



Canadian Stroke Network

Réseau Canadien contre  
les accidents cérébrovasculaires

**ICES** Institute for Clinical  
Evaluative Sciences

# Registry of the Canadian Stroke Network

## Report on the 2002/03 Ontario Stroke Audit



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## About the Organizations Involved in this Report

### The Canadian Stroke Network

The Canadian Stroke Network is one of Canada's Networks of Centres of Excellence, and is a collaborative effort that brings together researchers, students, government, industry and the non-profit sector. The Network, which began in 1999 with \$4.7 million in seed funding from the federal government, is a not-for-profit corporation governed by a Board of Directors and headquartered at the University of Ottawa. The Network puts Canada at the forefront of stroke research through its multi-disciplinary research program, high-quality training for Canadian scientists and clinicians, and national and global partnerships. At present, the Network has more than 100 researchers at 24 universities across the country ([www.canadianstrokenetwork.ca](http://www.canadianstrokenetwork.ca)).

The Canadian Stroke Network is dedicated to decreasing the physical, social and economic consequences of stroke on the individual and on society. In pursuit of this goal, it aims to:

- Promote research excellence;
- Train researchers and practitioners;
- Maximize economic benefits;
- Build national consensus on stroke policy; and,
- Create added value through partnerships.

### ICES—Ontario's resource for informed health care decision-making

ICES (Institute for Clinical Evaluative Sciences) is an independent, non-profit organization that conducts health services evaluations on a broad range of topical issues to enhance the effectiveness of health care for Ontarians. Internationally recognized for its innovative use of population-based health information, ICES knowledge provides evidence to support health policy development and changes to the organization and delivery of health care services.

Unbiased ICES evidence offers fact-based measures of health system performance; a clearer understanding of the shifting health care needs of Ontarians; and a stimulus for discussion of practical solutions to optimize scarce resources.

Key to ICES' work is the ability to link anonymous population-based health information on an individual patient basis, using unique encrypted identifiers that ensure privacy and confidentiality. This allows scientists to obtain a more comprehensive view of specific health care issues than would otherwise be possible. Linked databases reflecting 12 million of 30 million Canadians allow researchers to follow patient populations through diagnosis and treatment, and to evaluate outcomes.

ICES brings together the best and the brightest talent under one roof. Many of the faculty are not only internationally recognized leaders in their fields, but are also practicing clinicians who understand the grassroots of health care delivery, making ICES knowledge 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 management and creates a real-world mosaic of perspectives that is vital to shaping Ontario's future health care.

## Contents

<b>Publication Information</b> .....	<b>i</b>
<b>Authors' Affiliations</b> .....	<b>ii</b>
<b>Acknowledgments</b> .....	<b>iii</b>
<b>About the Organizations Involved in this Report</b> .....	<b>iv</b>
<b>List of Exhibits</b> .....	<b>vi</b>
<b>Executive Summary</b> .....	<b>ix</b>
<b>Background</b> .....	<b>1</b>
<b>Methods</b> .....	<b>2</b>
Participating Institutions.....	2
Patient Sample.....	2
Data Abstraction and Management .....	2
Statistical Analysis .....	2
<b>Results</b> .....	<b>3</b>
Baseline Characteristics .....	3
Pre-hospital Emergency Care .....	3
Thrombolysis.....	3
Emergency and In-hospital Management.....	3
Length of Stay, Discharge Status and Destination, and 30-day Mortality Rate .....	4
<b>Discussion</b> .....	<b>5</b>
<b>Exhibits</b> .....	<b>6</b>
<b>References</b> .....	<b>54</b>
<b>Appendices</b> .....	<b>55</b>
Appendix A. Current Provincial Resources for Stroke in 2005/06.....	55
Appendix B. Glossary of Terms .....	62

## List of Exhibits

- Exhibit 1** Characteristics of participating hospitals, by Ontario Stroke Strategy (OSS) region, April 1, 2002 to March 31, 2003
- Exhibit 2** Characteristics of participating hospitals, by Ontario Stroke Strategy (OSS) designation, April 1, 2002 to March 31, 2003
- Exhibit 3** Characteristics of participating hospitals, by Ontario hospital peer group, April 1, 2002 to March 31, 2003
- Exhibit 4** Characteristics of participating hospitals, by Ontario Local Health Integration Network (LHIN) region, April 1, 2002 to March 31, 2003
- Exhibit 5** Patient demographics and stroke presentation, by Ontario Stroke Strategy (OSS) region, April 1, 2002 to March 31, 2003
- Exhibit 6** Patient demographics and stroke presentation, by Ontario Stroke Strategy (OSS) designation, April 1, 2002 to March 31, 2003
- Exhibit 7** Patient demographics and stroke presentation, by Ontario hospital peer group, April 1, 2002 to March 31, 2003
- Exhibit 8** Patient demographics and stroke presentation, by Ontario Local Health Integration Network (LHIN) region, April 1, 2002 to March 31, 2003
- Exhibit 9** Pre-hospital and emergency stroke care, by Ontario Stroke Strategy (OSS) region, April 1, 2002 to March 31, 2003
- Exhibit 10** Pre-hospital and emergency stroke care, by Ontario Stroke Strategy (OSS) designation, April 1, 2002 to March 31, 2003
- Exhibit 11** Pre-hospital and emergency stroke care, by Ontario hospital peer group, April 1, 2002 to March 31, 2003
- Exhibit 12** Pre-hospital and emergency stroke care, by Ontario Local Health Integration Network (LHIN) region, April 1, 2002 to March 31, 2003
- Exhibit 13** Proportion (%) of stroke patients receiving thrombolysis, by Ontario Stroke Strategy (OSS) region, April 1, 2002 to March 31, 2003
- Exhibit 14** Proportion (%) of stroke patients receiving thrombolysis, by Ontario Stroke Strategy (OSS) designation, April 1, 2002 to March 31, 2003
- Exhibit 15** Proportion (%) of stroke patients receiving thrombolysis, by Ontario hospital peer group, April 1, 2002 to March 31, 2003
- Exhibit 16** Proportion (%) of stroke patients receiving thrombolysis, by Ontario Local Health Integration Network (LHIN) region, April 1, 2002 to March 31, 2003
- Exhibit 17** Neuroimaging rate per 100 stroke patients, by Ontario Stroke Strategy (OSS) region, April 1, 2002 to March 31, 2003
- Exhibit 18** Proportion (%) of stroke patients receiving neuroimaging, by Ontario Stroke Strategy (OSS) designation, April 1, 2002 to March 31, 2003
- Exhibit 19** Proportion (%) of stroke patients receiving neuroimaging, by Ontario hospital peer group, April 1, 2002 to March 31, 2003
- Exhibit 20** Neuroimaging rate per 100 stroke patients, by Ontario Local Health Integration Network (LHIN) region, April 1, 2002 to March 31, 2003
- Exhibit 21** Carotid imaging rate per 100 stroke patients, by Ontario Stroke Strategy (OSS) region, April 1, 2002 to March 31, 2003

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- Exhibit 22** Carotid imaging rate per 100 stroke patients, by Ontario Local Health Integration Network (LHIN) region, April 1, 2002 to March 31, 2003
- Exhibit 23** Proportion (%) of stroke patients receiving investigations, by Ontario Stroke Strategy (OSS) designation, April 1, 2002 to March 31, 2003
- Exhibit 24** Proportion (%) of stroke patients receiving investigations, by Ontario hospital peer group, April 1, 2002 to March 31, 2003
- Exhibit 25** Proportion (%) of stroke patients receiving drug therapy, by Ontario Stroke Strategy (OSS) designation, April 1, 2002 to March 31, 2003
- Exhibit 26** Proportion (%) of stroke patients receiving drug therapy, by Ontario hospital peer group, April 1, 2002 to March 31, 2003
- Exhibit 27** Antithrombotic therapy rate per 100 stroke patients, by Ontario Stroke Strategy (OSS) region, April 1, 2002 to March 31, 2003
- Exhibit 28** Antithrombotic therapy rate per 100 stroke patients, by Ontario Local Health Integration Network (LHIN) region, April 1, 2002 to March 31, 2003
- Exhibit 29** Warfarin therapy rate per 100 stroke patients with atrial fibrillation (AF), by Ontario Stroke Strategy (OSS) region, April 1, 2002 to March 31, 2003
- Exhibit 30** Warfarin therapy rate per 100 stroke patients with atrial fibrillation (AF), by Ontario Local Health Integration Network (LHIN) region, April 1, 2002 to March 31, 2003
- Exhibit 31** Proportion (%) of stroke patients receiving in-hospital services, by Ontario Stroke Strategy (OSS) region, April 1, 2002 to March 31, 2003
- Exhibit 32** Proportion (%) of stroke patients receiving in-hospital services, by Ontario Stroke Strategy (OSS) designation, April 1, 2002 to March 31, 2003
- Exhibit 33** Proportion (%) of stroke patients receiving in-hospital services, by Ontario hospital peer group, April 1, 2002 to March 31, 2003
- Exhibit 34** Proportion (%) of stroke patients receiving in-hospital services, by Ontario Local Health Integration Network (LHIN) region, April 1, 2002 to March 31, 2003
- Exhibit 35** Stroke unit admission rate per 100 stroke patients, by Ontario Stroke Strategy (OSS) region, April 1, 2002 to March 31, 2003
- Exhibit 36** Stroke unit admission rate per 100 stroke patients, by Ontario Local Health Integration Network (LHIN) region, April 1, 2002 to March 31, 2003
- Exhibit 37** Proportion (%) of stroke patients with various in-hospital outcomes, by Ontario Stroke Strategy (OSS) region, April 1, 2002 to March 31, 2003
- Exhibit 38** Proportion (%) of stroke patients with various in-hospital outcomes, by Ontario Stroke Strategy (OSS) designation, April 1, 2002 to March 31, 2003
- Exhibit 39** Proportion (%) of stroke patients with various in-hospital outcomes, by Ontario hospital peer group, April 1, 2002 to March 31, 2003
- Exhibit 40** Proportion (%) of stroke patients with various in-hospital outcomes, by Ontario Local Health Integration Network (LHIN) region, April 1, 2002 to March 31, 2003
- Exhibit 41** Age- and sex-adjusted 30-day mortality rate in patients with ischemic stroke admitted to hospital, by Ontario Stroke Strategy (OSS) region, April 1, 2002 to March 31, 2003

