

Ontario Stroke Evaluation Report 2011

# Improving System Efficiency by Implementing Stroke Best Practices



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# About the Organizations Involved in This Report

## Ontario Stroke Network and Ontario Stroke System

The Ontario Stroke Network (OSN) provides the provincial leadership and coordination for the Ontario Stroke System (OSS). The OSN recommends, implements and evaluates province-wide goals and standards for the continuum of stroke care, including health promotion and stroke prevention, acute care, recovery and reintegration processes; it also administers the stroke research program and supports the evaluation of and reports on the progress of the OSS. The OSS is a collaborative system of a provider organization and partners who deliver stroke care across the province and care continuum.

The OSN and OSS share a common vision: fewer strokes and better outcomes. Since the inception of the OSS in 2000, significant improvements have occurred in stroke prevention, diagnosis and treatment across the continuum of care. There have been positive impacts on access to stroke-related services, the integration and coordination of stroke care, treatment for stroke, and client and provider satisfaction.

## 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. The CSN was first funded in 1999 and is a not-for-profit corporation with headquarters at the University of Ottawa. The CSN 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.

The CSN 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.

In partnership with the Heart and Stroke Foundation of Canada, the CSN formally launched the Canadian Stroke Strategy in 2006. The strategy promotes education and awareness about stroke, the need to use effective treatments, best practices in providing coordinated care in integrated stroke programs, the importance of delivering rehabilitation at the right time and in the right intensity, and the need to support stroke patients and their families in the community. The Ontario Ministry of Health and Long-Term Care provides funding to the CSN to measure, monitor and evaluate stroke care in Ontario.

## 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 our work is our 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 12 million of 33 million Canadians allow us 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 our scientists are not only internationally recognized leaders in their fields, but are also practicing clinicians who understand the 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, our faculty and staff compete for peer-reviewed grants from federal funding agencies, such as the Canadian Institutes of Health Research, and project-specific funds are received 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 independent of our funding bodies, which is critical to our success as Ontario's objective, credible source of *Evidence Guiding Health Care*.



# About This Report

## Background and Purpose

In April 2003, the Ontario Ministry of Health and Long-Term Care launched the Ontario Stroke Strategy Monitoring and Evaluation Initiative. The goals of the initiative are to: measure changes and outcomes attributable to the Ontario Stroke System (OSS)<sup>1</sup>; identify areas of excellence and areas for improvement; make recommendations to achieve better performance and outcomes at the provincial, regional, Local Health Integration Network (LHIN), facility and patient levels; and report on improvements and gaps in stroke prevention and care. In August 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 evaluation and reporting responsibilities. 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.

## Methods

### Indicator Selection

To evaluate how well the Ontario Stroke System delivers best practice stroke care across the care continuum, in 2010 the SEQC Committee reviewed over 150 performance indicators included in the Canadian Stroke Strategy's 2008 Performance Measurement Manual and from that identified a set of 45 core performance indicators. The 2011 SEQC Evaluation Report provides a comprehensive look at each core performance indicator and the variation in stroke care by stroke care sectors, including Emergency Department, Acute Inpatient Care, Inpatient Rehabilitation and Home Care Services in Ontario from 2003/04 to 2009/10.

## Data Sources

### *Registry of the Canadian Stroke Network – 2002/03, 2004/05 and 2008/09 Ontario Stroke Audits*

New to this year's report is the inclusion of data from three of the Ontario Stroke Audits produced by the Registry of the Canadian Stroke Network (RCSN). The Ontario Stroke Audit is a biennial assessment of a 20% random sample of stroke or transient ischemic attack (TIA) patients seen at over 140 acute care facilities in Ontario. The Audit captures clinical stroke care data currently not available from administrative data sources, including, for example, stroke symptom onset, stroke severity, dysphagia screening, and admission to a stroke unit.

### *Administrative Data*

The following data sources, all housed at the Institute for Clinical Evaluative Sciences, were used to monitor the performance of the OSS:

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

Encrypted health card numbers were used to link stroke/TIA patients across the various administrative databases.

