		X	X[10]	X[4]	
Cornwall Community Hospital (Second)	Cornwall	Champlain						X	
Deep River and District Hospital	Deep River	Champlain							
Glengarry Memorial Hospital	Alexandria	Champlain	X[6]					X[4]	
Hawkesbury and District General Hospital	Hawkesbury	Champlain		X		X	X		
Hôpital Montfort	Ottawa	Champlain		X	X			X[4]	
Kemptville District Hospital	Kemptville	Champlain							
Pembroke Regional Hospital Inc.	Pembroke	Champlain	X	X		X	X	X[4]	
Queensway-Carleton Hospital	Ottawa	Champlain		X	X		X[9]		
Renfrew Victoria Hospital	Renfrew	Champlain		X				X	
St. Francis Memorial Hospital	Barry's Bay	Champlain							
The Arnprior and District Memorial Hospital	Arnprior	Champlain							
The Ottawa Hospital (Civic)	Ottawa	Champlain	X	X	X		X	X[4]	
The Ottawa Hospital (General)	Ottawa	Champlain	X	X	X			X[4]	
Winchester District Memorial Hospital	Winchester	Champlain		X				X	
12. North Simcoe Muskoka									
Collingwood General and Marine Hospital	Collingwood	Central East		X				X[4]	
Georgian Bay General Hospital	Midland	Central East		X				X	
Muskoka Algonquin Healthcare (Huntsville)	Huntsville	Central East		X				X[4]	
Muskoka Algonquin Healthcare (Bracebridge)	Bracebridge	Central East		X				X[4]	
Orillia Soldiers' Memorial Hospital	Orillia	Central East		X	X			X[4]	
The Royal Victoria Hospital of Barrie	Barrie	Central East	X	X	X	X	X	X[4]	
13. North East									
Anson General Hospital	Iroquois Falls	Northeast							
Bingham Memorial Hospital	Matheson	Northeast							
Blind River District Health Centre/Pavillon Santé	Blind River	Northeast							
Englehart and District Hospital	Englehart	Northeast							
Espanola Regional Hospital and Health Centre	Espanola	Northeast							
Hornepayne Community Hospital	Hornepayne	Northeast							

LHIN/Institution (Site)	Location	OSS region	Stroke unit	CT scanner	MRI scanner	Telestroke centre[2]	Stroke prevention clinic[3]	AlphaFIM	Outpatient/ ambulatory rehabilitation clinics
Health Sciences North / Horizon Santé-Nord – Ramsey Lake Health Centre	Sudbury	Northeast	X	X	X	X	X	X[4]	
Kirkland and District Hospital	Kirkland Lake	Northeast							
Lady Dunn Health Centre	Wawa	Northeast							
The Lady Minto Hospital	Cochrane	Northeast							
Manitoulin Health Centre (Little Current)	Little Current	Northeast							
Manitoulin Health Centre (Mindemoya)	Mindemoya	Northeast							
Mattawa General Hospital	Mattawa	Northeast							
North Bay Regional Health Centre	North Bay	Northeast	X	X	X	X	X	X[4]	
Notre Dame Hospital	Hearst	Northeast							
Sault Area Hospital (Sault Ste. Marie)	Sault Ste. Marie	Northeast	X	X	X	X	X	X[4]	
Sensenbrenner Hospital	Kapuskasing	Northeast							
Service de Santé de Chapleau Health Service	Chapleau	Northeast							
Smooth Rock Falls Hospital	Smooth Rock Falls	Northeast							
St. Joseph's General Hospital	Elliot Lake	Northeast							
Temiskaming Hospital	New Liskeard	Northeast		X		X			
Timmins and District General Hospital	Timmins	Northeast	X	X	X	X	X	X[4]	
Weeneebayko Area Health Authority	Moose Factory	Northeast							
West Nipissing General Hospital	Sturgeon Falls	Northeast							
West Parry Sound Health Centre	Parry Sound	Northeast		X				X[4]	
14. North West									
Atikokan General Hospital	Atikokan	Northwest							
Dryden Regional Health Centre	Dryden	Northwest		X		X		X[4]	
Geraldton District Hospital	Geraldton	Northwest							
Lake-of-the-Woods District Hospital	Kenora	Northwest		X		X	X	X	
Manitouwadge General Hospital	Manitouwadge	Northwest							
McCausland Hospital	Terrace Bay	Northwest							
Nipigon District Memorial Hospital	Nipigon	Northwest							
Riverside Health Care Facilities (La Vérendrye)	Fort Frances	Northwest		X		X	X	X	
Sioux Lookout Meno Ya Win Health Centre (District)	Sioux Lookout	Northwest		X			X	X	
The Red Lake Margaret Cochenour Memorial Hospital	Red Lake	Northwest							
Thunder Bay Regional Health Sciences Centre	Thunder Bay	Northwest	X	X	X		X	X[4]	
Wilson Memorial General Hospital	Marathon	Northwest					X		

Notes:

1 Based on provincial hospital resources as of October 12, 2011.

2 A funded Ontario Telemedicine Network site in 2011/12.

3 Designated as a secondary prevention clinic by the Ministry of Health and Long-Term Care.

4 Hospital with AlphaFIM documentation found in chart at time of 2010/11 Ontario Stroke Audit – Acute Care.

5 Analyzed as a district stroke centre.

6 For rehabilitation patients only.

7 Hospital does not have a designated stroke unit, as defined by the Best Practice Standards, but has clustered beds for stroke patients.