- Exhibit 42** Age- and sex-adjusted 30-day mortality rate in patients with ischemic stroke admitted to hospital, by Ontario Stroke Strategy (OSS) designation, April 1, 2002 to March 31, 2003
- Exhibit 43** Age- and sex-adjusted 30-day mortality rate in patients with ischemic stroke admitted to hospital, by Ontario hospital peer group, April 1, 2002 to March 31, 2003
- Exhibit 44** Age- and sex-adjusted 30-day mortality rate in patients with ischemic stroke admitted to hospital, by Ontario Local Health Integration Network (LHIN) region, April 1, 2002 to March 31, 2003
- Exhibit 45** Age- and sex-adjusted 30-day mortality rate in patients with intracerebral hemorrhage admitted to hospital, by Ontario Stroke Strategy (OSS) region, April 1, 2002 to March 31, 2003
- Exhibit 46** Age- and sex-adjusted 30-day mortality rate in patients with intracerebral hemorrhage admitted to hospital, by Ontario Stroke Strategy (OSS) designation, April 1, 2002 to March 31, 2003
- Exhibit 47** Age- and sex-adjusted 30-day mortality rate in patients with intracerebral hemorrhage admitted to hospital, by Ontario hospital peer group, April 1, 2002 to March 31, 2003
- Exhibit 48** Age- and sex-adjusted 30-day mortality rate in patients with intracerebral hemorrhage admitted to hospital, by Ontario Local Health Integration Network (LHIN) region, April 1, 2002 to March 31, 2003

## Executive Summary

### Purpose

Stroke is the fourth leading cause of death and a leading cause of adult disability in Canada. In Ontario, previous studies have shown wide variations in the availability of stroke care resources in acute care institutions across the Province, as well as variations in the treatment of stroke patients in organizations with similar resources. In order to address these inconsistencies, and to ensure that Ontarians have access to high quality stroke care throughout the Province, Ontario has developed a “coordinated stroke strategy”. Its goal is to improve both access to and quality of services across the continuum of stroke care—from primary prevention to pre-hospital/emergency care, hospital-based acute care, rehabilitation, secondary prevention and community re-engagement.

Within the Ontario Stroke Strategy, ongoing monitoring and evaluation is considered essential to ensure implementation of best practices and evidence-based stroke care. The Registry of the Canadian Stroke Network (RCSN) was established in 2001, and its mandate includes ongoing measurement and monitoring of the quality of stroke care delivery in Ontario. One component of the RCSN is a province-wide audit of stroke care in Ontario, which is performed every two years. This report presents information obtained from the RCSN Ontario Stroke Audit for fiscal year 2002/03.

### Study

The RCSN Ontario Stroke Audit was performed to evaluate the characteristics, management and outcomes of stroke patients in Ontario, with comparisons by Ontario Stroke Strategy region, by institutional designation within the Stroke Strategy (Regional Stroke Centre, District Stroke Centre, non-designated hospital), by hospital peer group (Regional Stroke Centre, academic hospital, large community hospital, small community hospital) and by Local Health Integration Network (LHIN) region.

All Ontario acute care institutions, excluding children’s and mental health care hospitals and those with fewer than 10 stroke or transient ischemic attack (TIA) separations per year, were invited to participate in the RCSN Ontario Stroke Audit. All patients seen in the emergency department or admitted to hospital with a most responsible diagnosis of stroke or TIA were eligible for inclusion in the audit. Overall, 151 acute care institutions (with 153 individual hospital sites) were eligible, and all agreed to participate in the 2002/03 RCSN Ontario Stroke Audit. During the study time frame there were 25,905 hospitalizations or emergency department visits for acute stroke or TIA. The audit sample included a total of 3,388 patients (approximately 13% of all cases).

### Key Points

1. This audit was undertaken prior to full implementation of the Ontario Stroke Strategy, and will serve as baseline data for ongoing evaluation of the strategy. Future audits will provide information on temporal trends in stroke care delivery, and will provide valuable information on the impact of the Ontario Stroke Strategy on stroke care and outcomes.
2. For patients experiencing an ischemic stroke, the best outcomes are expected to occur if the patient is treated in hospital as soon as possible after stroke onset. In 2002/03, 33% of all stroke patients arrived at hospital within 2.5 hours of stroke onset.
3. In 2002/03, thrombolysis was administered to 3.2% of patients with acute ischemic stroke. Rates of thrombolysis were significantly higher at Regional Stroke Centres compared with other types of hospitals, and were particularly high in certain regions of the Province. Coordinated regional stroke care and/or “telestroke”<sup>1</sup> may be useful interventions to increase rates of thrombolysis administration across the Province.
4. Thirty-day stroke mortality rates were significantly lower at Regional Stroke Centres compared with other types of institutions.

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<sup>1</sup>The telestroke program links specialists in Southern Ontario with hospitals in the North to improve patient access to care.

5. Research evidence suggests that outcomes are best if patients are managed on dedicated stroke units. In this audit, only 32 out of 153 hospitals had dedicated stroke units in 2002/03, and 2.7% of all stroke patients were cared for on these units, the majority of whom were patients at Regional Stroke Centres.
6. Significant gaps and regional variations were found in the use of virtually all stroke care investigations, including both neuroimaging and carotid imaging.
7. Significant variations were also found in the use of secondary prevention interventions, such as antithrombotic agents for ischemic stroke and use of warfarin for atrial fibrillation.
8. In 2002/03, 11 secondary prevention clinics were operational in Ontario, and 4.7% of all patients were referred to these clinics for ongoing assessment and management at the time of hospital discharge. By the end of 2004–2005, a total of 17 stroke prevention clinics were operational in Ontario, which should have a positive impact on future access to these stroke care services.
9. In 2002/03, 51% of all stroke patients were discharged home after their stroke. Twenty-eight percent of patients were discharged to inpatient rehabilitation facilities.

## Implications

In summary, in the RCSN 2002/03 Ontario Stroke Audit, we found that most Ontarians received high quality stroke care. However, there were significant regional and inter-institutional variations in care—particularly in the use of evidence-based interventions such as stroke units, thrombolysis and antithrombotic agents—and significant differences in survival after stroke based on the location of stroke care delivery. Many opportunities have been identified for improvements to the Ontario Stroke Strategy through this audit and, as a result, several initiatives are now in the planning stages. The Ontario Stroke Strategy has grown and expanded in terms of the services provided since this 2002/03 audit. Future provincial audits will be needed to determine whether coordination and optimization of stroke care delivery through the Ontario Stroke Strategy will result in improvements in stroke care delivery and stroke outcomes across the Province.

## Background

Stroke is the fourth leading cause of death and a leading cause of adult disability in Canada.<sup>1</sup> Clinical trials have demonstrated that the optimal management of acute stroke includes care on a dedicated stroke unit, early use of aspirin in those with ischemic stroke and administration of thrombolysis to eligible patients.<sup>2-4</sup> Established interventions for secondary prevention of ischemic stroke include antithrombotic agents, warfarin for those with atrial fibrillation, and carotid endarterectomy for symptomatic, high-grade carotid stenosis.<sup>5-7</sup> Such interventions require specialized institutional resources, including clinicians with expertise in stroke, organized interdisciplinary stroke care teams and units, rapid access to computed tomography (CT) or magnetic resonance imaging (MRI) scanning and expert interpretation of neuroimaging results.

In Ontario, previous studies have shown wide variations in the availability of stroke care resources in acute care institutions across the Province.<sup>8,9</sup> In order to address this, and to ensure that Ontarians have access to high quality stroke care throughout the Province, Ontario has developed a “coordinated stroke strategy”, which was launched by the Heart and Stroke Foundation of Ontario in 1998, and is now funded and supported by the Ontario Ministry of Health and Long-Term Care.<sup>10</sup> The Ontario Stroke Strategy (now known as the Ontario Stroke System) seeks to improve both access to and quality of services across the continuum of stroke care, from primary prevention to pre-hospital and acute care, to rehabilitation and community reengagement.

Within the strategy, the Province is divided into regions, each of which has a Regional Stroke Centre or enhanced District Stroke Centre. This is typically a large institution with specific stroke care resources (CT, MRI, cerebral angiography, neurology and neurosurgery), which is responsible for coordinating stroke care within its region (Appendix A). Each region may also have one or more District Stroke Centres, which have some stroke-specific resources (CT and a clinician with stroke expertise); the remaining hospitals are classified as community or non-designated hospitals.