## Stroke Cohorts

Stroke cohorts from administrative databases were generated using codes from the International Classification of Disease, 10<sup>th</sup> Revision, Canada (ICD-10-CA) listed in Appendix C. The most responsible diagnosis was used to identify the record as a stroke/TIA record. The first record for an individual in each fiscal year was used to measure the various indicators. Indicators generated from the Ontario Stroke Audits used the same approach of identifying a stroke/TIA case in the NACRS and DAD databases for chart abstraction and then a 15–20% random sample of stroke/TIA cases was selected.

<sup>1</sup> The OSS is a collaboration between a provider organization and partners who deliver stroke care across the province and the care continuum.

For individuals with both NACRS and DAD records, only the DAD separation was included in the audit. Stroke/TIA cases were over-sampled at the low-volume institutions (those with fewer than 100 stroke cases per year) such that each acute hospital contributed at least 10 cases. All data were analysed according to fiscal year. For example, the fiscal year for 2003/04 extends from April 1, 2003, to March 31, 2004.

## Analyses

### *Process-based Indicators*

Indicator analyses counted only unique patients for each fiscal year. The majority of indicators reported at the regional and LHIN level 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 the patients to receive a given service (e.g., thrombolysis, carotid endarterectomy, inpatient rehabilitation, home care-based rehabilitation therapy).

### *Population-based Indicators*

Most 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 for each fiscal year using the Ontario population 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*

Readmissions and mortality used indirect standardization based on an age-sex regression model. First, an expected rate for each region was calculated using the age-sex regression model; then for each region, the crude rates were divided by the expected rate and multiplied by the overall Ontario rate. Readmission rates relate to patients who survived the initial stroke visit or hospitalization but were readmitted to hospital at least once within 30 days and 90 days of the index visit or admission. Readmission rate is a good indicator of whether there was appropriate discharge planning to prevent secondary complications or another stroke/TIA event.

Inhospital mortality is a measure of the number of deaths that occurred in that fiscal year based on the NACRS visit or DAD separation within that fiscal year. Thirty-day mortality measures the number of deaths that occurred within 30 days from the first stroke/TIA visit date or admission date each fiscal year, with death being identified in the Registered Persons Database (RPDB).

## Report Layout and Interpretation

For the purposes of this report, paediatric stroke patients aged 0 to 17 were identified and reported separately from adult stroke/TIA patients aged 18 to 108. We intend to provide data for stroke patients residing in long-term or complex continuing care homes in the 2012 edition of the SEQC Evaluation Report. The sections are divided into Emergency Department Care, Acute Inpatient Care, Inpatient Rehabilitation, Home Care Services and Patient Outcomes. Paediatric data are presented by Emergency Department Care, Acute Inpatient Care and Longer-Term Patient Outcomes.

For the first time this year, we include an Ontario Stroke Care Report Card and one for each of Ontario's 14 LHINS (see Appendix B). The report cards provide a snapshot of stroke care in Ontario using a subset of 20 indicators.

The report provides detailed information on progress across the care continuum and at multiple levels of analysis, enabling the OSN and the OSS regions to compare performance to other LHINS/regions. This report highlights stroke system successes while pointing out inefficiencies and opportunities for improvement. Given the MOHLTC's current focus on eliminating system inefficiencies, reducing emergency room wait times and decreasing the number of people waiting for an Alternate Level of Care (ALC), the theme of this year's report and its key recommendations is *Improving System Efficiency by Implementing Stroke Best Practices*.

The use of happy, neutral and sad faces was introduced in the 2010 Evaluation Report and is continued in this report. A happy face indicates improvement, a neutral face indicates no change, and a sad face indicates a need for investigation and/or improvement. Where possible, the data in the exhibits is presented by the 14 LHINS, 11 OSS regions and three facility types (i.e., regional stroke centres, district stroke centres and non-designated centres).

# Executive Summary

## Improving System Efficiency by Implementing Stroke Best Practices

The 2011 Stroke Evaluation Report provides a comprehensive review of stroke and transient ischemic attack (TIA) across the care continuum, including stroke prevention, emergency department care, acute inpatient care, inpatient rehabilitation and home care services, from 2003/04 to 2009/10. This information is used to assess the progress of the Ontario Stroke System (OSS) and identify gaps and opportunities for improvement.

