



Performance Measurement Manual

*A supplement to the Canadian Stroke Strategy
Canadian Best Practices Recommendations for Stroke Care
(Update 2008)*

Developed by:
CSS Information & Evaluation Working Group
(Update 2008)



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Canadian Stroke Strategy Performance Measurement Manual

What is new in 2008:

- New recommendations and performance measures on emergency medical services and care of stroke patients before hospital arrival; management of transient ischemic attack and minor stroke; components of acute inpatient care; and vascular cognitive impairment
- Revised recommendations and performance measures on acute thrombolysis and outpatient and community-based rehabilitation
- Grouping of performance measures for neurovascular imaging (brain imaging and carotid imaging) to reflect the 2008 update of the *Canadian Best Practice Recommendations for Stroke Care*
- Refinement of case definitions and coding for analysis in stroke care
- Pilot project on nursing-sensitive outcomes in stroke care

1.0 Purpose of this Manual

This manual provides the framework for monitoring and evaluation of stroke services in Canada. It provides standardization and consistency for the calculation of performance measures. The focus is on the processes of care and impacts on patient outcomes. It can be used by provinces, regional health authorities, and local service providers as a foundation for their own evaluation frameworks for stroke. It guides national efforts to measure specific indicators country-wide and is aligned with related Canadian Stroke Strategy initiatives involving the Public Health Agency of Canada, the Canadian Institute for Health Information and Accreditation Canada.

2.0 Overview

The Canadian Stroke Strategy (CSS) is an initiative of the Canadian Stroke Network and the Heart and Stroke Foundation of Canada. It brings together a multitude of stakeholders and partners to develop and implement a coordinated and integrated approach to stroke prevention, treatment, rehabilitation and community reintegration in every province and territory in Canada.

The CSS is committed to supporting all provinces and territories in the development and implementation of integrated stroke strategies by providing national tools that facilitate optimal approaches to service organization, care delivery, evaluation, and professional development.

The tools developed by the Canadian Stroke Strategy Information & Evaluation Working Group (IEWG) and the Professional Development & Training Working Group directly support the dissemination, implementation, and evaluation of the *Canadian Best Practice Recommendations for Stroke Care*. All tools are available through the Canadian Stroke Strategy at www.canadianstrokestrategy.ca.

3.0 Best Practice Recommendations for Stroke Care (Update 2008)

The *Canadian Best Practice Recommendations for Stroke Care* provide a synthesis of best practices in stroke care across the continuum and serves as a framework for provinces, territories and regional health authorities as they develop and implement integrated stroke strategies. They are the result of an extensive review of international stroke research and published evidence-based best practice recommendations or guidelines for stroke care across the continuum.

The full *Canadian Best Practice Recommendations for Stroke Care* document can be accessed at:

www.cmaj.ca (publication date December 2nd, 2008).

4.0 Canadian Stroke Strategy Information and Evaluation Platform

The mandate of the Information and Evaluation Working Group (IEWG) is to develop and implement an evaluation framework for the Canadian Stroke Strategy that incorporates: (1) a strategic evaluation of the implementation of the national strategy, and (2) an evaluation of the impact of provincial, regional, and local stroke activities and initiatives on the processes and outcomes of care for stroke patients. The Information and Evaluation Working Group is comprised of experts in stroke care delivery, epidemiology, and performance measurement. The Canadian Stroke Strategy Performance Measurement Manual provides detailed performance measures to address the latter goal of the IEWG, specifically the impact of implementing the stroke best practice recommendations on processes of care, and the short, medium, and long-term impacts on patient health outcomes.

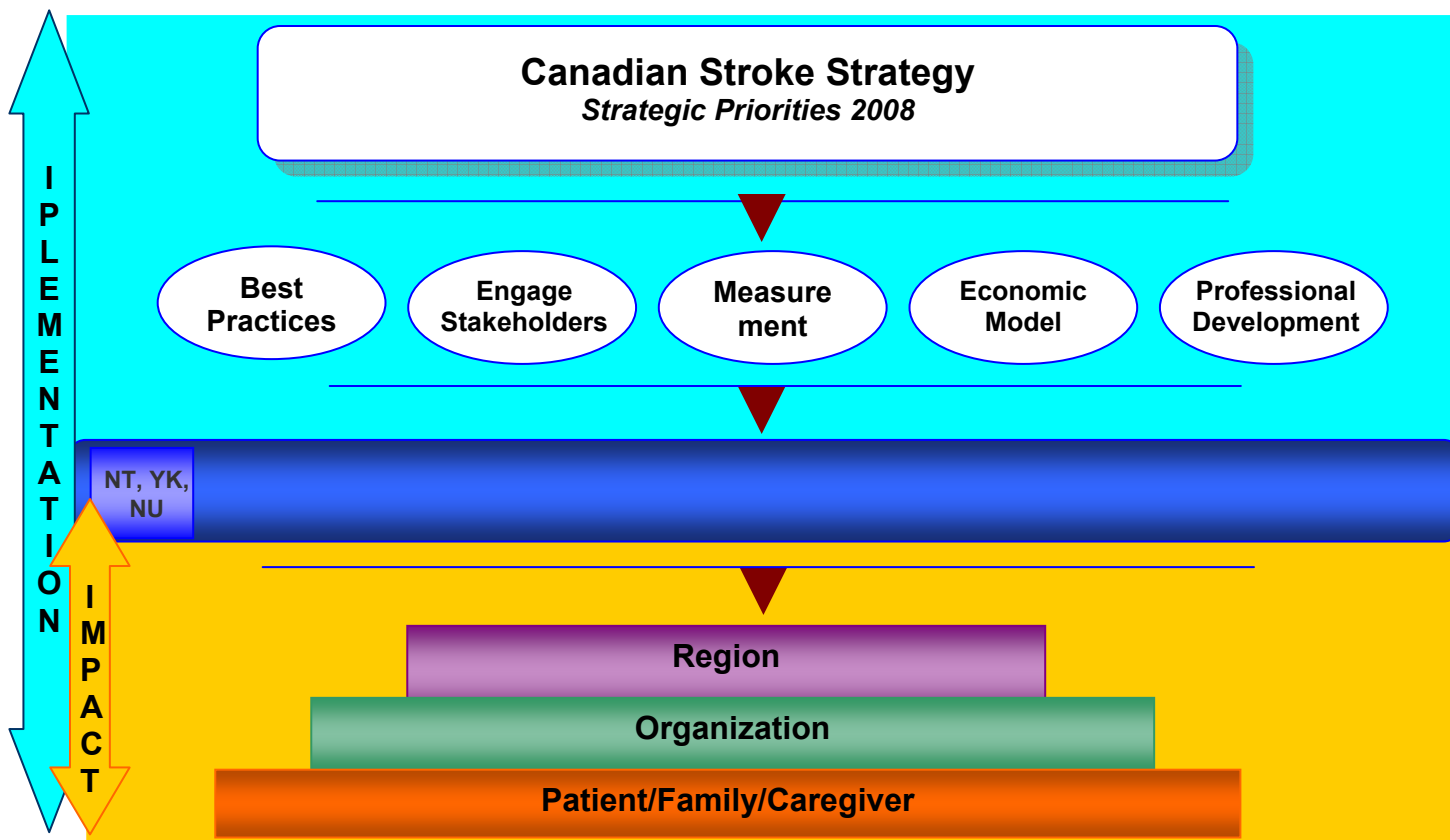
Within the Canadian stroke guidelines and performance manual, the “continuum of stroke care” is defined as having the following components:

- primary prevention, health promotion and public awareness
- hyperacute stroke management
- acute stroke management
- stroke rehabilitation and community reintegration
- prevention of stroke recurrence (secondary prevention)
- long-term recovery

4.1 Performance Measurement Framework

This framework for evaluation has evolved as integrated stroke strategies have been implemented by provincial, regional, and local stroke champions and as best practices have been adopted by providers. The evaluation framework is multidimensional. It considers measurement of successes and opportunities related to the **implementation** of the Canadian Stroke Strategy from a national perspective. Secondly, the framework is structured to consider the extent to which integrated stroke strategies have been implemented at the provincial, regional, and local levels. Thirdly, the framework addresses the **impact** implementation has had on quality of care and outcomes (Figure 1). It is this third dimension that is the primary focus of this performance measurement manual, and provides a standardized approach to in-depth monitoring of processes and outcomes of stroke care.