With respect to emergency and acute stroke care, the Ontario Stroke Strategy aims to coordinate and optimize stroke care through the implementation of symptom awareness campaigns, practice guidelines, care maps and collaborative arrangements among institutions. Regional transfer agreements and bypass protocols exist to permit the movement of stroke patients among these institutions, so that patients with acute stroke who would normally be seen at non-designated hospitals may be investigated and managed at larger centres with appropriate resources.

Within the Ontario Stroke Strategy, ongoing monitoring and evaluation is considered essential to ensure implementation of best practices and evidence-based stroke care. The Registry of the Canadian Stroke Network (RCSN) was established in 2001, and its mandate includes the measurement and monitoring of the quality of stroke care delivery in Ontario.<sup>11</sup> The RCSN performs a province-wide audit of stroke care in Ontario every two years—a process which began in 2002/03. We used RCSN Ontario Stroke Audit data to evaluate the characteristics, management and outcomes of stroke patients in Ontario in 2002/03, and to make comparisons by: Ontario Stroke Strategy region, institutional designation within the Stroke Strategy (Regional Stroke Centre, District Stroke Centre, non-designated hospital), hospital peer group (Regional Stroke Centre, academic hospital, large community hospital, small community hospital), and Local Health Integration Network (LHIN) region.

## Methods

### Participating Institutions

All Ontario acute care institutions, excluding children's and mental health care hospitals and those with fewer than 10 stroke or transient ischemic attack (TIA) separations per year, were invited to participate in the RCSN Ontario Stroke Audit. Based on the annual number of visits or admissions for stroke or TIA, institutions were categorized as low- (<34), medium- (34–99) or high- ( $\geq 100$ ) volume. Institutions were also classified as Regional Stroke Centres, District Stroke Centres or non-designated hospitals, based on their designation within the Ontario Stroke Strategy. In order to provide baseline data, we classified sites according to their *final* designation within the Ontario Stroke Strategy (as of 2005), even though a number of Regional and District Stroke Centres had not yet been given their designation at the time of the 2002/03 audit. No institutions had been classified as *enhanced* District Stroke Centres at the time of the 2002/03 audit, so this category was not included in the analyses. Institutions were also classified into "peer groups", consisting of small hospitals, large community hospitals, academic hospitals, and Regional Stroke Centres.<sup>12</sup> Regional Stroke Centres included hospitals from both the community and academic hospital peer groups, but were treated as a distinct category because of their stroke-specific resources (Appendix A).

### Patient Sample

The 2002/03 audit includes those patients seen between April 1, 2002 and March 31, 2003. All patients seen in the emergency department or admitted to hospital during this time period, with a most responsible diagnosis of stroke or TIA, were eligible for inclusion in the audit. Stroke/TIA separations were identified from the discharge abstract database (DAD) and the National Ambulatory Care Reporting System (NACRS) database maintained by the Canadian Institute for Health Information (CIHI), using the International Classification of Diseases, Tenth Revision (ICD-10) codes I60, I61, I63, I64 and G45 (excluding G45.4). For individuals with both NACRS and DAD separations, only the DAD separation was included. For discrepancies between the NACRS and DAD diagnosis, the DAD diagnosis was considered to be correct. From all eligible cases, a simple random sample of 13% was selected, with over-sampling performed at low-volume institutions such that each institution contributed a minimum of 10 cases.

### Data Abstraction and Management

The overall research project was approved by the Research Ethics Board at Sunnybrook and Women's College Health Sciences Centre, with additional approval by research ethics boards at participating institutions where required. Centrally-trained neurology research nurses performed chart abstraction at participating hospitals. Data were collected on all aspects of acute stroke management, including patient sociodemographics, the use of pre-hospital emergency medical services, and in-hospital and emergency department management, complications and outcomes. Data were entered electronically into a Microsoft Access database on Fujitsu Lifebook® touch screen laptop computers, and the aggregate anonymized database was managed at the coordinating centre for the RCSN at the Institute for Clinical Evaluative Sciences (ICES) in Ontario, Canada. Chart validation revealed that inter-rater agreement was substantial or almost perfect ( $\kappa > 0.80$ ) for key variables including age, sex, stroke date, use of thrombolysis and in-hospital mortality. At ICES, unique patient identification numbers were used to link the RCSN database with the Ontario Registered Persons Database to obtain information on deaths that occurred after discharge from hospital.

### Statistical Analysis

Results are presented for the entire Province, for each Stroke Strategy region, for each type of hospital by strategy designation, by hospital peer group and by LHIN region. Analyses by Stroke Strategy designation are based on individual hospital sites rather than on institutions, since several institutions had multiple sites, and in some cases one site within a multi-site institution was a Regional or District Stroke Centre, while the remaining site(s) were not.

Results were weighted based on hospital volume and the number of charts sampled, in order to account for over-sampling at low-volume institutions. The weight assigned to a record is inversely proportional to the probability of that record being selected for inclusion in the study. By using the weights in our analysis, we obtained an estimate that applied to the entire "population" of discharge records.

The characteristics, management, and in-hospital outcomes of stroke patients by region and institution type were compared using Rao-Scott Chi-square tests for categorical variables. The 30-day mortality rate by region and institution type was calculated with adjustment for age, sex and stroke type. For these analyses of mortality, we used the entire stroke/TIA cohort included in CIHI data from fiscal year 2002/03, rather than from the audit sample alone. SAS version 9.1 was used for all analyses.

## Results

Overall, 151 acute care institutions (with 153 individual hospital sites) were eligible, and all agreed to participate in the 2002/03 RCSN Ontario Stroke Audit (Appendix A). Of these, 26 institutions (17%) were low-volume, 50 (33%) were medium-volume, and 77 (50%) were high-volume, accounting for 2%, 11%, and 87% of all stroke visits, respectively (Exhibit 1). Within the Stroke Strategy, 127 (83%) were non-designated hospitals, 17 (11%) were designated as District Stroke Centres, and 9 (6%) were designated as Regional Stroke Centres, accounting for 60%, 20% and 20% of all stroke visits, respectively (Exhibit 1).

### Baseline Characteristics

In Ontario in fiscal year 2002/03, there were 25,905 hospitalizations or emergency department visits for acute stroke or TIA. The initial audit sample included 3,678 charts. Of these, 136 charts were not reviewed because they were missing or miscoded, and 154 were determined after review to have a diagnosis other than stroke, leaving a total sample size of 3,388 stroke events (13% of the total stroke population). Overall, 52% were women, and the median age at stroke presentation was 75 years (Exhibit 5). There were significant differences in baseline risk factors and stroke presentation among regions and among different types of hospitals (Exhibits 5–8). Patients seen at Regional Stroke Centres were less likely to live in rural areas, had less comorbid illness (with a lower proportion having a Charlson-Deyo comorbidity index score of greater than 2), were more likely to have intracerebral hemorrhage and subarachnoid hemorrhage, and had greater stroke severity, as reflected by the Canadian Neurological Scale score (Exhibit 6).

Overall, the presence of established stroke risk factors was high: 58% had hypertension; 24% had a history of diabetes, 25% had hyperlipidemia, 12% were current smokers and 15% had atrial fibrillation. The final diagnosis was ischemic stroke in 48%, TIA in 34%, intracerebral hemorrhage in 9%, subarachnoid hemorrhage in 4%, and “unable to determine” in 6% of patients (Exhibit 5). Those at small hospitals were significantly more likely to have an undetermined stroke type (17% in small hospitals, 7% in large community hospitals, 2% in academic hospitals, 1% in Regional Stroke Centres), primarily because neuroimaging could not be performed.

### Pre-hospital Emergency Care

Overall, 56% of patients were transported to hospital by ambulance and 33% presented to hospital within 2.5 hours of stroke onset, with a median stroke onset to emergency department arrival time of 6 hours (Exhibit 9). There were significant differences in stroke onset to arrival time and mode of transportation by region and by type of institution (Exhibits 9–12).

### Thrombolysis

Thrombolysis was administered to 1.6% of the entire stroke population, 3.1% of those with ischemic stroke and 5.1% of those with ischemic stroke arriving at hospital within 2.5 hours of stroke onset (Exhibit 13). There were significant differences in rates of thrombolysis administration by region, by hospital type and by LHIN region, with the highest rates of thrombolysis use in Regional Stroke Centres, followed by District Stroke Centres, followed by non-designated hospitals (Exhibits 13–16). The highest rates of thrombolysis (15% of those with ischemic stroke and 25% of those with ischemic stroke arriving at hospital within 2.5 hours of stroke onset) were seen in the Southeast Stroke Region, whose Regional Stroke Centre was one of the pilot demonstration sites for the Stroke Strategy.