This latest report shows that the OSS continues to make significant gains in the implementation of many stroke best practices. Areas of ongoing progress include reduced

stroke thrombolysis, timely neuroimaging, increased access to stroke unit care, decreased mortality rates, enhanced stroke prevention therapies and reduced carotid endarterectomy wait times. Modest improvement has been made in admission to inpatient rehabilitation but rates are lower than projected. In addition, the variation in practices and outcomes across the Local Health Integration Networks signals the need for a standardized approach for access to, and outcomes for, the rehabilitation sector. There has been minimal change in the public's responsiveness to the onset of the signs and symptoms of stroke, clinical management of atrial fibrillation and community-based services; this should be an area of continued focus.

### Report Highlights

- There was a decrease in the rate of emergency department visits and in-hospital stays for stroke or transient ischemic attack (TIA) between 2003/04 and 2009/10. This finding is particularly noteworthy given the projections of increased stroke admissions with the aging population. This improvement is associated with the efforts of the Ontario Stroke System (OSS) to implement best practices and increase access to stroke prevention clinics across the province, as well as other agencies who are working to reduce risk factors of cardiovascular diseases. Efforts to reduce stroke-related risk factors, such as hypertension, hyperlipidemia, obesity and diabetes, should continue.
- Only one in three stroke victims arrived at hospital in time to be considered for therapy that would dramatically improve outcomes (e.g., stroke thrombolysis). This indicator has not improved in recent years. The Heart and Stroke Foundation's public awareness campaign of stroke warning signs should be sustained; the recent review and update of the media campaign is commended. OSS regional and district initiatives to increase stroke awareness should be encouraged.
- In 2008/2009, almost 90% of patients received neuroimaging within 24 hours of arrival at hospital, indicating that we are close to achieving universal access to vital diagnostic imaging. Neuroimaging is required to confirm a diagnosis of stroke and determine the appropriate course of treatment. This is a remarkable improvement as six years ago less than half of stroke patients received neuroimaging within 24 hours. This improvement indicates that the OSS has been effective in increasing access to vital diagnostic imaging for stroke patients. The OSS should continue to monitor this indicator to ensure that the improvement is sustained and further gains are achieved.

- Specialized stroke centres were much more likely to provide stroke care best practices, including:
  - access to stroke thrombolysis;
  - admission to stroke units;
  - discharge to inpatient rehabilitation;
  - access to secondary prevention clinics;
  - higher rates of appropriate medications; and
  - lower rates of stroke recurrence within 90 days of first event.

These data reflect the evidence on the benefits of organized stroke care. There should be ongoing efforts to increase access to organized stroke care in designated stroke centres.

- Although there was an increase in the number of stroke prevention clinics across the province with a focus on urgent management of transient ischemic attack (TIA), it is noteworthy that the number of patients with TIA admitted to hospital and their length of stay remained relatively unchanged over the seven-year study period. This may be due to increased awareness of the risks associated with TIA and increased access

to neuroimaging. This finding warrants further examination. In addition, there was no change in the proportion of patients with atrial fibrillation who were prescribed warfarin. Improving the management of atrial fibrillation could be an area of focus for the Ontario Integrated Vascular Health Strategy Initiative.

- Although there was a two-day reduction in wait time for inpatient rehabilitation from 2003/04 to 2009/10, there was also a reduction in access to inpatient rehabilitation among severely disabled stroke patients (despite a reasonable length of stay of less than two months). In addition, there was wide variation across the LHINs in access to inpatient rehabilitation, and patients requiring community-based rehabilitation received inadequate service levels. A province-wide, standardized, early-assessment tool to rapidly determine eligibility for rehabilitation should be established. Rehabilitation programs should be encouraged to admit more severe patients, and the availability of outpatient and community-based services for mild stroke patients should be expanded or established.

# Review of Progress by Sector

## **Improving System Efficiency by Implementing Stroke Best Practices**

Best practices are well established for stroke prevention and care, both in Canada and internationally. The following is an overview of progress made in implementing best practices that would optimize outcomes for stroke patients in Ontario.

# Stroke Prevention

## Best Practice 1

**Stroke can be prevented by better management of risk factors, such as hypertension, heart disease, diabetes and smoking.**

### Findings



The annual age- and sex-adjusted rate of first emergency department visit for stroke/TIA per 1,000 adults dropped by 5%, from 2.0 visits in 2003/04 to 1.9 visits in 2009/10 ( $p < 0.0001$ ). This may reflect several trends, including a reduction in smoking, better blood pressure control and increased availability of secondary prevention clinics.