Figure 1: Conceptual Model of Stroke Performance Measurement



4.2 Selection of Performance Measures

The IEWG advisory group reviewed each best practice recommendation and developed a corresponding set of evidence-based performance measures to monitor the quality of stroke care in the pre-hospital, acute care, rehabilitation, and community settings. Performance measures were identified and selected using a rigorous process, similar to that used to develop the stroke best practice recommendations. A comprehensive literature review was conducted to identify existing measures and validate proposed measures, followed by a modified-Delphi consensus process. Many of the performance measures included in this manual were adopted from a series of consensus panels held from 2004 – 2006 as parts of the Canadian Stroke Quality of Care study.¹ Through this study a core set of performance measures were identified for acute stroke care, secondary stroke prevention, telestroke and stroke rehabilitation, the latter in collaboration with the Stroke Canada Optimization of Rehabilitation through Evidence (SCORE) project.² Additional measures for this manual were identified through the literature reviews conducted as part of the best practice recommendation development process, and those suggested by the best practices task groups during their deliberations in the formation of each recommendation. The proposed performance measures were reviewed and refined by the IEWG advisory group and finally confirmed by a national consensus panel.

¹ Canadian Stroke Quality of Care panel reports available at www.canadianstrokestrategy.ca > resources > evaluation

² SCORE (Stroke Canada Optimization of Rehabilitation through Evidence) evidence-based recommendations for the upper and lower extremities and risk assessment post-stroke 2007. Ottawa (ON): Canadian Stroke Network; 2007. Available: www.canadianstrokenetwork.ca/eng/tools/downloads/SCORE_EBR_Aug2307.pdf

To be included in the stroke evaluation framework and performance manual, performance measures had to meet the following criteria:

- **Relevance:** direct relationship of the performance measure to a stroke best practice recommendation;
- **Validity:** sufficient scientific evidence to support a link between the performance of that indicator and overall positive outcomes when the corresponding best practices are implemented;
- **Importance:** considered a priority in both best practice implementation and ongoing measurement;
- **Room for Improvement:** there is an opportunity to improve care in most stroke care delivery centres in Canada and it is plausible to expect that quality improvement activities will lead to improvement in the results of this indicator;
- **Feasibility:** data to measure this indicator are available and accessible and not cost prohibitive.

Each performance measure that is included with the stroke best practice recommendations is accompanied by 'measurement notes' which identify potential data sources, methods to enhance data collection, challenges to data access, potential data quality issues, and identifies where sub-group stratification or risk adjustment is required.

Through the IEWG consensus panel (September 2005), a core set of 19 performance measures were selected for stroke care across the continuum (Appendix 1). These have been incorporated into the best practice recommendations where appropriate, and are identified by the notation (*core*) at the end of appropriate measures in this document indicating they are part of the core set. Additional performance measures have been provided here for several recommendations, which are not included in the best practices documents, to provide opportunities for a more comprehensive evaluation of the degree to which the recommendations have been achieved, and capture the nature of each recommendation and its associated nuances.

It is not expected that each group implementing the stroke best practice recommendations will be able to collect and monitor all performance measures defined in this manual. The most significant measures have been highlighted in **bold**. These should be considered first when setting up a performance measurement system to monitor the quality of stroke care. The remaining measures are provided for those groups who are able to conduct a more extensive evaluation of stroke practice and for those who are implementing targeted quality improvement initiatives for specific best practice recommendations. Note that some performance measures are relevant to more than one recommendation. For clarity we have added all relevant indicators within each section, therefore some measures are repeated intentionally.

4.3 Implementation and Monitoring of Performance Measures

Evaluation of integrated stroke strategy initiatives and stroke care occurs at all levels of engagement and from the perspectives of a range of stakeholders. National, provincial, and regional/local stroke organizations have established goals and priorities, and the activities to measure stroke performance need to align with these differing priorities (Figure 2). The core indicators identified by the CSS (Appendix 1) serve as building blocks from which we can create a system or structure of interlinking multi-level indicators that show the impact of integrated stroke strategies and implementation of best practices on patients, communities, and provinces.

At the *national* level, CSS participates in stroke surveillance initiatives in partnership with the Public Health Agency of Canada and the Canadian Institute of Health Information. Performance measures at this level focus on broader outcome measures including rates of stroke patient admission to acute care hospitals and inpatient rehabilitation, hospital length of stay, mortality rates, and readmission of recurrent stroke. They reflect national chronic disease prevention and management directions. Measurement of specific indicators that reflect the development and implementation of the Canadian Stroke Strategy and are aligned with strategic and operational priorities are currently in development.

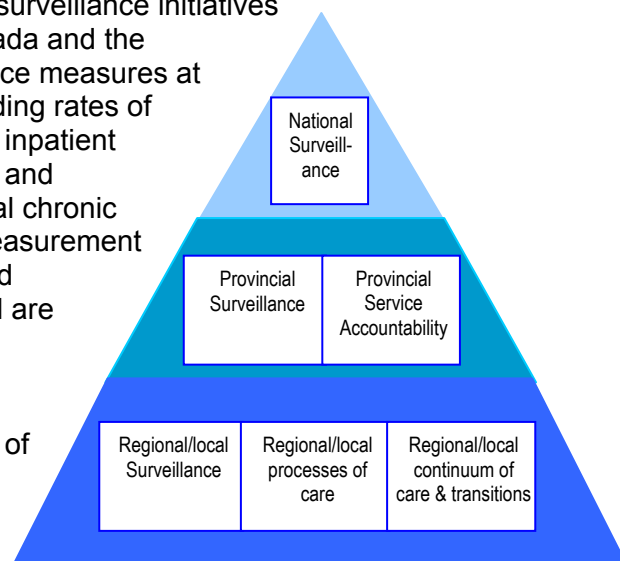


Figure 2: Hierarchy of Stroke Performance Priorities

At the *provincial* level, measurement and monitoring of stroke care addresses infrastructure and service accountability with regions in provinces where provincial funding has been allocated for stroke care. These may include ambulance bypass agreements, access to rehabilitation beds and community services for stroke. Provinces also engage in surveillance, using indicators that are similar to those used at the national level, including hospitalization, mortality, and stroke recurrence rates.

Within *regional health authorities and local stroke service providers*, mechanisms are being established to monitor more detail regarding the processes of stroke care delivery and direct interfaces with patients. The focus at this level is on service delivery and quality of care in meeting the needs of the stroke population and individual patients. Measures at this level include: emergency medical services coordination and rates of hospital bypass; proportion of patients receiving neuroimaging; rates of acute thrombolysis; swallowing screening; stroke unit availability and utilization; assessment for signs of depression; and, access to stroke prevention clinics for rapid assessment of transient ischemic attack patients who are not admitted to hospital.

4.4 Alignment with Accreditation Canada

A subset of performance measures relevant to regional health authorities and local stroke service providers' organizations are being incorporated into a new pilot program being established by Accreditation Canada in partnership with the Canadian Stroke Network. This stroke-specific accreditation program will provide an opportunity for regional and local stroke programs to undergo a stroke-program surveying process as a compliment to the broader standard accreditation all organizations and regions currently participate in. This new program to recognize excellence in stroke care is being pilot-tested in early 2009 with full release scheduled for the fall of 2009. The new Q-Mentum accreditation standards place a strong emphasis on measurement and several of the performance measures in this manual are currently being considered for incorporation as either core or optional measures that all participating stroke programs will collect and report on a semi-annual basis to Accreditation Canada.

More information regarding the Stroke Designation Accreditation program can be found at:

<http://www.accreditation-canada.ca>

4.5 Benchmarks for Stroke Care

The establishment of benchmarks for stroke care performance is an ongoing initiative of the Canadian Stroke Strategy. It is important that all users of this manual have a clear understanding of the term 'benchmark' and the related terms of standards of care; best practice guidelines, targets, and thresholds.

Definitions

Standards of care: are the basis of comparison in measuring or judging the capacity, quality, content, or extent of a particular object of activity. In the absence of evidence, standards may be informed by expert opinion. Standards can be considered as the basic requirements of a healthcare profession and are usually defined within policies, procedures, and standards of practice documents. Standards specify the minimum acceptable characteristics of what constitutes quality care. They specify appropriate management based on strong scientific evidence and collaboration between healthcare professionals involved in the treatment of a given condition. Standards of care describe the level at which the average, prudent provider in a given community should practice and how similarly qualified practitioners would have managed the patient's care under the same or similar circumstances.

Best Practice Guidelines: are recommendations for practice or policy decisions that are informed by sufficient good quality evidence. They describe the *most effective* health care practices, interventions, and processes determined by research evidence and in some cases, expert opinion, and consensus. Best practices guidelines can take the form of clinical practice/best practice recommendations or policy guidelines.