8 Cardiovascular clinic; not specific to stroke.

9 Stroke prevention clinic not funded by the Ministry of Health and Long-Term Care. The Peterborough Vascular Health Network (an SPC) is not affiliated with Peterborough Regional Health Centre; the Humber River SPC located at York-Finch serves the Church site.

10 Hospital not included in the 2011/12 Ontario Stroke Audit – Secondary Prevention Clinics.

11 CT scanner shared between the Perth and Smiths Falls sites.

* Includes institutions identified in footnotes 6 and 7.

** Includes institutions identified in footnotes 8 and 9.

APPENDIX F Calculation of Patient Discharge Disposition

Acute Care: Discharge Discharge Abstract Database

Discharge Disposition	Coding Algorithm
Dead	Discharge disposition = Died (07)
Rehabilitation	Discharge disposition = Transferred to another facility providing inpatient hospital care or acute care inpatient institution (01), Transferred to a long-term or continuing care facility (02) or Transferred to other ambulatory care, palliative care/hospice, addiction treatment centre, jail, including infants and children discharged/detained by social services (03) AND Institution to type (InsttTyp) = Gen Rehab Hosp (02) or Spec Rehab Hosp (07)
Long-term care nursing home	Discharge disposition = Transferred to another facility providing inpatient hospital care or acute care inpatient institution (01), Transferred to a long-term or continuing care facility (02) or Transferred to other ambulatory care, palliative care/hospice, addiction treatment centre, jail, including infants and children discharged/detained by social services (03) AND Institution to type (InsttTyp) = Nursing Home (04)
Long-term care home for the aged	Discharge disposition = Transferred to another facility providing inpatient hospital care or acute care inpatient institution (01), Transferred to a long-term or continuing care facility (02) or Transferred to other ambulatory care, palliative care/hospice, addiction treatment centre, jail, including infants and children discharged/detained by social services (03) AND Institution to type (InsttTyp) = Home for Aged (09)
Complex continuing care	Discharge disposition = Transferred to another facility providing inpatient hospital care or acute care inpatient institution (01), Transferred to a long-term or continuing care facility (02) or Transferred to other ambulatory care, palliative care/hospice, addiction treatment centre, jail, including infants and children discharged/detained by social services (03) AND Institution to type (InsttTyp) = Chronic Hosp (03)
Acute care	Discharge disposition = Transferred to another facility providing inpatient hospital care or acute care inpatient institution (01) AND Institution to type (InsttTyp) = Acute Care Hosp (01)
Home with support services	Discharge disposition = Discharged to a home setting with support services (04)
Home without support services	Discharge disposition = Discharged to home (no support service from an external agency required) (05)
Palliative care	Discharge disposition = Transferred to other ambulatory care, palliative care/hospice, addiction treatment centre, jail, including infants and children discharged/detained by social services (03)
Other	All other codes

Inpatient Rehabilitation: National Rehabilitation Reporting System

Discharge Disposition	Coding Algorithm
Home without services	Disch Living Setting Code (dliveset) = Home without health services (1)
Home with services	Disch Living Setting Code (dliveset) = Home with paid health services (2)
Other community services	Disch Living Setting Code (dliveset) = Boarding house (3); Assisted living (4); Shelter (6); Public place (7)
Long-term care facility	Disch Living Setting Code (dliveset) = Residential care (5)
Acute care facility	Referred to Code (referto) = Inpatient acute care unit, same facility (02); Inpatient acute care unit, different facility (03)
Dead	Discharge Reason Code (dreason) = Person deceased (8)
Unavailable/unknown	Disch Living Setting Code (dliveset) = Not available, temporarily (–50); Asked, unknown (–70)

APPENDIX G Designated Rehabilitation Beds/Facilities in Ontario by Ontario Stroke System region, 2012

DEFINITION USED BY REHABILITATION COORDINATORS FOR CLASSIFICATION PURPOSES: A freestanding rehabilitation centre is a geographic site that is physically separated from an affiliated acute care hospital and does not have on-site access to acute care medical services.

OSS Region	Institution Number	Institution (Site)	Master Numbering System Facility Type	2013 SEQC Definition of Facility Type
Central East	2771	Southlake Regional Health Centre	SR	non-freestanding
	3507	Royal Victoria Regional Health Centre	GR	non-freestanding
	3617	Peterborough Regional Health Centre	GR	non-freestanding
	3858	Mackenzie Health	SR	non-freestanding
	4705	Georgian Bay General Hospital (Penetanguishene)	GR	freestanding
	3934	Lakeridge Health Corporation (Oshawa)	SR	non-freestanding
	4307	Markham Stouffville Hospital	GR	non-freestanding
	4450	Northumberland Hills Hospital	GR	non-freestanding
	4483	Ross Memorial Hospital	GR	non-freestanding
	4688	Orillia Soldiers' Memorial Hospital	GR	non-freestanding
Central South	1912	Grand River Hospital Corp (Freeport)	GR	freestanding
	3155	St. Joseph's Health Care System (Hamilton)	GR	non-freestanding
	3736	Grand River Hospital Corp (Waterloo)	GR	non-freestanding
	3778	Joseph Brant Memorial Hospital	GR	non-freestanding
	3880	Hamilton Health Sciences Corporation (Juravinski)	GR	non-freestanding
	3881	Hamilton Health Sciences Corporation (Chedoke)	SR	non-freestanding
	3912	St. Joseph's Health Centre (Guelph)	GR	non-freestanding
	4289	St. Mary's General Hospital (Kitchener)	GR	non-freestanding
	4342	Hamilton Health Sciences Corporation (General)	GR	non-freestanding
	4385	Guelph General Hospital	GR	non-freestanding
	4433	William Osler Health Centre (Georgetown)	GR	non-freestanding
	4678	Brant Community Healthcare System (Brantford)	GR	non-freestanding
	4595	Religious Hospitallers of St. Joseph (Hotel Dieu)	GR	freestanding
	4711	Hamilton Health Sciences Corporation (General)	SR	non-freestanding
	3537	St. Joseph's Health Care System (Brantford)	GR	non-freestanding
	4720	Cambridge Memorial Hospital	GR	non-freestanding