### Emergency and In-hospital Management

Seventy-seven percent of patients underwent neuroimaging, 94% had an electrocardiogram, 43% underwent carotid imaging, and 20% had lipid levels measured. There were significant variations in the rates of investigations by region, by hospital type and by LHIN region, with the highest rates at Regional Stroke Centres, followed by District Stroke Centres, followed by non-designated hospitals (Exhibits 17–24). In hospital, 2.7% of patients were admitted to an acute stroke unit, 46% were seen by a neurologist, 67% by physiotherapy, 56% by occupational therapy, 43% by speech language pathology, 43% by social work and 35% by a nutritionist, with significant differences by region and by hospital type (Exhibits 31–36). Patients seen at Regional Stroke Centres were significantly more likely than those seen at other centres to be admitted to a stroke unit, to be seen by a neurologist or to receive inpatient rehabilitation services. Among patients with ischemic stroke or TIA, 78% were treated with antithrombotic agents, 35% were treated with lipid-lowering medications, 23% were treated with angiotensin-converting enzyme (ACE) inhibitors or angiotensin receptor blockers (ARBs) and 60% of those with atrial fibrillation were treated with warfarin. There were significant differences in rates of these therapies by OSS region, by hospital type and by LHIN region (Exhibits 25–30).

### **Length of Stay, Discharge Status and Destination, and 30-day Mortality Rate**

For patients admitted to hospital, the median length of stay was 8 days. At discharge, 48% had a Rankin score  $\leq 2$  (indicating minimal disability), 51% were discharged home, 15% went to a nursing home or long-term care, and 28% were discharged to an inpatient rehabilitation facility, with significant differences by Stroke Strategy region, by hospital type and by LHIN region (Exhibits 37–40). Overall 30-day mortality rate was 12.7%, adjusted for age, sex and stroke type. There were significant regional variations in mortality, and mortality rates were significantly lower at Regional Stroke Centres compared with other types of hospitals, even after adjustment for age, sex and stroke type (Exhibits 41–48).

## Discussion

This is the first population-based stroke audit available in Canada, with a focus on recognized quality of care indicators,<sup>13</sup> and with the ability to explore the association between stroke care resources and stroke care delivery. We found gaps in care delivery for patients with stroke or TIA seen at Ontario acute care institutions, with underuse of stroke quality of care indicators such as neuroimaging, care on an Acute stroke unit, antithrombotic agents and warfarin for atrial fibrillation. In addition, we found significant institutional and regional variations in the type of care patients received, with substantially higher rates of thrombolysis, neuroimaging and other interventions in Regional Stroke Centres compared to other types of hospitals, as well as lower rates in certain regions of the Province compared with others. These findings are consistent with studies from a variety of jurisdictions, including Canada, which have shown gaps and regional variations in stroke care delivery, as well as with a Canadian study that found lower use of neuroimaging in rural institutions<sup>9,14-17</sup>. In addition, these findings also highlight the benefits of a coordinated stroke system, where centres that are given stroke resources and have bypass protocols in place provide patients with superior stroke care.

The finding of low rates of thrombolysis use across much of the Province, and particularly in smaller centres, may be related to inadequate resources such as neuroimaging, or to other factors such as a lack of physician training and experience. In addition, the costs of acute thrombolytics are not funded directly as part of the Ontario Stroke Strategy and must be assumed by each academic hospital. The Ontario Stroke Strategy encourages the development of bypass protocols and cooperative arrangements to allow potentially eligible patients to be taken or transferred to sites with the capacity to administer thrombolysis; many of these have been implemented since the audit was undertaken and this may lead to improvements in rates of thrombolysis administration. Telemedicine may also prove to be another efficient means of providing thrombolysis administration to patients seen in small or remote centres. It is notable that some regions, particularly the Southeast, were able to achieve very high rates of thrombolysis administration to eligible patients as a result of focused quality improvement initiatives. Their experience should provide valuable information for other regions as they plan for coordinated regional stroke care delivery.

Addressing other observed gaps in care may require more targeted interventions. For example, the underuse of antithrombotic agents and warfarin for atrial fibrillation suggests the need for local quality improvement interventions such as provider feedback, academic detailing and education. Stroke symptom and public awareness campaigns may be important strategies for decreasing pre-hospital delays and increasing the proportion of patients eligible for thrombolysis. For instance, evaluation of a recent public awareness campaign by the Heart and Stroke Foundation found that 72% of people surveyed in August 2005 were able to identify at least two signs and symptoms of stroke. Many were aware of the need to treat this as a medical emergency, with a marked increase from the 2003 polling results where only 52% of those polled were aware of at least two signs and symptoms of stroke (Heart and Stroke Foundation 2005, unpublished data).

In addition to variations in care delivery, we observed significant regional and inter-institutional variations in outcomes. Compared to those seen at other centres, patients at Regional Stroke Centres had a longer length of stay, were more likely to be discharged to inpatient rehabilitation facilities, and were more likely to have measurable disability at the time of discharge, as measured by a modified Rankin score of two or greater. This may reflect a higher proportion of patients with hemorrhagic stroke and worse functional outcomes. However, we found that 30-day and one-year mortality were lower at Regional Stroke Centres compared with other types of institutions, and this was true even after adjustment for age, sex and stroke type, suggesting that care at a Regional Stroke Centre is associated with a significant and sustained survival advantage after stroke. As stroke care becomes more concentrated at Regional Stroke Centres, it will be important to monitor provincial stroke mortality rates to see if these decline over time. We do not have information on other important stroke outcomes, such as long-term functional status and quality of life.

The Ontario Stroke Strategy was developed to ensure that all Ontarians have access to optimal stroke care. This audit was undertaken at a time when most regions had not fully developed or implemented a strategy, so the results should not be seen as reflecting current stroke care delivery or the full potential effectiveness of the Ontario Stroke Strategy. Rather, these will be used to provide valuable baseline information for ongoing evaluation of the quality of stroke care in the Province.

In summary, in the RCSN 2002/03 Ontario Stroke Audit, we found significant regional and inter-institutional variations in stroke care delivery, particularly in the use of recognized quality indicators such as the use of thrombolysis, stroke units and antithrombotic agents, and significant differences in survival after stroke based on the location of stroke care delivery. Future provincial audits will be needed to determine whether coordination and optimization of stroke care delivery through the Ontario Stroke Strategy will result in improvements in stroke care delivery and stroke outcomes across the Province.

## Exhibits

### Exhibit 1 Characteristics of participating hospitals, by Ontario Stroke Strategy (OSS) region, April 1, 2002 to March 31, 2003

OSS Region		Central East	Central South	West GTA	Champlain	Southeast	Northeast	Northwest	Southwest	North and East GTA	Southeast GTA	Toronto West	All Ontario
<b>Number of hospitals</b>		19	24	8	18	9	19	8	34	4	4	6	153
<b>Hospital designation within the Stroke Strategy (n)</b>	Non-designated	16	20	7	16	7	15	7	28	3	3	5	127
	District Stroke Centre	3	3	0	1	1	4	0	5	0	0	0	17
	Regional Stroke Centre	0	1	1	1	1	0	1	1	1	1	1	9
<b>Annual stroke patient volume (n)**</b>	Low (<33)	0	2	0	3	1	8	4	8	0	0	0	26
	Medium (33–99)	5	8	2	9	4	7	3	12	0	0	0	50
	High (≥100)	14	14	6	6	4	4	1	14	4	4	6	77
<b>Location (n)**</b>	Urban	14	19	8	8	5	6	2	15	4	4	6	91
	Rural	5	5	0	10	4	13	6	19	0	0	0	62
<b>Academic hospital (n)**</b>		0	5	0	2	2	0	0	3	1	1	3	17
<b>Acute stroke unit (n)**</b>		4	1	5	0	0	0	0	3	3	0	4	20

\*p<0.05 or \*\*p<0.001 for comparisons across OSS regions.

**Annual stroke patient volume:** Indicates the annual number of hospital separations (inpatient and emergency) for stroke or transient ischemic attack.

**Academic hospital:** University-affiliated 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.

**Exhibit 2 Characteristics of participating hospitals, by Ontario Stroke Strategy (OSS) designation, April 1, 2002 to March 31, 2003**

OSS Designation		Non-Designated Hospital	District Stroke Centre	Regional Stroke Centre
<b>Number of hospitals</b>		127	17	9
<b>Annual stroke patient volume (n)**</b>	Low (<33)	26	0	0
	Medium (33–99)	50	0	0
	High (≥100)	51	17	9
<b>Location (n)**</b>	Urban	65	17	9
	Rural	62	0	0
<b>Academic hospital (n)**</b>		10	0	7
<b>Acute stroke unit (n)</b>		15	2	3

\*p<0.05 or \*\*p<0.001 for comparisons across OSS designations.

**Annual stroke patient volume:** Indicates the annual number of hospital separations (inpatient and emergency) for stroke or transient ischemic attack.

**Academic hospital:** University-affiliated 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.

**District Stroke Centre:** Facilities with 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.

**Regional Stroke Centre:** All the requirements of a District Stroke Centre, plus neurosurgical facilities and interventional radiology.

**Non-designated:** Acute care hospital that does not fit the definition of District or Regional Stroke Centre.

**Exhibit 3 Characteristics of participating hospitals, by Ontario hospital peer group, April 1, 2002 to March 31, 2003**

Hospital Peer Group		Small Community	Large Community	Academic ‡	Regional Stroke Centre
<b>Number of hospitals</b>		<b>35</b>	<b>99</b>	<b>10</b>	<b>9</b>
<b>Hospital designation within the stroke strategy (n)**</b>	Non-designated	35	82	10	0
	District Stroke Centre	0	17	0	0
	Regional Stroke Centre	0	0	0	9
<b>Annual stroke patient volume (n)**</b>	Low (<33)	16	8	2	0
	Medium (33–99)	19	31	0	0
	High (≥100)	0	60	8	9
<b>Location (n)**</b>	Urban	1	71	10	9
	Rural	34	28	0	0
<b>Academic hospital (n)**</b>		0	0	10	7
<b>Acute stroke unit (n)*</b>		0	15	2	3

\*p<0.05 or \*\*p<0.001 for comparisons across hospital peer groups.