Benchmark: is the performance level which is recognised as the standard of excellence for a specific process of care or outcome and is used for comparisons across groups. Benchmarks provide standard values by which something can be measured, compared, or judged. Benchmarks can be identified through several techniques, including: validated research and statistical methods; identification of top performers; and the past performance of one's own organization.

Target: is the level of performance that an organization aims to achieve within a specified period of time. It is usually a value between the current actual level of performance and the benchmark, but could be equal to or greater than the benchmark. Target values take into account the resources and constraints with respect to meeting the standard of care.

Threshold: is the minimal acceptable level of performance. Performance rates that fall short of the threshold are considered poor performance and should result in corrective action.

For a small number of performance measures corresponding to best practice recommendations, benchmarks have been established through primary research resulting in valid and reliable 'gold standards' for performance. For many other measures, however, clear benchmark levels of performance for stroke have not been well-established nationally or globally. One of the greatest challenges is the lack of standard definitions of performance measures. For example, establishing benchmarks for acute thrombolysis administration is challenged by the wide variety of inclusion and exclusion criteria included in reported denominators making published administration rates difficult to interpret and compare. In addition, some of these rates are based on levels of performance within research protocols, rather than based on levels achieved based on best practices across hospitals.

Within this performance measurement manual, benchmarks are provided where valid benchmarks are available through research or expert consensus. In addition, thresholds have also been identified for some measures and should be considered as the minimal level of performance to be considered as acceptable quality of care. As additional benchmarks and thresholds become available through the ongoing work of the CSS, they will be posted as interim bulletins at www.canadianstrokestrategy.ca.

5.0 Case Definitions for Stroke Coding

Consistent identification of stroke cases in administrative databases will facilitate increased consistency of available data, enable comparative reporting, and provide valuable information for ongoing benchmarking. To achieve this goal, the Canadian Stroke Strategy has been collaborating with the Public Health Agency of Canada and the Canadian Institute for Health Information to create a standardized set of case definitions for stroke that all stakeholders will use for data analysis. These codes have been confirmed through related research initiatives and expert consensus. The International Classification of Diseases (ICD) codes for identification of stroke, including versions 9 and 10, are provided in Appendix 2. Standard codes used for stroke-related clinical investigations have also been identified in related projects and are provided in Appendix 3.³ Appendix 4 contains a list of ICD codes for selected comorbidities and potential in-hospital complications more commonly associated with stroke. These case definitions and additional intervention and related-condition codes should be applied to all stroke performance measure analyses by all stakeholders.

6.0 Pilot Project 2008: Nursing Sensitive Outcomes

There is a growing body of research suggesting that certain patient outcomes can be more directly linked to the activities of a specific profession. The Nursing Sensitive Outcomes (NSOS) project has demonstrated that direct care activities such as symptom control and symptom management, physical and psychological functioning and self-care activities, which are considered nursing-specific, can have a measurable impact on patients.⁴⁻⁵ Currently within the Canadian National Stroke Nursing Council (NSNC), a review is being undertaken to look at nursing sensitive outcomes for stroke which would challenge nurses to identify and define their contribution to quality stroke care. It is anticipated that nursing sensitive outcomes will be incorporated in future editions of the *Canadian Best Practice Recommendations for Stroke Care* and the performance measurement model, providing opportunities to standardize nursing practices nationally while encouraging professional accountability. It is anticipated that the NSOS project will be linked with quality indicators in the Stroke Designation program of Accreditation-Canada and the Canadian Stroke Network.

Throughout 2008-2009, performance measures for NSOS will be developed and proposed for implementation and operational definitions will be developed. These measures will then be confirmed through a consensus process and pilot-tested. Some examples of proposed topics under examination include measures related to the nursing activities of bladder continence, fall prevention, and pressure ulcers.

7.0 Performance Measurement Manual Data Dictionary

The remainder of this manual contains a list of performance measures that have been identified through a systematic process for use in measuring and monitoring processes of stroke care and the outcomes of care. The performance measures are presented in sections that directly align with the organization of the 2008 update of those *Canadian Best Practice Recommendations for Stroke Care*. Additional measures, beyond this listed in the best practices document, are provided for some best practice recommendations where more extensive evaluation may be warranted, and resources may be available to implement them.

³ Lindsay et al. Validation of Stroke Coding. World Stroke Congress Poster; September 2008, Vienna Austria.

⁴ Brooten D, Naylor MD. Nurses' Effect on Changing Patient Outcomes. *Journal of Nursing Scholarship*, 1995;27(2):95-99.

⁵ Doran DM, Myopoulos J et al. Evidence in the palm of your hand: Development of an outcomes-based knowledge translation intervention. *World Views on Evidence-based Nursing*, 2007; Second Quarter.

8.0 Canadian Stroke Strategy Performance Measurement Dictionary

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
1. Public Awareness and Patient Education				
1.1 Public Awareness and Responsiveness	i. Proportion of the population that can name two or more stroke symptoms. ^{c6}	N: number of persons interviewed who can name two or more signs and symptoms of stroke. D: total number of persons interviewed	National, provincial, local surveys	Signs and symptoms are based on current HSFC list used in all ad and print materials; Surveys and polls should be standardized and conducted by HSFC or other similar organization.
	ii. Proportion of the population that can name the three dominant stroke symptoms – sudden weakness, trouble speaking, vision problems.	N: number of persons interviewed who can name the three dominant stroke symptoms – sudden weakness, trouble speaking, vision problems D: total number of persons interviewed	National, provincial, local surveys	See comments for 1.1 (i)
	iii. Median time from stroke symptom onset to presentation at an emergency department. ^c	Mean/median of LSN time to ED presentation for all stroke/TIA patients	Local databases (not available from CIHI); stroke registries	Should calculate mean, SD, and all percentiles (min, 5, 10, 25, 50, 75, 90, 95, 100). Note: Median is best measure to present this data – mean can be skewed and affected by outliers. *Measure is dependent on collecting accurate information on LSN time.
	iv. Proportion of patients who seek medical attention within 4 hours of stroke symptom onset	N: number of all stroke patients arriving at hospital within 4 hours of stroke/TIA symptom onset D: total number of patients admitted to an ED for stroke/TIA	Local databases (not available from CIHI); stroke registries	Time frames from LSN to hospital can be varied according to need (i.e., can look at arrival within 2h, 3h, 4h etc) ; Can sub-analyze by stroke type (hemorrhagic, ischemic), ambulance transport etc. *dependent on collecting accurate information on LSN time.

⁶ The superscript 'c' following a recommended performance measure indicates that the performance measure is part of the CSS Core set of stroke performance measures identified at the CSS Information and Evaluation consensus meeting, 2005