OSS Region	Institution Number	Institution (Site)	Master Numbering System Facility Type	2013 SEQC Definition of Facility Type
Champlain	3782	Bruyère Continuing Care Inc.	GR	freestanding
	4299	Pembroke Regional Hospital Inc.	GR	non-freestanding
	4329	Ottawa Hospital (Civic)	GR	non-freestanding
	4429	Ottawa Hospital (Rehab Centre)	SR	non-freestanding
	4461	Hôpital Montfort	GR	non-freestanding
	4470	Cornwall Community Hospital (General)	GR	non-freestanding
	4584	Queensway-Carleton Hospital	GR	non-freestanding
	4695	Ottawa Hospital (General)	GR	non-freestanding
	4722	Glengarry Memorial Hospital	GR	non-freestanding
Northeast	4733	North Bay Regional Health Centre	GR	non-freestanding
	3416	Timmins & District General Hospital	GR	non-freestanding
	4061	Health Sciences North	SR	non-freestanding
	4409	Sault Area Hospital (Sault Ste. Marie)	GR	non-freestanding
	4592	West Parry Sound Health Centre	GR	non-freestanding
Northwest	3892	St. Joseph's Care Group (Thunder Bay)	GR	freestanding
	3891	St. Joseph's Care Group (Thunder Bay)	SR	freestanding
South East	2223	Providence Care Centre (St. Mary's of The Lake)	GR	freestanding
	3990	Quinte Healthcare Corporation (Belleville)	GR	non-freestanding
	4339	Providence Continuing Care Centre (St. Vincent)	GR	non-freestanding
	4369	Kingston General Hospital	GR	non-freestanding
	4647	Providence Continuing Care Centre (St. Vincent de Paul)	GR	non-freestanding

OSS Region	Institution Number	Institution (Site)	Master Numbering System Facility Type	2013 SEQC Definition of Facility Type
Southwest	4149	Hôtel-Dieu Grace Hospital (St. Joseph)	GR	freestanding
	4162	St. Thomas-Elgin General Hospital	GR	non-freestanding
	4204	Leamington District Memorial Hospital	GR	non-freestanding
	4417	Bluewater Health (Sarnia)	GR	non-freestanding
	4649	South Huron Hospital	GR	non-freestanding
	3612	Stratford General Hospital	GR	non-freestanding
	3897	Wingham & District Hospital	GR	non-freestanding
	3846	Windsor Regional Hospital (Western)	SR	freestanding
	3946	Grey Bruce Health Services (Owen Sound)	GR	non-freestanding
	3916	St. Joseph's Health Care (London – Parkwood)	SR	freestanding
	3884	St. Joseph's Health Care (London – Parkwood)	GR	freestanding
	4361	St. Joseph's Health Services Association of Chatham	GR	non-freestanding
Toronto – North and East	1337	St. John's Rehabilitation Hospital	GR	freestanding
	4155	Scarborough Hospital (General)	GR	non-freestanding
	4156	Scarborough Hospital (Grace)	GR	non-freestanding
	4273	Sunnybrook Health Sciences Centre	GR	non-freestanding
	4368	St. John's Rehabilitation Hospital	SR	freestanding
	4335	North York General Hospital (Branson)	GR	freestanding
	4274	Sunnybrook Health Sciences Centre (Orthopaedic)	GR	freestanding
	3439	Baycrest Hospital (North York)	GR	freestanding
Toronto – South East	3941	Rouge Valley Health System (Centenary)	GR	non-freestanding
	4151	Rouge Valley Health System (Ajax)	GR	non-freestanding
	4279	Toronto East General Hospital	GR	non-freestanding
	1355	Providence Healthcare	GR	freestanding
	1436	Bridgepoint Hospital	GR	freestanding
Toronto – West	3950	Toronto Rehabilitation Institute (Hillcrest)	GR	freestanding
	4293	Humber River Regional Hospital (Humber Memorial)	GR	non-freestanding
	3951	Toronto Rehabilitation Institute (Lyndhurst)	SR	freestanding
	4366	St. Joseph's Health Centre	GR	non-freestanding
West – GTA	4277	William Osler Health System (Etobicoke)	GR	non-freestanding
	4276	William Osler Health System (Brampton)	GR	non-freestanding
	1471	West Park Healthcare Centre (York)	SR	freestanding
	3288	The Credit Valley Hospital	GR	non-freestanding
	4136	Halton Healthcare Services Corporation (Oakville)	GR	non-freestanding
	4684	William Osler Health System (Civic)	GR	non-freestanding
	4150	Trillium Health Centre (Mississauga)	GR & SR	non-freestanding

SEQC = Stroke Evaluation and Quality Committee
GR = General rehabilitation hospital and units of hospital.
SR = Special rehabilitation hospital and units of hospital.