‡ Seven additional academic hospitals are included in the Regional Stroke Centre category.

**Annual stroke patient volume:** Indicates the annual number of hospital separations (inpatient and emergency) for stroke or transient ischemic attack.

**Academic hospital:** University-affiliated 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.

**Small community hospitals:** Facilities that generally provide less than 3,500 weighted cases per year, have a referral population of less than 20,000 people, and are the only hospital in their community, as defined by the Joint Policy and Planning Committee.

**District Stroke Centre:** Facilities with 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.

**Regional Stroke Centre:** All the requirements of a District Stroke Centre, plus neurosurgical facilities and interventional radiology.

**Large community hospitals:** All other hospitals.

**Exhibit 4 Characteristics of participating hospitals, by Ontario Local Health Integration Network (LHIN) region, April 1, 2002 to March 31, 2003**

LHIN Region		Central	Central East	Central	Champlain	Erie St. Clair	Hamilton Niagara Haldimand Brant	Mississauga Halton	North East	North Simcoe Muskoka	North West	South East	South West	Toronto Central	Waterloo Wellington	All Ontario
<b>Number of hospitals</b>		7	13	3	16	7	17	5	19	6	8	11	27	7	7	153
<b>Hospital designation within the stroke strategy (n)</b>	Non-designated	6	12	3	14	4	14	4	15	5	7	9	24	4	6	127
	District Stroke Centre	1	1	0	1	3	2	0	4	1	0	1	2	0	1	17
	Regional Stroke Centre	0	0	0	1	0	1	1	0	0	1	1	1	3	0	9
<b>Annual stroke patient volume (n)*</b>	Low (<33)	0	0	0	2	0	1	0	8	0	4	2	8	0	1	26
	Medium (33–99)	1	4	0	8	2	6	2	7	0	3	5	10	0	2	50
	High (≥100)	6	9	3	6	5	10	3	4	6	1	4	9	7	4	77
<b>Location (n)**</b>	Urban	7	10	3	8	6	15	5	6	4	2	5	9	7	4	91
	Rural	0	3	0	8	1	2	0	13	2	6	6	18	0	3	62
<b>Academic hospital (n)**</b>		0	0	0	2	0	5	0	0	0	0	2	3	5	0	17
<b>Acute stroke unit (n)**</b>		3	6	2	0	1	0	3	0	0	0	0	2	2	1	20

\*p<0.05 or \*\*p<0.001 for comparisons across LHIN regions.

**Annual stroke patient volume:** Indicates the annual number of hospital separations (inpatient and emergency) for stroke or transient ischemic attack.

**Academic hospital:** University-affiliated 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.

**Exhibit 5 Patient demographics and stroke presentation<sup>†</sup>, by Ontario Stroke Strategy (OSS) region, April 1, 2002 to March 31, 2003**

OSS Region		Central East	Central South	West GTA	Champlain	Southeast	Northeast	Northwest	Southwest	North and East GTA	Southeast GTA	Toronto West	All Ontario
<b>Number (provincial total)</b>		3,728	4,520	2,577	2,889	1,277	1,601	595	3,614	1,860	1,343	1,901	25,905
<b>Number (audit sample)</b>		421	545	288	405	164	309	104	596	209	146	201	3,388
<b>Female sex (%)</b>		47	53	54	49	49	48	56	54	56	55	52	52
<b>Median age (years)</b>		76	76	75	75	76	72	74	76	77	75	75	75
<b>Lives alone (%)**</b>		28	23	22	17	32	23	32	33	27	21	25	25
<b>Rural residence (%)**</b>		20	11	3	25	35	39	34	33	3	4	4	18
<b>Medical history (%)</b>	Stroke/transient ischemic attack (TIA)	43	38	35	35	38	34	38	39	40	32	37	38
	Diabetes**	22	23	24	25	18	26	27	23	26	28	27	24
	Hypertension**	51	63	58	55	45	63	76	61	63	60	59	59
	Smoking (current)**	12	14	8	8	11	20	21	12	11	14	11	12
	Hyperlipidemia**	20	26	21	24	15	30	30	28	26	31	33	25
	Atrial fibrillation**	13	17	10	15	10	9	19	15	12	13	18	14
Myocardial infarction		17	16	13	14	15	15	16	14	15	16	15	15
<b>Charlson score &gt; 1 (%)</b>		27	32	25	27	34	30	27	27	25	37	34	29
<b>Pre-admission Rankin score &lt; 2 (%)**</b>		72	76	79	80	75	69	94	63	83	75	72	74
<b>Stroke type (%)**</b>	Intracerebral hemorrhage	8	9	9	10	7	5	4	6	10	14	13	9
	Ischemic	44	37	51	51	44	43	49	56	55	48	53	48
	Subarachnoid hemorrhage	3	4	6	3	4	4	4	3	4	7	8	4
	TIA	39	40	33	31	28	41	40	32	31	26	24	34
	Unable to determine	7	10	2	5	18	8	4	4	1	5	2	6
<b>Unconscious (%)**</b>		4	7	5	5	7	4	2	5	6	5	7	5
<b>CNS score (median)</b>		11	11	10	11	10	10	11	10	10	9	10	10
<b>CNS score &gt; 8 (%)**</b>		82	75	80	80	71	81	81	72	65	66	72	76

\*p<0.05 or \*\*p<0.001 for comparisons across OSS designations.

<sup>†</sup>Includes patients with stroke or transient ischemic attack.

**Charlson score:** A comorbidity index score, where higher scores indicate more comorbid illness.

**Rankin score:** A measure of functional status after stroke with a range from 0 (no disability) to 6 (death).

**CNS:** Canadian Neurological Scale. CNS is a measure of stroke severity with a range of 0 to 11.5. A score < 8 indicates a severe stroke.

**Exhibit 6 Patient demographics and stroke presentation<sup>†</sup>, by Ontario Stroke Strategy (OSS) designation, April 1, 2002 to March 31, 2003**

OSS Designation		Non-Designated Hospital	District Stroke Centre	Regional Stroke Centre
<b>Number (provincial total)</b>		<b>16,208</b>	<b>4,709</b>	<b>4,988</b>
<b>Number (audit sample)</b>		<b>2,337</b>	<b>509</b>	<b>542</b>
<b>Female sex (%)</b>		51	53	52
<b>Median age (years)</b>		76	75	72
<b>Lives alone (%)*</b>		25	28	24
<b>Rural residence (%)**</b>		21	15	10
<b>Medical history (%)</b>	Stroke/transient ischemic attack (TIA)	38	40	36
	Diabetes	25	23	23
	Hypertension	57	61	61
	Smoking (current) *	10	14	15
	Hyperlipidemia**	24	26	29
	Atrial fibrillation	14	14	15
	Myocardial infarction*	15	17	13
<b>Charlson score &gt; 1 (%)</b>		29	30	27
<b>Pre-admission Rankin score &lt; 2 (%)**</b>		74	72	79
<b>Stroke type (%)**</b>	Intracerebral hemorrhage	7	8	14
	Ischemic	47	49	47
	Subarachnoid hemorrhage	3	3	10
	Transient ischemic attack	35	36	28
	Unable to determine	8	5	1
<b>Unconscious (%)</b>		5	5	7
<b>CNS score (median)</b>		10	10	10
<b>CNS score &gt; 8 (%)</b>		76	78	72

\*p<0.05 or \*\*p<0.001 for comparisons across OSS designations.

<sup>†</sup>Includes patients with stroke or transient ischemic attack.

**Charlson score:** A comorbidity index score, where higher scores indicate more comorbid illness.

**Rankin score:** A measure of functional status after stroke with a range from 0 (no disability) to 6 (death).

**CNS:** Canadian Neurological Scale. CNS is a measure of stroke severity with a range of 0 to 11.5. A score < 8 indicates a severe stroke.

**District Stroke Centre:** Facilities with 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.

**Regional Stroke Centre:** All the requirements of a District Stroke Centre, plus neurosurgical facilities and interventional radiology.

**Non-designated:** Acute care hospital that does not fit the definition of District or Regional Stroke Centre.

**Exhibit 7 Patient demographics and stroke presentation<sup>†</sup>, by Ontario hospital peer group, April 1, 2002 to March 31, 2003**

Hospital Peer Group		Small Community	Large Community	Academic ‡	Regional Stroke Centre
Number (provincial total)		1,217	17,734	1,965	4,988
Number (audit sample)		433	2,188	225	542
Female sex (%)		51	51	51	52
Median age (years)		76	76	75	72
Lives alone (%)*		23	25	32	24
Rural residence (%)**		89	17	6	10
Medical history (%)	Stroke/transient ischemic attack (TIA)	39	39	34	36
	Diabetes*	22	24	30	23
	Hypertension	58	57	62	61
	Smoking (current)*	13	12	9	15
	Hyperlipidemia**	25	24	27	29
	Atrial fibrillation*	14	13	21	15
	Myocardial infarction	16	15	17	13
Charlson score > 1 (%)		29	29	33	27
Pre-admission Rankin score < 2 (%)*		72	74	72	79
Stroke type (%)**	Intracerebral hemorrhage	2	7	10	14
	Ischemic	33	48	52	47
	Subarachnoid hemorrhage	2	3	3	10
	Transient ischemic attack	46	35	34	28
	Unable to determine	17	7	2	1
Unconscious (%)*		3	5	6	7
CNS score (median)		11	10	11	10
CNS score > 8 (%)*		77	77	72	72

\*p<0.05 or \*\*p<0.001 for comparisons across hospital peer groups.