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
1.2 Patient and Family Education	v. Proportion of emergency medical service (EMS) providers trained in stroke recognition and use of stroke triage algorithms for prioritizing stroke cases for transport within regions.	<p>N: number of patients with EMS transport where there is documentation that a triage process was used D: total number of stroke patients transported by EMS.</p> <p>N: number of EMS personnel trained in stroke triage D: number of active EMS personnel</p> <p>N: number of EMS personnel using algorithms/triage tools D: number of EMS personnel surveyed</p> <p>N: number of individuals with a family member who can name two or more signs and symptoms of stroke D: number of individuals surveyed with a family member who has had a stroke or transient ischemic attack</p> <p>N: Number of stroke patients in clinical setting (ED, family practice, inpatient; rehabilitation, etc) who have documentation in their record of the occurrence of patient/caregiver education D: Total number of stroke patients within the defined setting</p>	<p>Local databases (not available from CIHI); stroke registries; Training info from EMS central offices. National/Provincial surveys of EMS providers</p>	<p>Ambulance call records are not always available at hospital once patient transported; education for EMS on documentation and access to records will increase ability to collect this information.</p> <p>Surveys should evaluate both individuals (personnel trained), and organizations (use of algorithms).</p>
	vi. Proportion of the population with a family member who has had a stroke or transient ischemic attack who can name two or more signs and symptoms of stroke	<p>N: number of individuals with a family member who can name two or more signs and symptoms of stroke D: number of individuals surveyed with a family member who has had a stroke or transient ischemic attack</p>		<p>See comments for 1.1 (i) regarding signs and symptoms</p>
	i. Proportion of stroke patients with documentation of education provided for patient, family, and/or caregivers at each stage throughout the continuum of stroke management and recovery.	<p>N: Number of stroke patients in clinical setting (ED, family practice, inpatient; rehabilitation, etc) who have documentation in their record of the occurrence of patient/caregiver education D: Total number of stroke patients within the defined setting</p>	<p>Local charts, or stroke registries; National/Provincial survey (health institutions)</p>	<p>Currently there is significant variation and lack of standardization of documenting patient education encounters. This makes the quality, validity, and reliability of data very difficult to determine, and results should be interpreted with caution.</p> <p>Ideally, documentation of patient education should include the persons providing the education, scope of the education and content covered, time spent and materials provided. Ideally this is done using a standardized patient education documentation tool.</p>
ii. Total time spent on patient/family education during a healthcare encounter for stroke.		<p>a. Mean (total hours/total number of patients)/median of total time spent on patient/family education</p>	<p>Local chart audit or stroke registries</p>	<p>See comments for measure 1.2 (i) regarding data quality and validity for this measure.</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
<p>2. Prevention of Stroke</p> <p>2.1 Lifestyle and Risk Factor Management</p>	<p>i. The proportion of the population who have identified risk factors for stroke including: hypertension, obesity, history of smoking, low physical activity, hyperlipidemia, diabetes mellitus, atrial fibrillation. ^c</p> <p>ii. The annual occurrence of stroke in each province and territory by stroke type. ^c</p> <p>iii. Proportion of the population who can identify the major risks for stroke, including hypertension, sodium intake, diet, weight, exercise, smoking, and alcohol intake.</p> <p>iv. Proportion of people who are aware of the healthy targets for each stroke risk factor.</p> <p>v. Stroke mortality rates across provinces and territories, including in-hospital or 30 day, and one-year^s</p>	<p>N: % of patients within primary care practices with individual risk factors with evidence they are being treated</p> <p>D: % of pts in PCP's practice population with risk factors</p> <p>N: number of stroke/TIA patients admitted to acute hospital who has each of hypertension, diabetes mellitus, and atrial fibrillation.</p> <p>D: number of stroke/TIA patients admitted to an acute care hospital</p> <p>a. Number% of all stroke/TIA admissions to an ED or acute inpatient setting</p> <p>N: % identifying 1, 2, 3 or more major risks for stroke care</p> <p>D: % completing survey</p> <p>N: number of identifying healthy lifestyle activities</p> <p>D: number of completing survey</p> <p>a. 7-day in-hospital mortality rates by stroke type</p> <p>b. 30-day all case mortality rates by stroke type</p> <p>c. 3 month all case mortality rates by stroke type</p> <p>d. 1 year all case mortality rates by stroke type</p>	<p>Administrative databases (NACRS, DAD).</p> <p>National survey data.</p> <p>Administrative databases (NACRS, DAD)</p> <p>National, provincial, local surveys</p> <p>National, provincial, local surveys</p> <p>CIHI: NACRS & DAD</p> <p>Mortality statistics Registered persons database (RPDB)</p>	<p>From administrative databases, identification of other risk factors are harder to identify accurately and consistently.</p> <p>The Canadian Community Health Survey (CCHS) is a primary source for this data nationally and provincially.</p> <p>Hospital visits (ED and inpatient) are best available proxies for annual incidence of stroke, however, they should be considered under-estimate, especially for TIA</p> <p>The Canadian Community Health Survey is a primary source for this data in Canada.</p> <p>The Canadian Community Health Survey is a primary source for this data nationally.</p> <p>Risk adjustment required. Factors to include when available: stroke severity, age, gender, stroke type, comorbidities</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
2.2 Blood Pressure Management	i. Proportion of persons at risk for stroke who had their blood pressure measured at their last healthcare encounter.	N: number of individuals at risk of stroke who had their blood pressure measured at last healthcare encounter D: Total number of individuals surveyed	Health surveys and chart audits. Registry datasets	The Canadian Community Health Survey is a primary source for this data in Canada. Could focus on persons within primary care practices.
	ii. Proportion of the population who are aware of hypertension and the risks of high blood pressure.	N: number of individuals aware of hypertension and risks of high blood pressure D: Total number of individuals surveyed	Canadian Community Health Survey (CCHS)	* Will need to reinforce parameters for defining hypertension – according to CHEP guidelines. General population may not be reliable to report this.
	iii. Proportion of the population who have diagnosed elevated blood pressure (hypertension).	N: number of persons reporting they have been diagnosed with high blood pressure by a medical practitioner D: number of persons surveyed.	Health surveys and chart audits. Administrative data.	The Canadian Community Health Survey is a primary source for this data in Canada. Also, can look to patients admitted to hospital who have HTN as a primary or secondary diagnosis.
	v. Proportion of the population with known hypertension who are on blood-pressure lowering therapy.	N: number of persons reporting they have been diagnosed with high blood pressure by a medical practitioner and are taking medication for hypertension D: number of persons surveyed.	Health surveys and chart audits. Administrative pharmacy data.	The Canadian Community Health Survey is a primary source for this data in Canada. Some provinces collect data on all prescription drugs (may only be available for persons >65 years)
	vi. Proportion of the population with hypertension who are being treated and have achieved control of their blood pressure within defined targets (as per CHEP guidelines).	N: number of individuals who are being treated and have achieved control of their blood pressure within defined targets D: Total number of individuals surveyed	Local data records and chart audits	The defined targets may vary between individuals and criteria must be established to ensure consistency of data and interpretation.
	vii. Proportion of stroke and transient ischemic attack patients who have received a prescription for blood pressure lowering agents on discharge from acute care.	N: number of all stroke/TIA patients who are on blood pressure lowering medication at discharge from acute care D: total number of % of ischemic/TIA stroke patients at discharge from acute care	Local data records; Provincial drug plans for seniors,	May define categories for analysis: all anti-hypertensive, ACE inhibitors, ARBs, diuretics, etc Measures can be stratified by length of stay in hospital as those with a shorter LOS may be less likely to receive prescriptions.
	viii. Proportion of stroke and transient ischemic attack patients who have received a prescription for blood pressure lowering agents after assessment in a secondary prevention clinic.	N: number of all stroke/TIA patients who are on blood pressure lowering medication after assessment in a secondary prevention clinic. D: total number of % of ischemic/TIA stroke patients assessed in a stroke prevention clinic.	Local data records; Provincial drug plans for seniors,	May define categories for analysis: all anti-hypertensive, ACE inhibitors, ARBs, diuretics. Note: Secondary prevention clinic refers to any clinic visit where stroke/TIA issues are specifically addressed. It may include further diagnostics, investigations, medication prescriptions, and management.