Province-wide, the annual incidence rate of hospitalization for stroke per 1,000 adults dropped by 12%, from 1.7 hospitalizations in 2003/04 to 1.5 hospitalizations in 2009/10 ( $p < 0.0001$ ). As above, this likely reflects a reduction in smoking, better blood pressure control and increased availability of secondary prevention clinics.



The proportion of patients who were prescribed anti-thrombotic/coagulant, anti-hypertensive and anti-lipid drug therapy at discharge increased significantly from 19.9% in 2002/03 to 52.1% in 2008/09 ( $p \leq 0.0001$ ).



There was no significant change in the proportion of stroke/TIA patients with atrial fibrillation who were prescribed warfarin upon discharge from acute care in 2008/09 compared to 2002/03 ( $p = 0.1696$ ). Improvement was observed between 2002/03 and 2004/05 (from 68.9% to 74.6%), but provincial performance in 2008/09 was 69.6%, a 5.0% decrease from 2004/05. This pattern was observed for all facility types.

### Recommendations

1. LHINs with the highest incidence of stroke should continue to investigate the prevalence of risk factors and access to prevention/community services.
2. Health care providers should continue to aggressively focus on reduction of risk factors for stroke.
3. More work needs to be done to improve access to best-practice stroke prevention and care, including access to designated stroke facilities.
4. The OSN needs to investigate the decline in the prescribing of warfarin among stroke patients with atrial fibrillation upon discharge from a stroke/TIA hospitalization and determine the optimal proportion.

## Best Practice 2

Patients with transient ischemic attack or non-disabling stroke and internal carotid artery stenosis (narrowing) of 70–99% should be offered **carotid endarterectomy within two weeks of the attack or stroke**, unless contraindicated.

### Findings



The time to a carotid intervention (carotid stenting or carotid endarterectomy) within six months of an initial stroke among adults decreased dramatically between 2003/04 and 2008/09. The median wait time was 46.5 days in 2003/04, dropping to 20 days in 2008/09 ( $p \leq 0.0001$ ). In some LHINs, patients waited less than 14 days in 2008/09. This dramatic improvement is associated with the implementation of stroke prevention clinics.



In 2008/09, regional stroke centres had the shortest wait time for carotid intervention with a median of 8.5 days. District stroke centres had a median wait time of 42.5 days compared to 34.5 days at non-designated centres. The variation in median days to carotid intervention across LHINs ranged from 10 to 80 days. The higher rate at district stroke centres is unexpected and should be monitored closely.



Despite provincial improvement, LHIN variations in rates of carotid imaging remained, ranging from 51.1% to 90.5%.



Overall in 2008/09, 91.9% of patients with stroke or transient ischemic attack (TIA) had carotid imaging done in hospital or scheduled to be done following hospital discharge, a marked increase from 62.4% of patients in 2002/03 ( $p \leq 0.0001$ ). This remarkable improvement reflects OSS efforts to implement best practice stroke care.

### Recommendations

1. Continued effort is needed to ensure timely carotid artery imaging and prompt surgeon referral. The longer time to carotid intervention for patients at district stroke centres needs to be improved upon.
2. Current work to incorporate wait times for carotid endarterectomy into the Ontario Wait Time Strategy should continue.

## Acute Care

### Best Practice 3

**Stroke is a medical emergency;** the faster that patients get to a hospital, the better their chances of receiving treatments that could help reverse the effects of the stroke. There should be a coordinated emergency response system, and all members of the public should be able to recognize the signs and symptoms of stroke; these include the sudden onset of weakness, difficulty speaking, vision problems, headache and dizziness.

#### Findings



Provincially, the proportion of stroke patients arriving at the emergency department in time to be considered for thrombolysis improved slightly: from 33.8% 2003/04 to 35.3% in 2008/09 ( $p=0.45$ ).



Provincially, there was an increase in the proportion of stroke patients arriving at acute hospitals by ambulance: from 52.8% in 2003/04 to 55.5% in 2009/10.