APPENDIX H Thirty-Day Readmission Diagnoses for Ontario Stroke/TIA Patients, by Frequency, 2009–2011

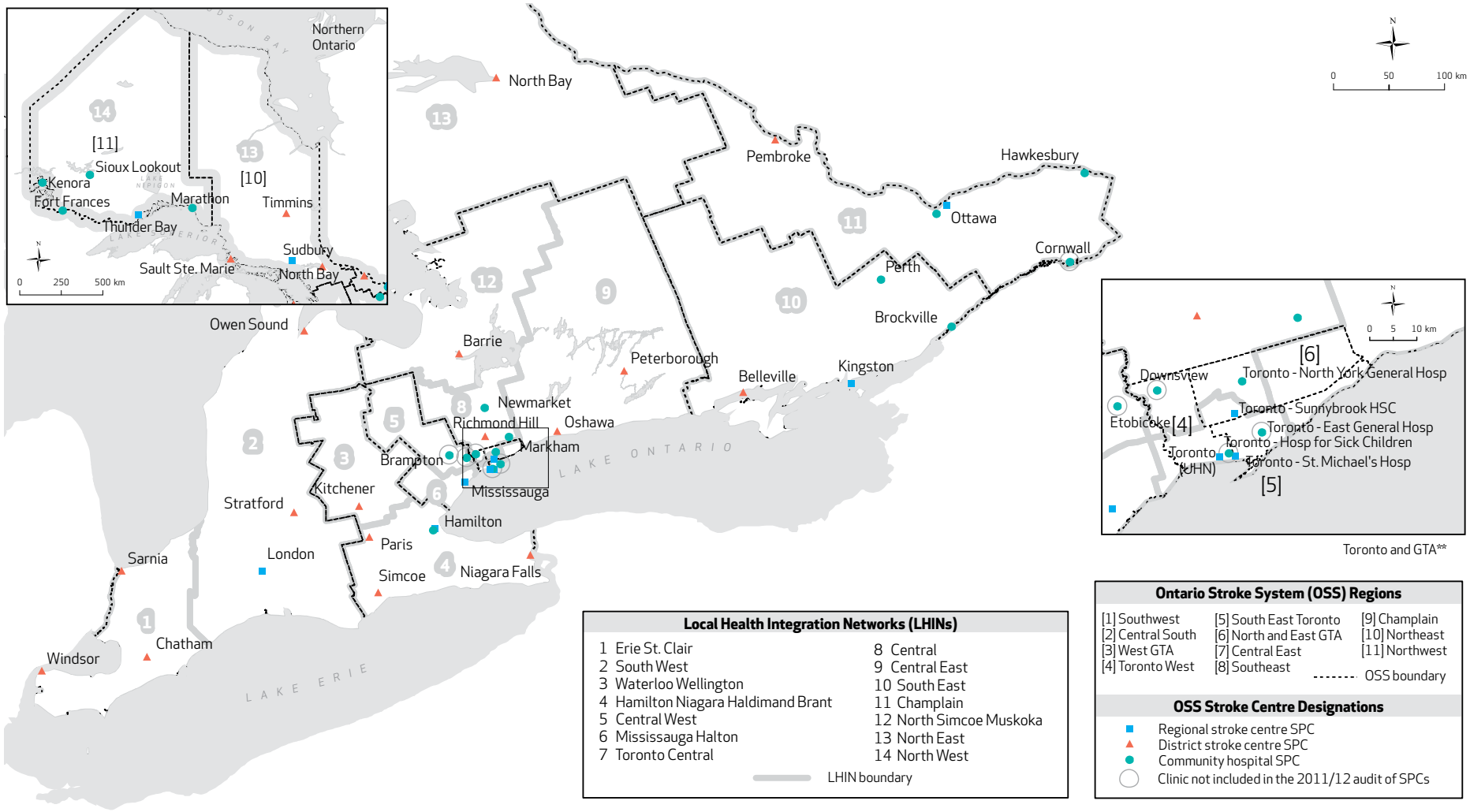
ICD-10 Code	Description	Frequency(%)
I639	Cerebral infarction, unspecified	7.8
G459	Transient cerebral ischemic attack, unspecified	5.8
I64	Stroke, not specified as hemorrhage or infarction	4.6
I635	Cerebral infarction due to unspecified occlusion or stenosis of cerebral arteries	2.9
Z515	Palliative care	2.5
N390	Urinary tract infection, site not specified	2.5
I652	Occlusion and stenosis of carotid artery	2.2
I500	Congestive heart failure	1.8
I480	Atrial fibrillation	1.6
J189	Pneumonia, unspecified	1.6
I638	Other cerebral infarction	1.5
I632	Cerebral infarction due to unspecified occlusion or stenosis of precerebral arteries	1.3
J690	Pneumonitis due to food and vomit	1.2
I634	Cerebral infarction due to embolism of cerebral arteries	1.2
R55	Syncope and collapse	1.2
I214	Acute subendocardial myocardial infarction	1.1
R53	Malaise and fatigue	1.1
K922	Gastrointestinal hemorrhage, unspecified	1.0
N179	Acute renal failure, unspecified	1.0
I619	Intracerebral hemorrhage, unspecified	0.9
A419	Sepsis, unspecified	0.9
R074	Chest pain, unspecified	0.8
J440	Chronic obstructive pulmonary disease with acute lower respiratory infection	0.8
R410	Disorientation, unspecified	0.8
C793	Secondary malignant neoplasm of brain and cerebral meninges	0.7
F03	Unspecified dementia	0.7
E871	Hypo-osmolality and hyponatraemia	0.7
I100	Benign hypertension	0.6
I609	Subarachnoid hemorrhage, unspecified	0.6
I620	Subdural hemorrhage (acute) (nontraumatic)	0.6
R5688	Other and unspecified convulsions	0.6
S065	Traumatic subdural hemorrhage	0.6
Z751	Person awaiting admission to adequate facility elsewhere	0.6
F059	Delirium, unspecified	0.6
R64	Cachexia	0.6
S72080	Other fracture of femoral neck, closed	0.5
J441	Chronic obstructive pulmonary disease with acute exacerbation, unspecified	0.5
R42	Dizziness and giddiness	0.5
I269	Pulmonary embolism without mention of acute cor pulmonale	0.5
R51	Headache	0.5
E860	Dehydration	0.5
R296	Tendency to fall, not elsewhere classified	0.5
S72100	Intertrochanteric fracture, closed	0.5