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
2.3 Lipid Management	<p>i. Proportion of the population who report that they have elevated lipid levels, especially low-density lipoprotein.</p> <p>ii. Proportion of stroke patients prescribed lipid-lowering agents for secondary prevention of stroke – either at discharge from acute care, through a secondary prevention clinic or by primary care.</p> <p>iii. Proportion of stroke patients with an LDL-C between 1.8 – 2.5 mmol/L at 3 months following stroke event.</p> <p>iv. Proportion of stroke patients with an LDL-C < 2.0 mmol/L at 3 months following stroke event.</p> <p>v. Proportion of stroke patients with an LDL-C > 2.0 mmol/L at 3 months following stroke event.</p>	<p>N: number of persons reporting increased cholesterol levels D: number of persons surveyed.</p> <p>N: number of all stroke patients who are discharged on lipid-lowering medication within defined setting D: total number of ischemic/TIA stroke patients (can define by: seen in prevention clinic; d/c from ED; d/c from hospital; followed by PCP)</p> <p>N: number of patients with an LDL-C between 1.8 – 2.5 mmol/L at 3 months post-stroke D: Total number of stroke patients</p> <p>N: number of patients with an LDL-C <2.0 mmol/L at 3 months post-stroke D: Total number of stroke patients</p> <p>N: number of patients with an LDL-C >2.0 mmol/L at 3 months post-stroke D: Total number of stroke patients</p>	<p>Health surveys</p> <p>Administrative data, chart audit or stroke registry data</p> <p>Chart audit or stroke registries</p> <p>Chart audit or stroke registries</p> <p>Chart audit or stroke registries</p>	<p>Canadian Study on Healthy Aging, Canadian Community Health Survey, Physical Measures Survey.</p> <p>*Need to consider context of primary or secondary prevention</p> <p>Define denominator population. This could vary.</p> <p>Values should be verified using actual laboratory reports.</p> <p>Values should be verified using actual laboratory reports.</p> <p>Values should be verified using actual laboratory reports.</p>
2.4 Diabetes Mellitus Management	<p>i. Proportion of the population with a confirmed diagnosis of diabetes mellitus (Type 1 and Type II)</p> <p>ii. Proportion of persons with diabetes mellitus presenting to hospital with a new stroke event.</p>	<p>N: number of persons reporting they have been diagnosed with diabetes mellitus (Type I or II) by a medical practitioner D: number of persons surveyed.</p> <p>N: number of patients with diabetes mellitus presenting to hospital with new stroke D: total number of all new stroke patients</p>	<p>Health surveys and chart audits. Administrative data.</p> <p>Administrative data, chart audits</p>	<p>Canadian Study on Healthy Aging, Canadian Community Health Survey, Physical Measures Survey. Also, on primary or secondary admitting diagnosis in hospital.</p> <p>Be cautious and verify the coding to ensure diabetes mellitus is an existing condition and not a new diagnosis received during the admission for stroke</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
2.5 Antiplatelet Therapy	iii. Proportion of patients who present to hospital with a stroke who receive a subsequent diagnosis of diabetes mellitus while in hospital for stroke care.	N: number of patients who present to hospital with a stroke who receive a subsequent diagnosis of diabetes mellitus while in hospital for stroke care. D: total number of all new stroke patients	Administrative data, chart audits	Be cautious and verify the coding to ensure diabetes mellitus is a new diagnosis and not a previously existing diagnosis
	i. Proportion of ischemic stroke/transient ischemic attack patients prescribed antiplatelet therapy on discharge from acute care. ^c	N: number of all stroke/TIA patients who are discharged from the ED or from inpatient acute care on antiplatelet therapy. D: total number of ischemic/TIA stroke patients discharged from the ED or from inpatient acute care	Local chart audit, stroke registries, some administrative databases	Distinction should be made between antithrombotic, antiplatelet and anticoagulants. TIA population not captured if only hospitalization data available (ambulatory care databases with ED data may capture this-may require chart review). Important to be aware that receiving a prescription does not imply compliance.
	ii. Proportion of stroke/transient ischemic attack patients prescribed antiplatelet therapy on discharge from secondary prevention clinic care. ^c	N: number of all stroke patients who are discharged on discharge from secondary prevention clinic. ^c D: total number of ischemic/TIA stroke patients seen in a stroke prevention clinic	Local chart audit, stroke registries of prevention clinics	Distinction should be made between antithrombotic, antiplatelet and anticoagulants. Important to be aware that receiving a prescription does not imply compliance.
2.6 Antithrombotic Therapy in Atrial Fibrillation	i. Proportion of eligible stroke and transient ischemic attack patients with atrial fibrillation prescribed anticoagulant therapy on discharge from acute care. ^c	N: number of all stroke/TIA patients with atrial fibrillation who are prescribed anticoagulant therapy at discharge from the emergency department or inpatient acute care D: total number of ischemic/TIA stroke patients discharged from ED or inpatient acute care with a diagnosis of atrial fibrillation	Local chart audit, stroke registries, some administrative databases	Difficult to determine eligibility from administrative databases. Need to define which medication groups will be included for this measure when reporting.
	ii. Proportion of stroke and transient ischemic attack patients with atrial fibrillation prescribed anticoagulant therapy after a visit to a secondary prevention clinic. ^c	N: number of all stroke/TIA patients with atrial fibrillation who are prescribed anticoagulant therapy following a visit to a secondary prevention clinic D: total number of ischemic/TIA stroke patients seen at a secondary prevention clinic	Local chart audit, stroke registries, some administrative databases	Difficult to determine eligibility from administrative databases. Need to define which medication groups will be included for this measure when reporting.

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
	<p>iii. Proportion of patients with stroke and atrial fibrillation on aspirin and not prescribed anticoagulant agents.</p>	<p>N₁: number of stroke/TIA patients with atrial fibrillation not prescribed any anticoagulant medications</p> <p>N₂: number of stroke/TIA patients with atrial fibrillation on another antiplatelet agent and not on an anticoagulant</p> <p>D: total number of ischemic/TIA stroke patients with atrial fibrillation</p>	<p>Local chart audit, stroke registries, some administrative databases</p>	<p>Important to track the types of medications included in all numerators to facilitate interpretation and comparisons.</p> <p>For this measure, it is important to also document reasons why anticoagulants not prescribed to ensure valid interpretation and reporting of findings.</p>
	<p>iv. Proportion of patients continuing to comply with warfarin therapy at 3 months, 6 months, and 1 year following initiation of therapy.</p>	<p>N₁: All patients complying with warfarin therapy at 3 months</p> <p>N₂: All patients complying with warfarin therapy at 6 months</p> <p>N₃: All patients complying with warfarin therapy at 1 year</p> <p>D: Total number of patients with stroke prescribed warfarin therapy</p>	<p>Patient questionnaires; lab results obtained from chart audits</p>	<p>Prescriptions for anticoagulants do not imply compliance. Patients should be questioned about their medication compliance and lab results should be obtained.</p>
	<p>v. Proportion of patients on warfarin with INR in therapeutic range at 3 months, 6 months, and 1 year following index stroke event.</p>	<p>N₁: All patients on warfarin with INR in therapeutic range at 3 months</p> <p>N₂: All patients on warfarin with INR in therapeutic range at 6 months</p> <p>N₃: All patients on warfarin with INR in therapeutic range at 1 year</p> <p>D: Total number of patients with stroke prescribed warfarin therapy</p>	<p>Patient questionnaires; lab results obtained from chart audits</p>	<p>Prescriptions for anticoagulants do not imply compliance. Patients should be questioned about their medication compliance. Lab results should be obtained to verify therapeutic range over the specified period of time.</p>
<p>2.7 Carotid Intervention</p>	<p>i. Proportion of stroke patients with moderate to severe (70-99%) carotid artery stenosis who undergo a carotid intervention procedure following an index stroke event.^c</p>	<p>N: number of stroke patients with severe carotid stenosis who undergo carotid revascularization</p> <p>D: All patients diagnosed with stroke and severe (70-99%) carotid artery disease.</p>	<p>Administrative data, local chart audit, stroke registries, provincial MD billing records</p>	<p>Determining degree of stenosis very difficult from administrative databases – will need to obtain information from physician consult and/or surgical notes.</p> <p>Separate results for carotid endarterectomy and carotid stenting.</p>
<p>ii. Median time from stroke symptom onset to carotid endarterectomy (CEA) surgery.^c</p>	<p>N: Sum(LSN to CEA time (days) for all CEA patients]</p> <p>D: number of CEA patients</p>	<p>Administrative data, local chart audit, stroke registries, provincial MD billing records; SPIRIT tool</p>		<p>Should calculate mean, SD, and all percentiles (min, 5, 10, 25, 50, 75, 90, 95, 100). Median is statistic of choice for reporting on this measure.</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
iii. Proportion of stroke patients requiring carotid intervention, who undergo the procedure within two weeks of the index stroke event.	N: Patients undergoing surgery within two weeks of stroke event D: All stroke patients requiring carotid endarterectomy	Administrative data, local chart audit, stroke registries	Time intervals should be taken from: Start: time of stroke symptom onset if known, or time of hospital arrival for investigation of stroke event; to a stop time of date of carotid endarterectomy surgery	
iv. Proportion of stroke patients with moderate carotid stenosis (50-69%) who undergo carotid intervention procedure following the index stroke event.	N: number of stroke patients with moderate carotid stenosis who undergo carotid revascularization D: All stroke patients diagnosed with moderate carotid artery disease.	Administrative data, local chart audit, stroke registries, provincial MD billing records	Determining degree of stenosis very difficult from administrative databases – will need to obtain information from physician consult and/or surgical notes. Separate stenting and CEA	
v. Proportion of stroke patients with mild carotid stenosis (<50%) who undergo carotid intervention procedure following the index stroke event.	N: number of stroke patients with mild carotid stenosis who undergo carotid revascularization D: All stroke patients diagnosed with mild carotid artery disease.	Administrative data, local chart audit, stroke registries, provincial MD billing records	Determining degree of stenosis very difficult from administrative databases – will need to obtain information from physician consult and/or surgical notes. Separate stenting and CEA	
vi. Proportion of CEA patients who experience peri-operative in-hospital stroke, acute myocardial infarction, or death.	N: number of stroke patients undergoing CEA who experience (define complication) D: number of stroke patients undergoing CEA	Administrative data (CHI-DAD); stroke registries and chart audit	Outcomes should be age-sex standardized, and adjusted for stroke severity if severity values available	
vii. The 30-day in-hospital post-CEA mortality rates for stroke patients; stratified by carotid occlusion severity.	N: number of stroke patients undergoing CEA who experience (define complication) D: number of stroke patients undergoing CEA	Administrative data (CHI-DAD); stroke registries and chart audit	Mortality should be age-sex standardized, and adjusted for stroke severity if severity values available. Determining degree of stenosis very difficult from administrative databases – will need to obtain information from physician consult and/or surgical notes.	
viii. Proportion of patients who undergo CEA within 2 weeks, from 2 – 4 weeks; between 2 weeks and 3 months, and between 3 – 6 months of stroke onset.	N: number of stroke patients undergoing CEA within (define time frame) of stroke D: number of patients undergoing CEA following stroke	Administrative data – may need to link between episodes	Report separately for CEA and stenting Time intervals should be taken from: Start: time of stroke symptom onset if known, or time of hospital arrival for investigation of stroke event; to a stop time of date of carotid endarterectomy surgery	

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
	ix. Proportion of patients who wait > 3 months for CEA or who are cancelled due to long wait times.	N: number of stroke patients who wait >3 months or who are cancelled D: number of stroke patients undergoing CEA	Administrative data – may need to link between episodes	Should collect information on whether these patients are followed in prevention clinic and include in interpretation of findings.
	x. Proportion of patients who experience a subsequent stroke event or death while waiting for CEA.	N: number of stroke patients who die while awaiting carotid endarterectomy D: number of stroke patients awaiting CEA	Administrative data (CIH-DAD); stroke registries and chart audit	Report by time period.