There was an 11.5% increase in the proportion of patients arriving by ambulance at the regional stroke centres: from 58.9% in 2003/04 to 65.7% in 2009/10. At district stroke centres, there was a 17.8% increase in the proportion of patients arriving by ambulance: from 52.2% in 2003/04 to 61.5% in 2009/10. The increase in the proportion of stroke patients arriving at designated stroke centres by ambulance may reflect the positive impact of new stroke centre designations, pre-hospital medical redirect protocols and the provincial paramedic prompt card, all improvements occurring since 2003/04.



There was a reduction in variation in the proportion of adult patients arriving at the emergency department by ambulance across the LHINs from 16 percentage points (41.3–57.2%) in 2003/04 to nine percentage points (49.5–59.1%) in 2009/10.

#### Recommendations

1. The recent decision of the Ontario Ministry of Health Promotion and Sport to fund the Heart and Stroke Foundation of Ontario's 2010/11 warning signs campaign is to be commended; however, the campaign needs to be sustained. The Ontario Stroke Network will work with the Heart and Stroke Foundation to provide evidence of the campaign's impact.
2. The revised provincial Emergency Medical System stroke prompt card was released in February 2011. The related OSN-funded research project to evaluate the impact of the revised prompt card will be important in determining if more suspected stroke patients have access to time-sensitive therapies at stroke centres and Telestroke sites.



## Best Practice 4

**Acute stroke patients should be cared for by a team of experts in stroke, preferably in a special dedicated unit. Expert care results in reduced complications and decreased death and disability.**

### Findings



In 2009/10, 47.2% of stroke patients in Ontario were treated in non-designated stroke centres, a 17.0% relative decrease from 2003/04. This development is related to efforts to improve access to brain imaging across the province and to increase admission to stroke centres.



Ontario's age- and sex-adjusted in-hospital stroke/TIA mortality rate decreased from 15.8% in 2003/04 to 14.3% in 2008/09 ( $p=0.0003$ ). OSS efforts to implement stroke unit care and reduce complications seem to be having an effect in reducing the mortality rate.



Variation in the age- and sex-adjusted in-hospital mortality rate ranged from 9.4% to 17.0% across LHINs in 2008/09. The reasons for the variation should be explored; however, these are difficult to assess in the absence of an adjustment for stroke severity.



The provincial rate of thrombolysis administration increased from 10.8% in 2002/03 to 29.6% in 2008/09 ( $p \leq 0.0001$ ) among ischemic stroke patients presenting to the hospital within 2.5 hours of stroke symptom onset. Rates of tPA administration were highest at regional stroke centres (47.2%); at district stroke centres the tPA administration rate more than doubled, increasing from 14.0% in 2002/03 to 36.1% in 2008/09.



The age- and sex-adjusted all-cause mortality rate for adults within 30 days of admission for stroke or TIA decreased from 13.3% in 2003/04 to 12.3% in 2008/09 ( $p=0.002$ ).

### Recommendations

1. There should be continued efforts to transport persons with stroke to hospitals with specialized stroke units (designated stroke centres) to sustain the trend of reduced mortality due to stroke.
2. The OSN should support the development of a risk-adjusted model for assessing stroke mortality across regions and hospitals.
3. Expanded accessibility to existing secondary prevention clinics and opening more clinics may further reduce readmission rates for stroke.

## Best Practice 5

Patients who present with symptoms suggestive of minor stroke or transient ischemic attack **must undergo a comprehensive evaluation** to confirm the diagnosis and begin treatment to reduce the risk of major stroke as soon as is appropriate to the clinical situation.

### Findings



The proportion of adult patients discharged from an inpatient stay with an “unable to determine” (UTD) stroke decreased from 32.7% in 2003/04 to 22.8% in 2009/10. The decrease was most notable at the designated stroke centres. This progress reflects efforts to increase access to diagnostic imaging and stroke centres.



Almost two-thirds (61.6%) of strokes categorized as UTD were located in non-designated stroke centres. It is unclear whether this was due to coding issues, lack of access to diagnostic imaging or both.



In 2008/09, 86.3% of patients underwent neuroimaging within 24 hours of hospital arrival, a significant improvement from 47.4% in 2002/03 ( $p \leq 0.0001$ ). Rates at designated stroke centres were higher—95.1% at regional stroke centres and 90.7% at district stroke centres—compared to 79.1% at non-designated centres in 2008/09.