Data sources: Canadian Institute for Health Information, Discharge Abstract Database (CIHI–DAD) and National Ambulatory Care Reporting System (NACRS), 2009/10–2011/12.

Inclusion criteria: All adult patients (≥18) readmitted for any cause to an inpatient setting of an acute care hospital in Ontario within 30 days of initial stroke (ischemic or hemorrhagic) or transient ischemic attack event starting in each year between April 1, 2009 and February 29, 2012 (N=5,466).

Exclusion criteria: Patients with an elective admission or transfer in a facility or between facilities within 24 hours.

APPENDIX I Map of Ontario's Local Health Integration Networks, Stroke System Regions, Designated Centres and Secondary Prevention Clinics



Local Health Integration Networks (LHINs)

1 Erie St. Clair	8 Central
2 South West	9 Central East
3 Waterloo Wellington	10 South East
4 Hamilton Niagara Haldimand Brant	11 Champlain
5 Central West	12 North Simcoe Muskoka
6 Mississauga Halton	13 North East
7 Toronto Central	14 North West

LHIN boundary

Ontario Stroke System (OSS) Regions

[1] Southwest	[5] South East Toronto	[9] Champlain
[2] Central South	[6] North and East GTA	[10] Northeast
[3] West GTA	[7] Central East	[11] Northwest
[4] Toronto West	[8] Southeast	

OSS boundary

OSS Stroke Centre Designations

- Regional stroke centre SPC
- District stroke centre SPC
- Community hospital SPC
- Clinic not included in the 2011/12 audit of SPCs

*OSS Regions version 4.0
**GTA = Greater Toronto Area

APPENDIX J Glossary of Terms

Term/Acronym	Definition
Academic hospital	University-affiliated health care facility; member of the Council of Academic Hospitals of Ontario
Acute stroke unit	Specialized, geographically-located hospital unit with dedicated stroke team and stroke resources
AF	Atrial fibrillation
AlphaFIM	A standardized assessment tool used to evaluate the disability and functional status of patients in acute care 3 to 5 days following stroke admission
Alternate level of care (ALC)	An ALC patient is one who has finished the acute care phase of his/her treatment but remains in an acute care bed. This classification is invoked when the patient's physician gives an order to change the level of care from acute care and requests a transfer for the patient.
Annual stroke patient volume	Indicates the annual number of hospital separations (inpatient and emergency) for stroke or transient ischemic attack
CABG	Coronary artery bypass graft surgery
CAS	Carotid artery stenting
CCAC	Community Care Access Centre
CCC	Complex continuing care
CEA	Carotid endarterectomy
Charlson score	A comorbidity index score where higher scores indicate more comorbid illness
Community hospital SPC	Secondary prevention clinic located in a hospital that is not a regional stroke centre or district stroke centre
CSN	Canadian Stroke Network
CSS	Canadian Stroke Strategy (or System)
CT	Computed tomography
District stroke centre (DSC)	A facility that has written stroke protocols for emergency services, emergency department and acute care, including: transport and triage protocols; ability to offer thrombolytic therapy to suitable ischemic stroke patients; timely computed tomography (CT) scanning and expert interpretation; clinicians with stroke expertise; and linkages to rehabilitation and secondary prevention.
ED	Emergency department
Enhanced district stroke centre (EDSC)	A facility established to provide leadership and integration in the regions of Ontario where the designation of a regional stroke centre cannot be met. Enhanced district stroke centres were not established until after the 2002/03 audit had been completed. For the purposes of analysis, calculations for these centres were included in the district stroke centre designation.
GTA	Greater Toronto Area
ICH	Intracerebral hemorrhage
IQR	Interquartile range
Large community hospital	A hospital that does not qualify as a small hospital, academic hospital, or district or regional stroke centre