<sup>†</sup>Includes patients with stroke or transient ischemic attack.

‡ Seven additional academic hospitals are included in the Regional Stroke Centre category.

**Charlson score:** A comorbidity index score, where higher scores indicate more comorbid illness.

**Rankin score:** A measure of functional status after stroke with a range from 0 (no disability) to 6 (death).

**CNS:** Canadian Neurological Scale. CNS is a measure of stroke severity with a range of 0 to 11.5. A score < 8 indicates a severe stroke.

**Small community hospitals:** Facilities that generally provide less than 3,500 weighted cases per year, have a referral population of less than 20,000 people, and are the only hospital in their community, as defined by the Joint Policy and Planning Committee.

**Academic hospitals:** University-affiliated facilities; members of the Council of Academic Hospitals of Ontario.

**District Stroke Centre:** Facilities with 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.

**Regional Stroke Centre:** All the requirements of a District Stroke Centre, plus neurosurgical facilities and interventional radiology.

**Large community hospitals:** All other hospitals.

### Exhibit 8 Patient demographics and stroke presentation<sup>†</sup>, by Ontario Local Health Integration Network (LHIN) region, April 1, 2002 to March 31, 2003

LHIN Region		Central	Central East	Central West	Champlain	Erie St. Clair	Hamilton Niagara Haldimand Brant	Mississauga Halton	North East	North Simcoe Muskoka	North West	South East	South West	Toronto Central	Waterloo Wellington	All Ontario
Number (provincial total)		2,125	2,962	986	2,808	1,510	3,357	1,591	1,601	1,168	595	1,358	2,104	2,576	1,163	25,905
Number (audit sample)		236	339	111	363	173	398	177	309	125	104	206	423	277	147	3,388
Female sex (%)		45	53	51	48	51	52	56	48	45	56	50	56	56	55	52
Median age (years)		77	77	76	74	77	76	74	72	74	74	76	76	73	75	75
Lives alone (%)**		29	23	21	17	27	24	22	23	28	32	31	36	27	18	25
Rural residence (%)**		2	12	5	23	9	9	2	39	31	34	39	49	5	18	18
Medical history (%)	Stroke/transient ischemic attack (TIA)	35	43	39	34	45	40	32	34	44	38	39	35	36	33	38
	Diabetes**	26	26	31	26	27	21	20	26	19	27	17	20	25	28	24
	Hypertension**	61	56	63	55	64	63	55	63	47	76	46	58	57	62	59
	Smoking (current)**	10	10	6	8	18	15	9	20	15	21	12	9	13	13	12
	Hyperlipidemia**	23	23	20	24	35	25	22	30	20	30	15	22	35	28	25
	Atrial fibrillation**	12	14	7	15	16	17	12	9	11	19	11	15	15	16	14
	Myocardial infarction*	18	15	13	14	18	17	13	15	18	16	14	10	15	12	15
Charlson score > 1 (%)		29	29	32	27	32	33	21	30	27	27	32	23	32	29	29
Pre-admission Rankin score < 2 (%)**		75	73	70	80	74	77	84	69	77	94	75	55	77	74	74
Stroke type (%)**	Intracerebral hemorrhage	10	9	9	10	5	11	9	5	4	4	6	6	15	6	9
	Ischemic	52	54	57	51	60	33	47	43	39	49	44	53	45	46	48
	Subarachnoid hemorrhage	2	2	5	3	1	4	6	4	6	4	4	5	10	2	4
	Transient ischemic attack	34	33	26	31	32	40	37	41	38	40	28	31	27	41	34
	Unable to determine	3	2	3	5	2	12	2	8	13	4	18	5	3	5	6
Unconscious (%)**		5	6	7	4	2	6	4	4	2	2	8	8	7	8	5
CNS score (median)		10	10	10	11	10	10	10	10	11	11	10	11	9	11	10
CNS score > 8 (%)**		68	80	81	81	71	72	80	81	86	81	71	72	66	82	76

\*p<0.05 or \*\*p<0.001 for comparisons across LHIN regions.

<sup>†</sup>Includes patients with stroke or transient ischemic attack.

**Charlson score:** A comorbidity index score, where higher scores indicate more comorbid illness.

**Rankin score:** A measure of functional status after stroke with a range from 0 (no disability) to 6 (death).

**CNS:** Canadian Neurological Scale. CNS is a measure of stroke severity with a range of 0 to 11.5. A score < 8 indicates a severe stroke.

**Exhibit 9 Pre-hospital and emergency stroke care<sup>†</sup>, by Ontario Stroke Strategy (OSS) region, April 1, 2002 to March 31, 2003**

OSS Region	Central East	Central South	West GTA	Champlain	Southeast	Northeast	Northwest	Southwest	North and East GTA	Southeast GTA	Toronto West	All Ontario
<b>Number (provincial total)</b>	3,728	4,520	2,577	2,889	1,277	1,601	595	3,614	1,860	1,343	1,901	25,905
<b>Number (audit sample)</b>	421	545	288	405	164	309	104	596	209	146	201	3,388
<b>Arrival in emergency department within 2.5 hours of stroke onset (%)**</b>	34	40	9	38	39	34	36	38	32	24	32	33
<b>Median time from stroke onset to emergency department arrival (hours)</b>	6	5	10	5	4	10	6	5	7	7	8	6
<b>Transported by ambulance (%)**</b>	56	56	55	60	55	51	42	55	54	57	65	56
<b>Transferred from another institution (%)**</b>	1	1	1	4	1	1	0	0	1	1	2	1
<b>Admitted to hospital (%)**</b>	58	61	61	56	64	69	72	69	68	70	77	64

\*p<0.05 or \*\*p<0.001 for comparisons across OSS regions.

<sup>†</sup>Includes patients with stroke or transient ischemic attack.

**Exhibit 10 Pre-hospital and emergency stroke care<sup>†</sup>, by Ontario Stroke Strategy (OSS) designation, April 1, 2002 to March 31, 2003**

OSS Designation	Non-Designated	District Stroke Centre	Regional Stroke Centre
Number (provincial total)	16,208	4,709	4,988
Number (audit sample)	2,337	509	542
Arrival in emergency department within 2.5 hours of stroke onset (%)**	34	40	24
Median time from stroke onset to emergency department arrival (hours)	6	5	8
Transported by ambulance (%)**	54	58	62
Transferred from another institution (%)**	1	0	3
Admitted to hospital (%)**	62	68	69

\*p<0.05 or \*\*p<0.001 for comparisons across OSS designations.

<sup>†</sup>Includes patients with stroke or transient ischemic attack.

**District Stroke Centre:** Facilities with 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.

**Regional Stroke Centre:** All the requirements of a District Stroke Centre, plus neurosurgical facilities and interventional radiology.

**Non-designated:** Acute care hospital that does not fit the definition of District or Regional Stroke Centre.

**Exhibit 11 Pre-hospital and emergency stroke care<sup>†</sup>, by Ontario hospital peer group, April 1, 2002 to March 31, 2003**

Hospital Peer Group	Small Community	Large Community	Academic ‡	Regional Stroke Centre
Number (provincial total)	1,217	17,734	1,965	4,988
Number (audit sample)	433	2,188	225	542
Arrival in emergency department within 2.5 hours of stroke onset (%)**	36	35	42	24
Median time from stroke onset to emergency department arrival (hours)	6	6	4	8
Transported by ambulance (%)**	48	54	62	62
Transferred from another institution (%)**	0	1	3	3
Admitted to hospital (%)**	57	64	55	69

\*p<0.05 or \*\*p<0.001 for comparisons across hospital peer groups.

<sup>†</sup>Includes patients with stroke or transient ischemic attack.

‡ Seven additional academic hospitals are included in the Regional Stroke Centre category.

**Small community hospitals:** Facilities that generally provide less than 3,500 weighted cases per year, have a referral population of less than 20,000 people, and are the only hospital in their community, as defined by the Joint Policy and Planning Committee.

**Academic hospital:** University-affiliated facility; member of the Council of Academic Hospitals of Ontario.

**District Stroke Centre:** Facilities with 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.

**Regional Stroke Centre:** All the requirements of a District Stroke Centre, plus neurosurgical facilities and interventional radiology.