In 2008/09, the median door-to-needle time (time from ED arrival to administration of thrombolysis) was 69.7 minutes, an improvement from 82.6 minutes in 2004/05 but still higher than the benchmark of 60 minutes. Regional stroke centres delivered tPA the fastest at 66.0 minutes.



Thirty- and 90-day non-elective revisit/readmission rates for adult stroke or TIA decreased between 2003/04 and 2008/09. Age- and sex-adjusted stroke-related readmissions at 30 days decreased from 5.0% in 2003/04 to 4.7% in 2008/09 ( $p=0.22$ ). Age- and sex-adjusted stroke-related readmissions at 90 days decreased from 7.0% in 2003/04 to 6.4% in 2008/09 ( $p=0.02$ ). Non-designated facilities had higher readmission rates than designated stroke hospitals. Rates of non-elective stroke-related readmission at 90 days varied from 5.5% to 7.7% in 2008/09.



Provincially, 62.3% of stroke patients admitted to hospital in 2008/09 underwent screening for dysphagia (a swallowing disorder), an increase from 47.9% in 2002/03 ( $p \leq 0.0001$ ). There was a corresponding decline in the inpatient pneumonia rate across all hospital designations. Inhospital pneumonia rates decreased from 1.7% in 2003/04 to 1.3% in 2009/10. A rate of 1.3% is much lower than what is reported in the literature.<sup>2,3</sup>



Improvements were seen at the non-designated centres, suggesting that best practices are extending beyond the designated centres. Improvements in screening for dysphagia were observed at non-designated centres, increasing from 45.9% of patients in 2003/09 to 57.0% of patients in 2008/09.



In 2009/10, pneumonia rates among hospitalized stroke/TIA patients varied across LHINs, from a low of 0.5% to a high of 2.3%.

## Recommendations

1. The data supports the evidence on the benefits of organized stroke care; patients who are admitted to designated stroke centres have better outcomes in relation to access to stroke thrombolysis, neuroimaging, readmission rates and having a confirmed diagnosis at discharge. Therefore, efforts to increase access to experts at specialized stroke centres and stroke prevention clinics should continue.
2. Almost one in four patients were categorized as “UTD” at discharge, and the rate was three-fold at non-designated centres. This issue should be explored to determine if the categorization of UTD is due to coding practices, lack of diagnostic testing, or a combination of both.
3. Almost one in five admissions were for TIA, a level that has remained consistent over time although the number of secondary stroke prevention clinics in Ontario has increased. The OSN needs to monitor referral patterns and levels of access to these clinics.
4. All individuals with TIA who are not admitted to hospital should be followed up immediately in secondary prevention clinics, as the time of highest risk for major stroke occurs in the first 48 hours after the initial stroke event.<sup>4</sup>
5. Efforts should continue toward the implementation of best practices for the screening and management of dysphagia.

<sup>2</sup> Walter U, Knoblich R, Steinhagen V, Donat M, Benecke R, Kloth A. Predictors of pneumonia in acute stroke patients admitted to a neurological intensive care unit. *J Neurol*. 2007; 254(10):1323–9.

<sup>3</sup> Vermeij FH, Scholte op Reimer W, de Man P, van Oostenbrugge R, Franke CL, de Jong G, de Kort P, Dippel D. Stroke-associated infection is an independent risk factor for poor outcome after acute ischemic stroke: data from the Netherlands Stroke Survey. *Cerebrovasc Dis*. 2009; 27(5):465–71.

<sup>4</sup> Johnstone DCC, Hill MD. The patients with transient cerebral ischemia: a golden opportunity for stroke prevention. *CMAJ*. 2004; 170(7):1134–7.

# Rehabilitation

## Best Practice 1

All patients with stroke who are admitted to hospital and who require rehabilitation **should be treated in a comprehensive or rehabilitation stroke unit** by an interdisciplinary team.

### Findings



The proportion of stroke patients discharged from acute inpatient hospitalization and admitted to inpatient rehabilitation increased from 27.8% in 2003/04 to 30.7% in 2009/10. Patients admitted to non-designated centres for inpatient acute stroke care were less likely to be discharged to inpatient rehabilitation than those admitted to designated stroke centres. The benchmark for this is 41%.