Term/Acronym	Definition
Local Health Integration Network (LHIN)	One of 14 not-for-profit corporations established in Ontario by the MOHLTC, each with specific geographic boundaries. Each LHIN is responsible for planning, integrating and funding local health services.
LOS	Length of stay
LSN	Last seen normal; time prior to onset of stroke symptoms
LTC	Long-term care
MOHLTC	Ministry of Health and Long-Term Care
MRI	Magnetic resonance imaging
Non-designated hospital	An acute care hospital that does not fit the definition of a district or regional stroke centre
OHA	Ontario Hospital Association
OSA	Ontario Stroke Audit
OSN	Ontario Stroke Network; provides provincial leadership and coordination for the OSS.
OSS	Ontario Stroke Strategy (or System) is a collaborative system of a provider organization and partners who deliver stroke care across the province and the care continuum.
PCI	Percutaneous coronary intervention
RAI-MDS	Resident Assessment Instrument–Minimum Data Set; used to assess patients in complex continuing care and long-term care homes
Rankin score	A measure of functional status after stroke with a range from 0 (no disability) to 6 (death)
Regional stroke centre (RSC)	A facility that has all the requirements of a district stroke centre, plus neurosurgical facilities and interventional radiology
SD	Standard deviation
SEQC	Stroke Evaluation and Quality Committee
SPC	Secondary stroke prevention clinic; an ambulatory care clinic that aims to reduce recurrent vascular events following an initial stroke
Small community hospital	A facility that generally provides care in fewer than 3,500 weighted cases, has a referral population of less than 20,000 people, and is the only hospital in its community, as defined by the Joint Policy and Planning Committee
Stroke unit	Specialized, geographically-located hospital unit with a dedicated stroke team and stroke resources
Telestroke	A telemedicine application that provides emergency physicians with immediate access to neurologists with expertise in stroke care who can support both the assessment and treatment of patients experiencing acute ischemic stroke
TIA	Transient ischemic attack, or "mini-stroke"
tPA	Tissue plasminogen activator
UTD	Unable to determine stroke type; based on available data in the patient's medical records, or on clinical presentation and/or findings

APPENDIX K Risk-Adjusted Mortality Models

	Risk adjustment model[1] for in-hospital stroke/TIA mortality, 2011/12			Risk adjustment model[2] for 30-day stroke/TIA mortality, 2011/12			Risk adjustment model[3] for one-year stroke/TIA mortality, 2010/11		
Variable	**Coefficient**	**Adjusted OR[4] (95% CI)**	**P Value**	**Coefficient**	**Adjusted OR[4] (95% CI)**	**P Value**	**Coefficient**	**Adjusted OR[4] (95% CI)**	**P Value**
Intercept	-5.541			-6.034			-5.661		
Age	0.035	1.04 (1.03-1.04)		0.043	1.04 (1.04-1.05)		0.054	1.06 (1.05-1.06)	
Female	0.01	1.01 (0.91-1.12)	0.858	0.166	1.18 (1.06-1.32)	0.003	-0.027	0.97 (0.92-1.04)	0.384
Ambulance arrival	1.163	3.20 (2.67-3.84)		1.165	3.21 (2.68-3.84)		0.732	2.08 (1.82-2.37)	
Atrial fibrillation	0.17	1.19 (1.05-1.34)	0.006	0.097	1.10 (0.98-1.25)	0.117	0.239	1.27 (1.17-1.38)	
Previous stroke/transient ischemic attack	0.358	1.43 (1.10-1.87)	0.008	0.14	1.15 (0.87-1.53)	0.332	0.353	1.42 (1.01-2.01)	0.043
History of CAD/CABG/PCI	0.356	1.43 (1.24-1.64)		0.294	1.34 (1.14-1.58)		0.35	1.42 (1.27-1.59)	
History of carotid disease/CEA/CAS	-0.753	0.47 (0.31-0.72)		-0.547	0.58 (0.39-0.87)	0.008	-0.392	0.68 (0.53-0.86)	0.002
Diabetes	0.048	1.05 (0.92-1.20)	0.486	0.014	1.01 (0.89-1.16)	0.842	0.157	1.17 (1.07-1.28)	0.001
Peripheral vascular disease	0.58	1.79 (1.25-2.55)	0.001	0.339	1.40 (0.95-2.08)	0.092	0.191	1.21 (0.89-1.65)	0.224
Hypertension	-0.396	0.67 (0.59-0.77)		-0.46	0.63 (0.55-0.72)		-0.282	0.75 (0.70-0.82)	
Hyperlipidemia	-0.471	0.62 (0.50-0.78)		-0.428	0.65 (0.52-0.82)		-0.509	0.60 (0.51-0.70)	
Intracerebral hemorrhage	1.209	3.35 (2.95-3.81)		1.215	3.37 (2.90-3.92)		1.057	2.88 (2.53-3.28)	
Subarachnoid hemorrhage	1.017	2.77 (2.06-3.72)		1.033	2.81 (2.11-3.73)		0.754	2.13 (1.61-2.82)	
Transient ischemic attack	-3.578	0.03 (0.02-0.05)		-2.576	0.08 (0.06-0.11)		-1.273	0.28 (0.25-0.32)	

1 C-statistic = 0.79

2 C-statistic = 0.79

3 C-statistic = 0.76

4 Odds ratio (OR) was adjusted for patient baseline characteristics determined by fitting logistic regression models using generalized estimating equations accounting for within-hospital correlation. Reference category = ischemic stroke.