**Large community hospitals:** All other hospitals.

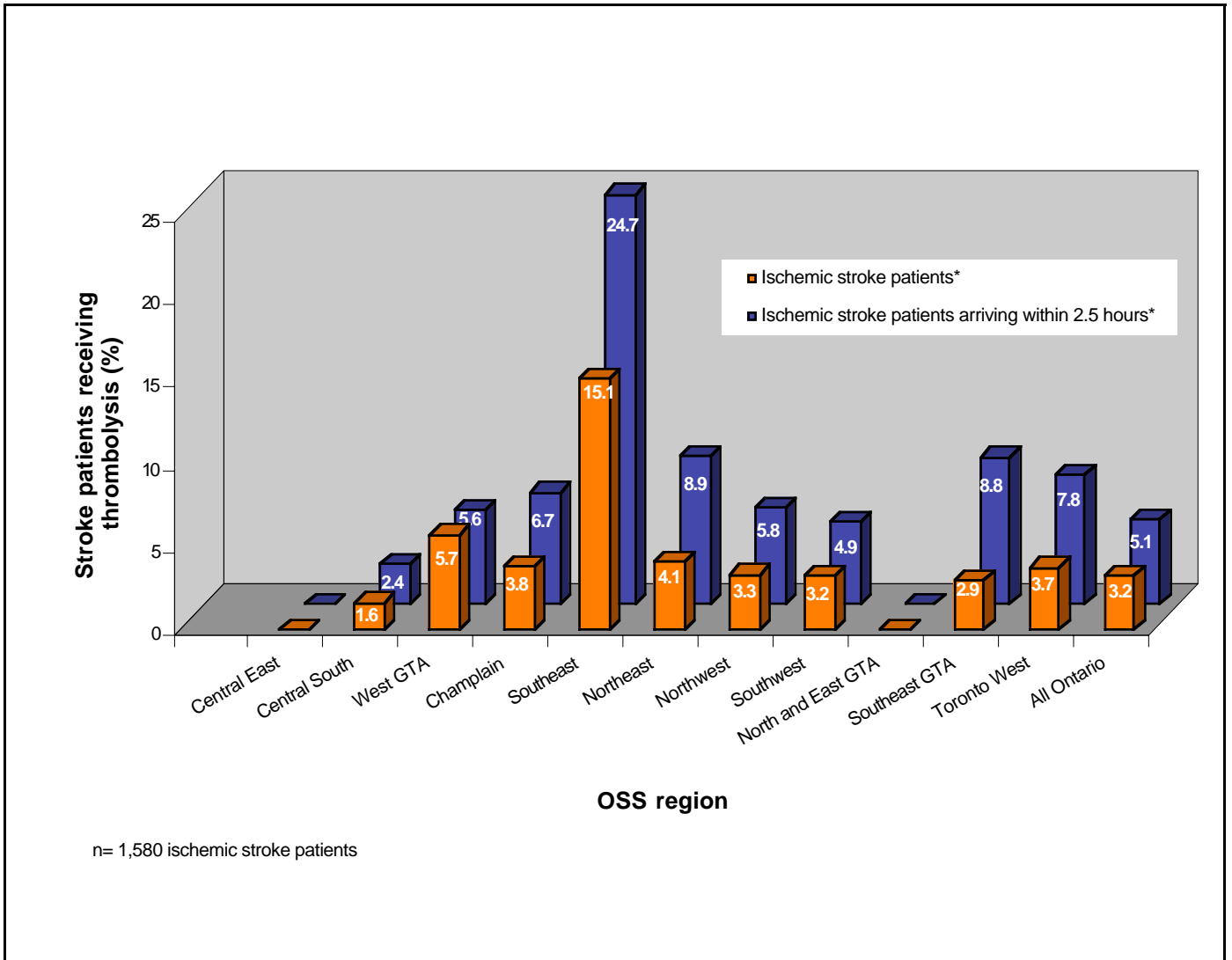
**Exhibit 12 Pre-hospital and emergency stroke care<sup>†</sup>, by Ontario Local Health Integration Network (LHIN) region, April 1, 2002 to March 31, 2003**

LHIN Region	Central	Central East	Central West	Champlain	Erie St. Clair	Hamilton Niagara Haldimand Brant	Mississauga Halton	North East	North Simcoe Muskoka	North West	South East	South West	Toronto Central	Waterloo Wellington	All Ontario
Number (provincial total)	2,125	2,962	986	2,808	1,510	3,357	1,591	1,601	1,168	595	1,358	2,104	2,576	1,163	25,905
Number (audit sample)	236	339	111	363	173	398	177	309	125	104	206	423	277	147	3,388
Arrival in emergency department within 2.5 hours of stroke onset (%)**	35	35	7	38	43	39	11	34	32	36	39	35	25	43	33
Median time from stroke onset to emergency department arrival (hours)	7	5	10	5	4	5	9	10	6	6	4	6	9	5	6
Transported by ambulance (%)**	54	57	62	60	61	57	51	51	58	42	55	51	62	51	56
Transferred from another institution (%)**	0	1	0	4	0	2	1	1	0	0	1	1	2	0	1
Admitted to hospital (%)**	66	63	60	56	75	62	62	69	58	72	63	65	72	59	64

\*p<0.05 or \*\*p<0.001 for comparisons across LHIN regions.

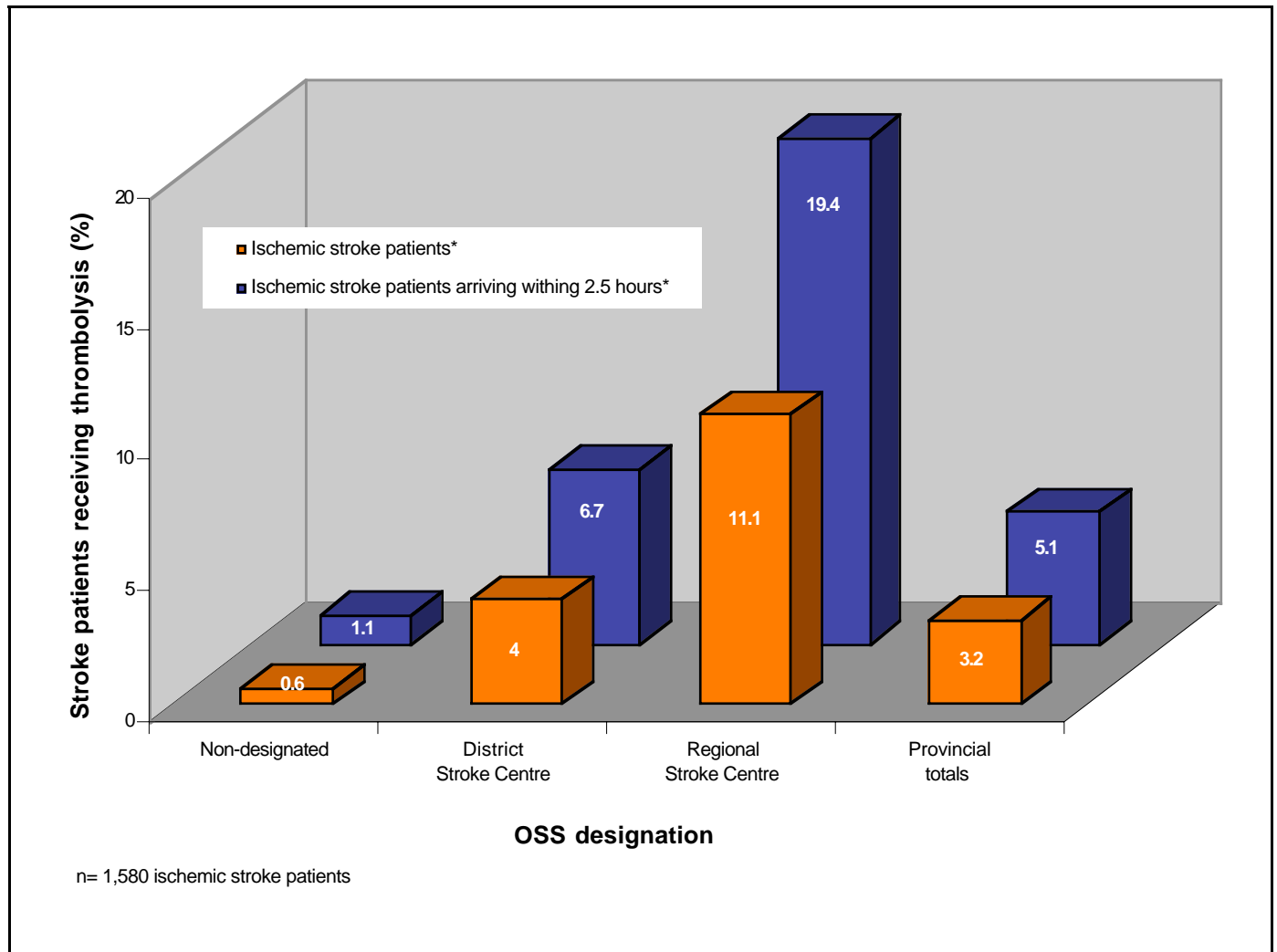
<sup>†</sup>Includes patients with stroke or transient ischemic attack.

**Exhibit 13 Proportion (%) of stroke patients receiving thrombolysis, by Ontario Stroke Strategy (OSS) region, April 1, 2002 to March 31, 2003**



\*Although some regions appear not to have administered thrombolysis during the study time frame, other data sources confirm that thrombolysis may have been given in up to 1% of all ischemic stroke patient cases and up to 2% of all ischemic stroke patient cases arriving within 2.5 hours—events which were not captured in the audit sample.