Over the seven-year study period, the proportion of severely disabled stroke patients admitted to inpatient rehabilitation facilities decreased and the proportion of patients with mild stroke admitted to these facilities was unchanged. In 2003/04, severely disabled stroke patients represented 37.6% of inpatients and mildly disabled patients, 21.9%. In 2009/10, severely disabled stroke patients represented 31.9% of inpatients despite a reasonable length of stay of two months.



The median time from stroke onset to admission to an inpatient rehabilitation facility was 13 days in 2003/04, decreasing to 11 days in 2009/10. The marked regional variation in wait times for rehabilitation admission decreased over the seven years: from an 18-day difference between LHINs with the shortest and longest wait times in 2003/04 to a six-day difference in 2009/10.



In 2009/10, 43.9% of patients were discharged home with services following inpatient rehabilitation, a minimal change from 43.2% in 2003/04. There was also minimal change in the discharge Functional Independence Measurement (FIM<sup>®</sup>) over the same time period. In 2003/04, the discharge FIM<sup>®</sup> was 106 compared to 107 in 2009/10.



There was wide institutional variation in the mean change in FIM<sup>®</sup> scores and length of stay. Specialized rehabilitation centres had lower rates of functional improvement (changes in FIM<sup>®</sup>) per day compared to general rehabilitation centres.

## Recommendations

1. The OSN should lead the development of province-wide inpatient rehabilitation admission criteria. It should also continue efforts to implement the alpha FIM<sup>®</sup> across acute care hospitals in the province and work with the Canadian Institute for Health Information to have this collected in the hospital discharge abstract.
2. General and specialized rehabilitation hospitals displayed differences in length of stay and FIM<sup>®</sup> scores within Rehabilitation Patient Groups (RPGs). These differences should be investigated. To reduce these differences, provincial standards for measuring staffing levels and therapy intensity should be developed to ensure consistent treatment across the province.

## Best Practice 2

Survivors of a severe stroke **should be reassessed at regular intervals** for their rehabilitation needs.

## Findings



It is generally agreed that the target FIM<sup>®</sup> score for admission to stroke rehabilitation is 40 to 80. A provincial median admission FIM<sup>®</sup> score of 78 (average score, 76) suggests that a notable proportion of patients in the severe group (those with an FIM<sup>®</sup> score of less than 60) did not have access to inpatient rehabilitation. This also suggests that patients with mild disability were going to inpatient rehabilitation due to a lack of outpatient services and/or pressures on inpatient rehabilitation centres to reduce length of stay.



There was modest variation in admission median FIM<sup>®</sup> scores assigned on admission to inpatient rehabilitation across the LHINS in 2009/10, ranging from 72 to 83.



The proportion of patients going to long-term care facilities following inpatient rehabilitation decreased from 13.5% in 2003/04 to 9.6% in 2009/10.

## Recommendations

1. The admission FIM<sup>®</sup> score trend should be monitored closely.
2. Rehabilitation programs should identify and reduce barriers to admission for patients with severe stroke, as evidence indicates these patients stand to benefit from rehabilitation. Without access to rehabilitation services, they will continue to be a major source of acute care Alternate Level of Care days.

## Community Integration

### Best Practice 1

People with stroke living in the community who have difficulty with activities of daily living **should have access, as appropriate, to therapy services** to improve or prevent deterioration in these activities.

### Findings



The mean number of rehabilitation services offered by Community Care Access Centres (CCACs) to patients discharged with an acute stroke hospitalization in 2007/08 did not change from the previous year: four visits for physical therapy, three for occupational therapy, three for speech-language pathology, and three for social work over a 60-day period. There was little variation in service intensity across the LHINs, ranging from an average of 2.8 to 4.9 physical therapy visits per stroke client in 2008/09.



The median time to first CCAC rehabilitation visit from stroke onset was 27 days.



CCAC service intensity was low and likely inadequate to achieve functional changes in those who had difficulty living independently.

### Recommendations

1. Currently, we do not have the ability to determine community-based rehabilitation services other than those provided by CCACs. Outpatient facilities should be surveyed to identify those providing therapies of benefit to stroke patients.
2. The National Ambulatory Care Reporting System (NACRS) database maintained by the Canadian Institute for Health Information needs to evolve to capture ambulatory rehabilitation.
3. Investment in CCAC rehabilitation services could potentially reduce rates of readmission to hospitals and admission to long-term care institutions.