CI = confidence interval; CAD = coronary artery disease; CABG = coronary artery bypass graft; PCI = percutaneous coronary intervention; CEA = carotid endarterectomy; CAS = carotid artery stenting.

APPENDIX L Progress on OSN 2016/17 Targets – 2012 Results

	Reduction in Strokes	Access to Stroke Units	Access to Inpatient Rehabilitation	Improved Outcomes
Metric	Incidence stroke/TIA inpatient discharge rate	Increase in the number of patients admitted to stroke units	Median time from stroke inpatient admission to inpatient rehabilitation admission	Proportion of stroke/TIA patients admitted to LTC facility within 1 year following discharge
OSN Target	**1.14 per 1,000**	**76%**	**5 days**	**3.2%**
LHIN Variation Target	0.45	35	3.5	3.7
2010/11 (baseline)	1.3 per 1,000 LHIN variation = 0.7 (1.2–1.9)	38% LHIN variation = 70% (0–70)	10 days LHIN variation = 7 (8–15)	6.4%
2011/12 update	1.3 per 1,000 LHIN variation = 0.8 (1.1–1.9)	N/A	10 days LHIN variation = 6 (8–14)	Pending; data quality issues to be addressed

APPENDIX M Ontario Stroke Audit of Secondary Prevention Clinics, 2011/12

Patient Sample

Given the ambulatory care nature of secondary prevention clinics (SPCs), a case list was not used to identify patients; rather, sites provided visit logs from which patient samples were derived. Chart abstractors were instructed to exclude patients who were seen for primary rather than secondary prevention of stroke, who did not have an initial visit within the study period or who had a missing referral. The number of excluded charts was not recorded. Clinic volumes ranged from 3 to 1,684 patient visits, with a median of 309 patient visits (147.5 and 628 as the 25th and 75th percentile) across 40 clinics.

The OSA-SPC patient sample was generated in the following way:

Every SPC patient visit between April 1, 2011 and March 31, 2012: Estimated N = 18,426

Excluded:

- Patients who did not have an initial visit in 2011/12 (i.e., patients who came for a routine follow-up not related to a new event; referred patients who did not attend their scheduled first visit; patients seen for primary prevention)
- Patients with missing or incomplete referrals

Final Sample:

- Total number of unique patients: 16,167
- Total number of initial visits: 16,487
- Total number of follow-up visits: 7,126

Data Abstraction and Management

Centrally-trained chart abstractors performed data collection at the participating sites. Abstractors included both clinic personnel and externally contracted workers and were authenticated with a username and password. Data was collected electronically through a web-based application, which was firewalled and accessed only from pre-registered hospital IP addresses. The application had built-in logics that forced the completion of all relevant questions within each form, which limited the amount of data missing per record. The application also restricted illogical date entries such as 30-Feb-2012 at the time of data entry. Data quality monitoring was completed near the end of the project and abstractors were contacted to make data corrections where possible, which further enhanced data validity. The application underwent a thorough security assessment and was approved to collect sensitive data under the ICES governance. Data was securely transmitted over an authenticated and encrypted connection to ICES, where it was then anonymized. The Ontario Stroke Registry of Secondary Prevention Clinics database and aggregate dataset were managed and analyzed by the Ontario Stroke Registry team at ICES.

APPENDIX N List of Supplementary Exhibits

***The following exhibits are available at* www.ices.on.ca**

1. Emergency Department Care

EXHIBIT 3.2S Age- and sex-adjusted rates of emergency department visits by adult patients with stroke or transient ischemic attack per 1,000 sub-LHIN population, in Ontario and by sub-Local Health Integration Network, 2003/04 and 2009/10–2011/12

EXHIBIT 3.3S Number and proportion of adult patients with stroke or transient ischemic attack arriving at the emergency department of regional stroke centres, district stroke centres and non-designated hospitals, in Ontario and by Ontario Stroke System region, 2003/04 and 2009/10–2011/12

EXHIBIT 3.4S Number and proportion of adult patients with stroke or transient ischemic attack transported to hospital by ambulance, in Ontario and by Ontario Stroke System region and facility, 2003/04 and 2009/10–2011/12

2. Acute Inpatient Care

EXHIBIT 4.2S Number and proportion of adult patients admitted to acute care hospitals for stroke or transient ischemic attack, in Ontario and by Ontario Stroke System region, stroke type and Local Health Integration Network, 2003/04 and 2009/10–2011/12

EXHIBIT 4.3S Age- and sex-adjusted inpatient admission rates for adults with stroke or transient ischemic attack per 1,000 sub-LHIN population 18 years and older, in Ontario and by sub-Local Health Integration Network, 2003/04 and 2009/10–2011/12

EXHIBIT 4.4S-1 Inpatient length of stay for adults with stroke or transient ischemic attack, in Ontario and by Ontario Stroke System region and facility, 2003/04 and 2009/10–2011/12