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
3. Hyperacute Stroke Management				
3.1 Emergency Medical Services Management of Acute Stroke Patients	i. Proportion of suspected stroke patients arriving in the emergency department who were transported by emergency medical services.	N: total number of suspected/confirmed stroke patients transported to an emergency department by emergency medical services D: total number suspected/confirmed stroke patients seen in the emergency department	Local chart audit; department logs; administrative databases where available for emergency departments.	To obtain 'suspected stroke patients, data will need to be collected through a log in the ED, or by using the 'Presenting Complaint' field where administrative databases are available for the ED (such as NACRS). Time frame for analysis, i.e., monthly, quarterly, or annually, should be defined for appropriate interpretation of the findings.
	ii. Time from initial call received by emergency dispatch centre (e.g., 9-1-1 operator) to Emergency Medical Services arrival on patient scene.	Mean/median time in minutes from initial call received by emergency dispatch centre to Emergency Medical Services arrival on patient scene	Local chart audit of EMS records; EMS data tracking systems.	Most EMS services have standardized records that are completed by EMS staff. Access to these data would provide valid information ad arrangements with EMS providers should be made for data sharing where possible.
	iii. Time from Emergency Medical Services arrival on patient scene of a suspected stroke patient to arrival at an appropriate emergency department.	T1: Time from EMS on scene to arrival at first hospital T2: Time from EMS on scene to arrival at stroke centre (if not directly to stroke centre)	Local chart audit of EMS records; EMS data tracking systems.	See comments for measure 3.1 (ii) above. Appropriate emergency department refers to an ED that provides advanced stroke care including comprehensive and intermediate stroke centres (see Best Practices 2008 for definitions) which include on-site access to CT scans, availability of tPA, and has medical personnel with stroke expertise available for emergent consult.

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
	<p>iv. Proportion of suspected stroke patients transported by Emergency Medical Services who received a final diagnosis of stroke or transient ischemic attack during hospital stay (in the emergency department or as an inpatient).</p>	<p>N: Number of suspected stroke patients who receive a final diagnosis of stroke in the ED or in hospital D: Number of suspected stroke patients transported by EMS</p>	Local chart audit; administrative databases; EMS logs	May need to create links across databases to obtain denominator of all suspected stroke patients transported by ambulance, and numerator of those with final diagnosis of stroke.
	<p>v. Number of suspected stroke patients transported by Emergency Medical Services directly to a comprehensive or intermediate stroke centre and who bypass smaller hospitals during transport.</p>	<p>N: Number of suspected stroke patients transported by EMS where EMS bypassed at least one hospital to arrive at a stroke centre D: Number of suspected stroke patients transported by EMS</p>	Local chart audit; EMS logs	Requires education of EMS providers to ensure bypass situations are clearly and consistently documented on EMS records. Data can also be determined manually by using a mapping program, however this is time consuming and not practical for large volume EDs.
	<p>vi. Number of suspected stroke patients transported by Emergency Medical Services directly to a comprehensive or intermediate stroke centre where the EMS personnel provided prenotification of transport to the receiving emergency department</p>	<p>N: Number of suspected stroke patients transported by EMS where EMS provided prenotification of transport to the receiving emergency department D: Number of suspected stroke patients transported by EMS</p>	Local chart audit; EMS logs; Emergency department flow sheets	Requires education of EMS providers to ensure prenotification is consistently documented on EMS records. Receiving ED should also consistently document prenotification (including time of call) on the suspected stroke patient's emergency department documentation (standard flow sheets, nurses, or physician notes).
<p>3.2 Acute Management of Transient Ischemic Attack and Minor Stroke</p>	<p>i. Recurrence of stroke or transient ischemic attack within 30 days, 90 days, and one year following an initial stroke-related event.</p>	<p>N: Total number of readmissions to emergency department or acute inpatient care for stroke related-diagnosis D: Total number of stroke separations from the emergency department or inpatient care</p>	Local chart audit, stroke registries, administrative data	Discharges from, and readmissions to the emergency department could be captured using administrative data in centres that routinely contribute to the NACRS database (CIHI). If emergency department data not available then can only When reporting on readmissions, the same ICD codes should be applied for the readmissions as were used for the original cohort (see Appendix 2) Readmissions should be measured at 3 months, 6 months, and one year following index stroke event.