**Exhibit 14 Proportion (%) of stroke patients receiving thrombolysis, by Ontario Stroke Strategy designation, April 1, 2002 to March 31, 2003**



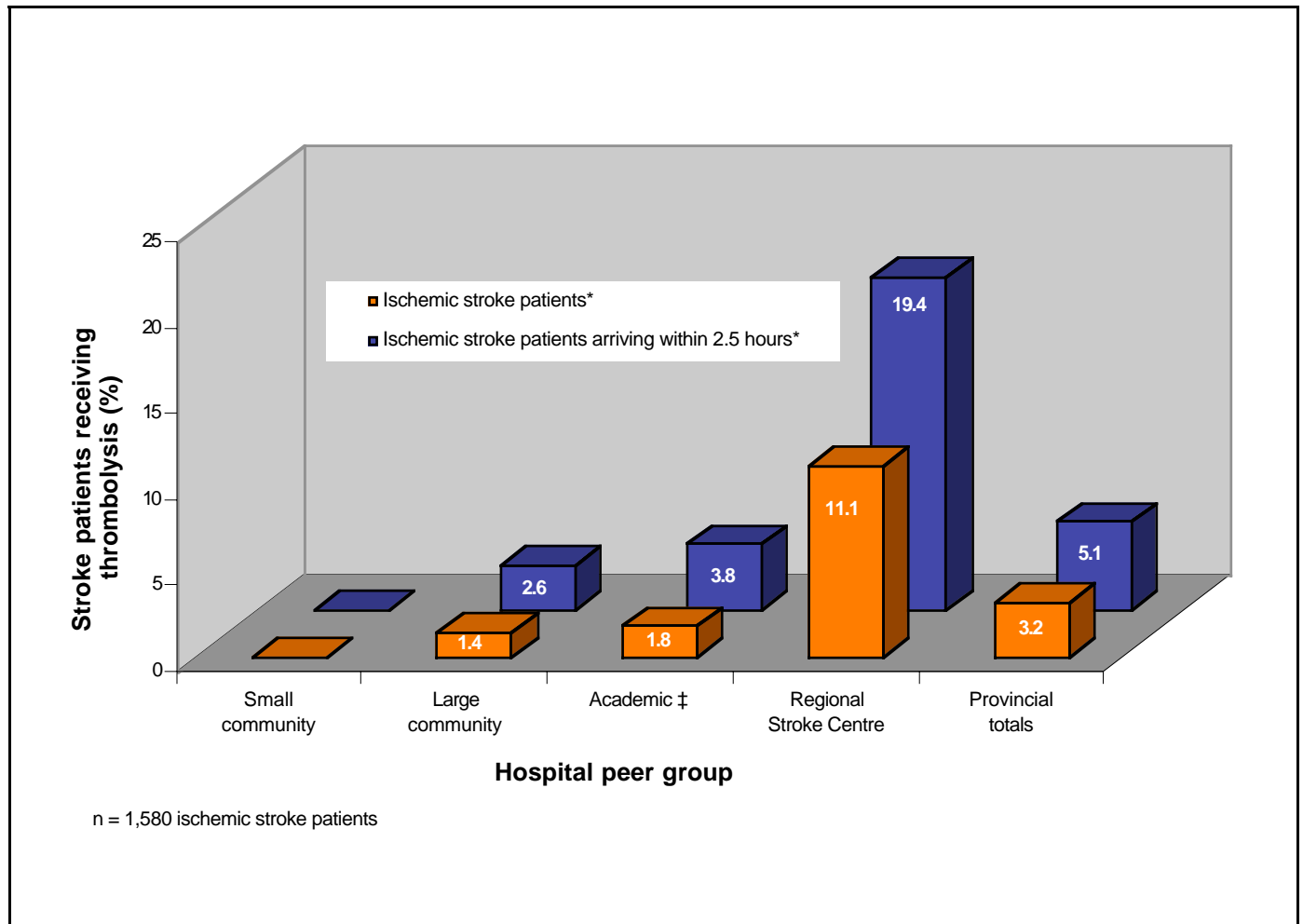
\*Although some regions appear not to have administered thrombolysis during the study time frame, other data sources confirm that thrombolysis may have been given in up to 1% of all ischemic stroke patient cases and up to 2% of all ischemic stroke patient cases arriving within 2.5 hours—events which were not captured in the audit sample.

**District Stroke Centre:** Facilities with 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.

**Regional Stroke Centre:** All the requirements of a District Stroke Centre, plus neurosurgical facilities and interventional radiology.

**Non-designated:** Acute care hospital that does not fit the definition of District or Regional Stroke Centre.

**Exhibit 15 Proportion (%) of stroke patients receiving thrombolysis, by Ontario hospital peer group, April 1, 2002 to March 31, 2003**



\*Although some regions appear not to have administered thrombolysis during the study time frame, other data sources confirm that thrombolysis may have been given in up to 1% of all ischemic stroke patient cases and up to 2% of all ischemic stroke patient cases arriving within 2.5 hours—events which were not captured in the audit sample.

‡ Seven additional academic hospitals are included in the Regional Stroke Centre category.

**Small community hospitals:** Facilities that generally provide less than 3,500 weighted cases per year, have a referral population of less than 20,000 people, and are the only hospital in their community, as defined by the Joint Policy and Planning Committee.

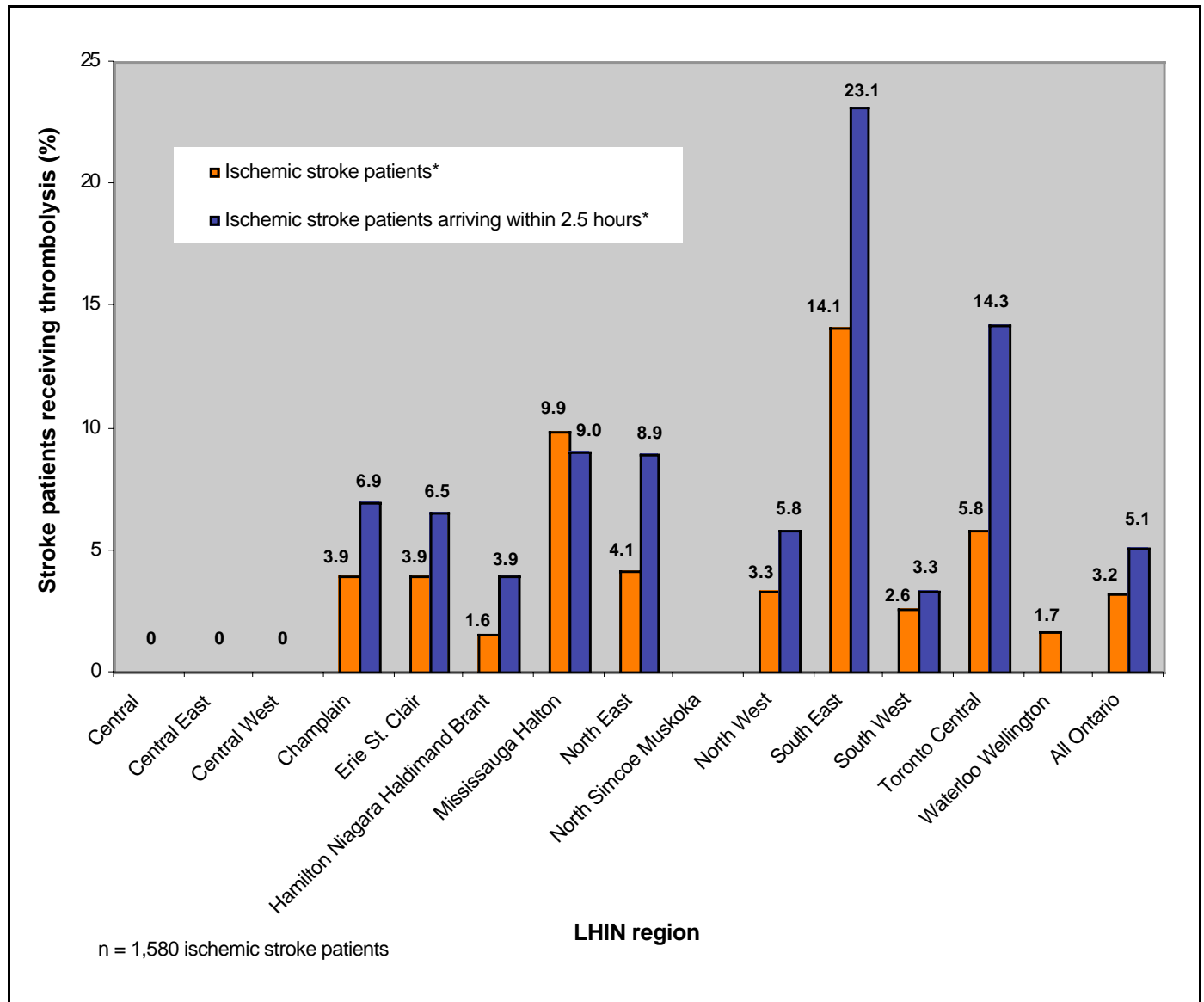
**Academic hospital:** University-affiliated facility; member of the Council of Academic Hospitals of Ontario.

**District Stroke Centre:** Facilities with 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.

**Regional Stroke Centre:** All the requirements of a District Stroke Centre, plus neurosurgical facilities and interventional radiology.

**Large community hospitals:** All other hospitals.

**Exhibit 16 Proportion (%) of stroke patients receiving thrombolysis, by Ontario Local Health Integration Network (LHIN) region, April 1, 2002 to March 31, 2003**



\*Although some regions appear to have administered no thrombolysis during the study time frame, other data sources confirm that thrombolysis may have been given in up to 1% of all ischemic stroke patient cases and up to 2% of all ischemic stroke patient cases arriving within 2.5 hours, but that these were not captured in the audit sample.