EXHIBIT 4.4S-2 Inpatient length of stay among adults for all strokes/TIA and for ischemic stroke, in Ontario and by Ontario Stroke System region, Ontario Stroke System designation and Local Health Integration Network, 2003/04 and 2009/10–2011/12

EXHIBIT 4.5S Inpatient length of stay for adults with stroke or transient ischemic attack who had at least one Alternate Level of Care (ALC) day, in Ontario and by Ontario Stroke System region, 2009/10–2011/12

EXHIBIT 4.6S Discharge destination of adult patients with stroke or transient ischemic attack following admission to an acute care hospital, in Ontario and by Ontario Stroke System region and facility, 2003/04 and 2009/10–2011/12

EXHIBIT 4.7S Time to carotid intervention within 6 months of hospitalization for adults with stroke or transient ischemic attack, in Ontario and by Ontario Stroke System region and facility, 2003/04 and 2009/10–2011/12

3. Inpatient Rehabilitation

EXHIBIT 5.3S Characteristics and outcomes of adult stroke patients in inpatient rehabilitation, in Ontario and by sub-Local Health Integration Network, 2003/04 and 2009/10–2011/12

EXHIBIT 5.4S Number of adult stroke patients by Rehabilitation Patient Group and their length of stay, in Ontario and by type of inpatient rehabilitation facility, 2003/04 and 2009/10–2011/12

EXHIBIT 5.7S Adult admissions to inpatient rehabilitation by stroke severity, in Ontario and by sex, Ontario Stroke System region and Local Health Integration Network, 2003/04 and 2009/10–2011/12

EXHIBIT 5.8S Functional Independence Measure efficiency of adult stroke patients by Rehabilitation Patient Group, in Ontario and by type of inpatient rehabilitation facility, 2003/04 and 2009/10–2011/12

EXHIBIT 5.9S-1 Characteristics of adult stroke patients in inpatient rehabilitation, in Ontario and by National Rehabilitation Reporting System facility number and name, 2003/04

EXHIBIT 5.9S-2 Characteristics of adult stroke patients in inpatient rehabilitation, in Ontario and by National Rehabilitation Reporting System facility number and name, 2009/10

EXHIBIT 5.9S-3 Characteristics of adult stroke patients in inpatient rehabilitation, in Ontario and by National Rehabilitation Reporting System facility number and name, 2010/11

EXHIBIT 5.9S-4 Characteristics of adult stroke patients in inpatient rehabilitation, in Ontario and by National Rehabilitation Reporting System facility number and name, 2011/12

EXHIBIT 5.9S-5 Characteristics of adult stroke patients in inpatient rehabilitation, in Ontario and by sex and Ontario Stroke System region, 2003/04 and 2009/10–2011/12

4. Home Care Services

EXHIBIT 6.2S Community Care Access Centre support services provided to adult home care clients (active and new) within 60 days following an acute care hospitalization for stroke, in Ontario and by sex and Local Health Integration Network, 2006/07–2011/12

EXHIBIT 6.3S Community Care Access Centre support services provided to adult home care clients (active and new) within 180 days following an acute care hospitalization for stroke, in Ontario and by Local Health Integration Network, 2006/07–2011/12

5. Patient Outcomes

EXHIBIT 7.1S Age- and sex-adjusted stroke/TIA-related revisit or readmission rates within 30 days following a stroke or transient ischemic attack, in Ontario and by Ontario Stroke System region, 2003/04 and 2009/10–2011/12

EXHIBIT 7.2S-1 Age- and sex-adjusted stroke/TIA-related revisit or readmission rates within 90 days following a stroke or transient ischemic attack, in Ontario and by Ontario Stroke System region, 2003/04 and 2008/09–2010/11

EXHIBIT 7.2S-2 Age- and sex-adjusted stroke/TIA-related revisit or readmission rates within 365 days following a stroke or transient ischemic attack, in Ontario and by stroke type, Ontario Stroke System region, Ontario Stroke System designation and Local Health Integration Network, 2003/04 and 2008/09–2010/11

EXHIBIT 7.3S-1 Age- and sex-adjusted all-cause readmission rates within 30 days following a stroke or transient ischemic attack, in Ontario and by Ontario Stroke System region, 2003/04 and 2009/10–2011/12

EXHIBIT 7.3S-2 Age- and sex-adjusted all-cause readmission rates within 30 days following a stroke or transient ischemic attack, in Ontario and by facility, 2003/04 and 2009/10–2011/12

EXHIBIT 7.4S Risk-adjusted in-hospital mortality rates among adult patients following a stroke or transient ischemic attack, in Ontario and by Ontario Stroke System region, using a 3-year combined rate for 2003/04–2005/06, 2006/07–2008/09 and 2009/10–2011/12

EXHIBIT 7.5S Risk-adjusted mortality rates at 30 days following a stroke or transient ischemic attack, in Ontario and by Ontario Stroke System region, using a 3-year combined rate for 2003/04–2005/06, 2006/07–2008/09 and 2009/10–2011/12

EXHIBIT 7.6S Risk-adjusted mortality rates at 1 year following a stroke or transient ischemic attack, in Ontario and by Ontario Stroke System region, using a 3-year combined rate for 2003/04–2005/06 and 2006/07–2008/09 and a 2-year combined rate for 2009/10–2010/11

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