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
	ii. Time from first encounter with medical care (primary care or emergency department) to neurological assessment by a stroke expert (in clinic or other setting). iii. (a) Time from first encounter with medical care to initial brain imaging (CT/MRI); (b) Time from first encounter with medical care to other vascular imaging (cervical arteries, echocardiogram).	Mean and median time (in hours) from first encounter with medical care to neurological assessment by a stroke expert T1: Mean/median from first encounter with medical care (primary care, emergency physician, or stroke expert) to initial brain imaging. T2: Mean/median from first encounter with medical care (primary care, emergency physician, or stroke expert) to other vascular imaging.	Local chart audit, stroke registries Local chart audit, imaging database (e.g. PACS), stroke registries	It is important to specify settings where both the first and subsequent encounters occur (e.g. Family physician and emergency department). Findings may be stratified by these settings/experts or they may be used as factors in advanced statistical analysis. It is important to specify settings where both the first and subsequent encounters occur (e.g. Family physician and emergency department). Also important to note the time of stroke symptom onset in relation to time of first medical encounter.
	iv. Proportion of stroke and TIA patients discharged directly from the emergency department who receive a referral to a stroke prevention clinic for ongoing assessment and management.	N: Total number of stroke and TIA patients discharged directly from the emergency department who receive a referral to a stroke prevention clinic before leaving the emergency department D: Total number of stroke and TIA discharges directly from the emergency department	Local/regional data chart audit and stroke registries	Different models for stroke prevention clinics exist. The types of clinic models should be identified and described in the report of findings to enable clear interpretation and comparisons
<i>* for additional performance measures related to acute management of TIA and minor stroke, please see Section 2 – Prevention of Stroke</i>				
3.3 Neurovascular Imaging	i. Proportion of stroke patients who receive a brain CT/MRI within 25 minutes of hospital arrival. ** This measure is relevant for potentially eligible iPA patients only and otherwise not relevant	N: number of stroke patients who arrive in an emergency department and receive first CT or MRI scan within 25 minutes of arrival in emergency department D: total number of stroke patients admitted to the emergency department	Local/regional data chart audit and stroke registries; imaging data systems (e.g., PACS)	Start time should be the first electronically documented time on the emergency department record. In Canada this should be the triage time, however in some places registration time occurs before triage. Stop time should be the official time of the CT/MRI scan electronically stamped on the CT report as the time taken (not the time the scan was read). <i>See comments in 3.3 (i) above regarding times for measurement.</i>
	ii. Proportion of stroke patients who receive a brain CT/MRI within 24 hours of hospital arrival.	N: number of stroke patients who arrive in an emergency department and receive first CT or MRI scan within 24 hours of arrival in emergency department D: total number of stroke patients admitted to emergency department and/or inpatient care	Local/regional data chart audit and stroke registries; imaging data systems (e.g., PACS)	<i>See comments in 3.3 (i) above regarding times for measurement.</i>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
<p>3.4</p> <p>Blood Glucose Abnormalities</p>	<p>iii. Proportion of all stroke patients who receive a brain CT/MRI prior to hospital discharge. ^c</p>	<p>N: number of stroke patients who receive at least one CT or MRI scan prior to hospital discharge</p> <p>D: total number of stroke patients admitted to the emergency department and/or inpatient care</p>	<p>Administrative databases, hospital imaging systems, chart audit</p>	<p>This includes patients discharged directly from the emergency department and those patients admitted to hospital.</p>
	<p>iv. Proportion of stroke patients who receive carotid imaging prior to hospital discharge.</p>	<p>N: number of all stroke patients who receive a carotid artery assessment prior to hospital discharge</p> <p>D: total number of ischemic/TIA stroke patients admitted to the emergency department and/or inpatient care</p>	<p>Administrative databases, Local/regional data chart audit and stroke registries</p>	<p>Research has shown poor validity of administrative databases in capturing carotid imaging studies. Should rely on chart audit and/or imaging databases. Imaging may include: Dopplers, CTA, MRA, angiography</p>
	<p>v. Proportion of patients who do not undergo carotid imaging in hospital who have an appointment booked before discharge for carotid imaging as an outpatient.</p>	<p>N: number of ischemic stroke/TIA patients who have appointment booked for outpatient carotid imaging prior to emergency department or hospital discharge.</p> <p>D: Total number of ischemic stroke/TIA patients admitted to the emergency department and/or inpatient care</p>	<p>Local/regional data chart audit and stroke registries</p>	<p>The quality of documentation for booked appointments varies considerably. If monitoring this measure, ensure education is provided to appropriate staff regarding the importance of accurate and complete documentation.</p>
	<p>vi. Median time from stroke symptom onset to carotid imaging.</p>	<p>a. median time (hours/days) from ischemic stroke/TIA patient registration in an emergency department to carotid imaging.</p>	<p>Local/regional data chart audit and stroke registries</p>	<p>Mean time should not be used as may be skewed. This measure will be difficult to consistently obtain accurate information on times. Specify unit of time measure (hours/days).</p>
	<p>i. Proportion of patients with blood glucose levels documented during assessment in the emergency department or on the inpatient ward.</p>	<p>N: number of patients with blood glucose levels documented during assessment in the emergency department or on the inpatient ward.</p> <p>D: number of stroke/TIA patients seen in the emergency department and/or admitted to inpatient ward.</p>	<p>Local/regional data chart audit and stroke registries</p>	<p>Lab reports should be accessed to verify that glucose levels were measured when possible.</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
3.5 Acute Thrombolytic Therapy	ii. Proportion of patients with known diabetes mellitus who have blood glucose levels in therapeutic range for that patient.	N: number of stroke patients with diabetes mellitus and glucose in therapeutic range D: number of stroke patients with diabetes mellitus.	Local/regional data chart audit and stroke registries	Note: therapeutic range can be different for each patient depending on circumstance and should be clarified before reporting this measure.
	i. Proportion of all ischemic stroke patients who receive acute thrombolytic therapy (tPA). ^c	N: number of ischemic stroke patients who receive IV, IV/IA or intra-arterial thrombolysis in an emergency department or as an inpatient D: number of eligible ischemic stroke patients presenting to the emergency department or admitted as inpatients [within eligible time frame]	Local/regional data chart audit and stroke registries <i>*Starting in April 2009, CIHI will have a designated ICD10 code for tPA.</i>	When measuring and reporting this indicator, it is important to pre-define definition of eligible and last seen normal to treatment time frames included. Report IV and IA routes separately for this measure as combining them makes interpretation and comparisons difficult. Current best practice recommendations define eligibility as patients with stroke symptom onset within 4.5 hours and have ischemic stroke. Reasons for not receiving tPA should be documented and reported to enhance interpretation of the findings.
	ii. Median time from patient arrival in the emergency department to administration of acute thrombolytic agent (in minutes).	N: SUM [number of minutes from emergency department arrival (registration/triage) to administration of tPA] D: number of ischemic stroke patients presenting to the emergency department who receive tPA	Local/regional data chart audit and stroke registries	Should calculate mean, SD, and all percentiles (min, 5, 10, 25, 50, 75, 90, 95, 100). Denominator should include all ischemic stroke patients. It is important to clearly define the denominator and state any exclusion criteria to enable interpretation and comparisons. Start time should be the first electronically documented time on the emergency department record. In Canada this should be the triage time, however in some situations registration time occurs before triage. Stop time should be the time documented on the patient medication record as the time tPA administration was initiated (not when it was completed)
iii. Proportion of all thrombolysed ischemic stroke patients who receive acute thrombolytic therapy (tPA) within one hour of hospital arrival. ^c	N: Number /percentage of patients who receive IV tPA within 1 hour of hospital arrival D: All patients who receive IV tPA	Local/regional data chart audit and stroke registries	See note in comments for 3.5 (ii) above regarding time frames.	

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
	<p>iv. Proportion of patients in rural or remote communities who receive thrombolysis through the use of telemedicine/telestroke technologies (as a proportion of all ischemic stroke cases in that community, and as a proportion of all telestroke consults for ischemic stroke cases).</p>	<p>N: number of stroke patients receiving a telestroke consult and also receive tPA as a result of the consult.</p> <p>D1: number of ischemic stroke patients who receive a telestroke consult</p> <p>D2: Number of all ischemic stroke patients admitted to the emergency department or hospital</p>	Local/regional data chart audit and stroke registries	When reporting, it is important to describe and define the type of telestroke connection made – phone consult physician to physician, video link, etc. This indicator is meant to focus on two-way video linkage between a stroke expert consultant and a referring centre (usually a rural or community hospital).
<p>3.6 Acute Aspirin Therapy</p>	<p>v. Proportion of patients with symptomatic secondary intracerebral hemorrhage following acute thrombolysis.</p>	<p>N: proportion of patients who receive IV tPA who experience a symptomatic secondary hemorrhage within 48 hours following tPA administration</p> <p>D: Number of all patients who receive tPA</p>	Local/regional data chart audit and stroke registries	Need to specify whether secondary hemorrhage was symptomatic or asymptomatic. Hemorrhage should be confirmed by CT scan. If possible, hemorrhage should be confirmed as secondary to tPA and not a conversion of the initial stroke.
	<p>i. Proportion of ischemic stroke and TIA patients who receive acute aspirin therapy within the first 48 hrs following a stroke event.</p>	<p>N: number of ischemic stroke/TIA patients who receive acute aspirin therapy within the first 48 hrs following a stroke event.</p> <p>D: total number of ischemic stroke/TIA patients seen in the emergency department or admitted to inpatient.</p>	Local/regional data chart audit and stroke registries	<p>Start time should be the first electronically documented time on the emergency department record. In Canada this should be the triage time, however in some situations registration time occurs before triage. Stop time should be the time documented on the patient medication record as the time first dose of ASA given.</p> <p>Note, current best practice evidence supports the use of aspirin within the first 48 hours. In some institutions, practice may vary and other antiplatelet agents may be used instead. It is important to document if this measure includes ASA alone or whether a broader group of antiplatelets is also included.</p>
	<p>ii. Median time from stroke onset to administration of first dose of aspirin in hospital.</p>	<p>N: SUM [time from stroke patient registration in ED or inpatient to acute aspirin administration]</p> <p>D: total number of ischemic stroke/TIA patients seen in the emergency department or admitted to inpatient</p>	Local/regional data chart audit and stroke registries	See note in comments for measure 3.6 (i) for time frames for measurement.

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
3.7 Management of Subarachnoid and Intracerebral Hemorrhage	i. Proportion of hemorrhagic stroke patients treated on an acute stroke unit.	N: number of hemorrhagic stroke patients admitted to hospital and treated on an acute stroke unit at any time during hospital stay D: total number of hemorrhagic stroke patients admitted to a hospital	Local/regional data, chart audit, stroke registries	Exclude patients taken directly to the operating room from the emergency department If patients taken to the intensive care unit as opposed to acute stroke unit, these can be included, but should be reported separately, and appropriately explained in the findings.
	ii. Proportion of total time in hospital spent on an acute stroke unit.	N: Sum {all time spent on acute stroke unit by all hemorrhagic stroke patients} D: Number of hemorrhagic stroke patients who spent any time on an acute stroke unit.	Local/regional data, chart audit, stroke registries	See comments for measure 3.7 (i)
	iii. Proportion of hemorrhagic stroke patients who receive a neurosurgical consult while in hospital.	N: of hemorrhagic stroke patients who receive a neurosurgical consult while in hospital. D: total number of hemorrhagic stroke patients admitted to hospital	Local/regional data, chart audit, stroke registries	Need to also account for referrals made or patients transferred to another hospital if neurosurgical services are not available in the hospital of original admission. Not all patients with hemorrhagic stroke require a neurosurgical consultation, so findings should be interpreted with appropriate cautions and explanatory notes.
	iv. Proportion of patients with hemorrhagic stroke who are discharged to: their place of residence, or inpatient stroke rehabilitation, or Complex rehabilitation, or Complex Continuing Care, or Long Term Care following hospital discharge.	N: number of hemorrhagic stroke patients discharged to each of: their place of residence, inpatient stroke rehabilitation, Complex Continuing Care, or Long Term Care following hospital discharge. D: total number of hemorrhagic stroke patients admitted to hospital and discharged alive	Administrative data; Local/regional data, chart audit, stroke registries	This measure should be considered in conjunction with both stroke severity and length of hospital stay to provide a fuller interpretation of the findings using this suite of measures.
	v. 30-days in hospital mortality rate for subarachnoid and intracerebral hemorrhage.	N: Number of hemorrhagic stroke patients who died within the first 30 days of their stroke event while in hospital D: total number of hemorrhagic stroke patients admitted to hospital	Administrative data; Local/regional data, chart audit, stroke registries	Mortality rates for subarachnoid and intracerebral hemorrhage should be reported separately. Mortality rates should be risk adjusted for stroke severity, age, gender, comorbidities.

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
4. Acute Inpatient Stroke Care				
4.1 Stroke Unit Care	<p>i. Number of stroke patients treated on a stroke unit at any time during their in-patient hospital stay for an acute stroke event as a Proportion of total number of stroke patients admitted to hospital.</p> <p>ii. Proportion of total time in hospital for an acute stroke event spent on a stroke unit.</p> <p>iii. Proportion of stroke patients discharged to their home or place of residence following an inpatient admission for stroke.</p> <p>iv. Proportion increase Telehealth/ telestroke coverage to remote communities to support organized stroke care across the continuum</p>	<p>N: number of stroke patients admitted to hospital and treated on an acute stroke unit at any time during hospital stay</p> <p>D: total number of stroke patients admitted to hospital (TIA, ischemic, hemorrhage)</p> <p>N: Sum {all time spent on acute stroke unit}</p> <p>D: Number of stroke patients who spent any time on an acute stroke unit.</p> <p>N: number of stroke patients discharged to home or place of residence following inpatient admission for stroke</p> <p>D: total number of stroke patients admitted to hospital (TIA, ischemic, hemorrhage)</p> <p>N1: Total number of telestroke consults for stroke patients by an institution</p> <p>D1: number of stroke patients treated in the institution during time frame (emergency department only or inpatient).</p> <p>N2: number of telestroke consultations by modality used (telephone, video, digital imaging etc)</p> <p>D2: total number of telestroke consults</p>	<p>Local/regional data and stroke registries</p> <p>Local/regional data and stroke registries</p> <p>Administrative databases, chart audit</p> <p>Local/regional data; chart audit; telemedicine databases, and stroke registries</p>	<p>Definition of stroke unit varies widely from institution to institution. Where stroke units do not exist that meet the criteria defined in the recommendation, then a hierarchy of other stroke care models could be considered: (1) dedicated stroke unit, (2) designated area within a general nursing unit where clustering of stroke patients occurs, (3) mobile stroke team care and (4) management on a general nursing unit by staff using guidelines and protocols.</p> <p>This measure should be reported for all strokes, and also reported separately by stroke type.</p> <p>Stroke unit carries many definitions. When reporting it is important to define the type of stroke unit model being measured.</p> <p>This measure could be reported for all strokes, and also reported separately by stroke type.</p> <p>This includes all patients discharged to their place of residence. In the CHI DAD database there are two categories for discharge home: 'home with services' and 'home without services'. Both categories should be included in the numerator.</p> <p>Increasing reported numbers would indicate increasing access to these resources.</p> <p>When reporting, it is important to describe and define the type of telestroke connection made – such as phone consult physician to physician, video link, imaging views reviewed electronically. This indicator is meant to focus on two-way video linkage between a stroke expert consultant and a referring centre (usually a rural or community hospital).</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
4.2 Components of Acute Inpatient Care	<p>i. Proportion of stroke patients admitted to hospital who experience any post-stroke complication while in hospital.</p>	<p>N: Total number of patients with each defined complication</p> <p>D: total number of stroke patients admitted to hospital (TIA, ischemic, hemorrhage)</p>	Local chart audit, stroke registries	<p>Complication must be a <i>new development</i> while in hospital and not an exacerbation or continuation of a pre-existing complication or condition.</p> <p>In-hospital post stroke complications may include: pneumonia, venous thrombo-embolism, gastrointestinal bleed, secondary cerebral hemorrhage, pressure ulcers, urinary tract infection, pulmonary embolus, seizures, and/or convulsions.</p> <p>Each complication rate should be calculated and reported separately to enable interpretation and comparisons.</p>
	<p>ii. Length of stay for stroke patients admitted to hospital and discharged alive.</p>	<p>Mean/median time from stroke patient arrival in the emergency department arrival to final discharge from hospital (days)</p>	Administrative data, local charts, stroke registries	<p>Total length of stay may be a combination of several segments of hospitalization: emergency department stay + acute inpatient stay ± stay for rehabilitation ± stay as alternate level of care.</p> <p>Where possible, total length of stay should be reported as well as the length of stay breakdown to separate the emergency and inpatient care from rehabilitation and alternate level of care.</p>
	<p>iii. 30-day in-hospital mortality rate for all admitted stroke patients.</p>	<p>N: Number of stroke patients who died within the first 30 days of their stroke event while in hospital</p> <p>D: total number of stroke patients admitted to hospital</p>	Administrative data; Local/regional data, chart audit, stroke registries	<p>Mortality rates for subarachnoid and intracerebral hemorrhage should be reported separately.</p> <p>Mortality rates should be risk adjusted for stroke severity, age, gender, comorbidities.</p>
	<p>iv. Proportion of admitted stroke patients prescribed venous thrombo-embolism prophylaxis while in hospital</p>	<p>N: Number of stroke patients prescribed venous thrombo-embolism prophylaxis while in hospital</p> <p>D: total number of stroke patients admitted to hospital</p>	Local/regional data, chart audit, stroke registries	<p>Best practice recommendation states that patients who are identified as high risk for venous thrombo-embolism should receive prophylaxis. Therefore when monitoring this performance measure it is important to state whether the numerator and denominator includes all stroke inpatients or only the subset identified as high risk for embolism.</p>
	<p>v. Proportion of patients with a documented elevated temperature during hospital stay who are treated with antipyretics in hospital</p>	<p>N: Number of stroke patients with a documented elevated temperature during hospital stay who are treated with antipyretics in hospital</p> <p>D: total number of stroke patients admitted to hospital</p>	Local/regional data, chart audit, stroke registries	<p>Fever may be recorded as a secondary diagnosis in administrative databases if it occurred after hospital admission. Specific medications administered during hospitalization are generally not included in administrative databases.</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
	<p>vi. Proportion of admitted stroke patients with documentation that they were mobilized within 48 hours of hospital admission.</p>	<p>N: Number of stroke patients with documentation that they were mobilized within 48 hours of hospital admission</p> <p>D: total number of stroke patients admitted to hospital</p>	Local/regional data, chart audit, stroke registries	Mobilization is defined in the Best Practices as "the act of getting a patient to move in the bed, sit up, stand, and eventually walk." (page E48). Stroke patients should be active participants in mobilization; therefore passive transfers of patients unable to assist in mobilization should not be included in the cohort for this measure.
	<p>vii. Proportion of admitted stroke patients who have bladder or bowel incontinence concerns identified on screening who have an individualized continence management plan documented and implemented</p>	<p>N: Number of admitted stroke patients who have bladder or bowel incontinence concerns identified on screening who have an individualized continence management plan documented and implemented</p> <p>D: total number of stroke patients admitted to hospital and identified to have bladder or bowel incontinence concerns</p>	Local/regional data, chart audit, stroke registries	<p>^ This performance measure is considered a nursing sensitive outcome measure and will be pilot-tested as part of that project.</p> <p>Documentation for a continence plan should be a standardized tool or incorporated within the nursing notes.</p>
	<p>viii. Proportion of admitted stroke patients who have hydration problems or dysphagia identified on screening who are seen by a dietitian within 48 hrs of admission.</p>	<p>N: Number of admitted stroke patients who have hydration problems or dysphagia identified on screening who are seen by a dietitian within 48 hrs of admission.</p> <p>D: total number of stroke patients admitted to hospital who have hydration problems or dysphagia identified on screening</p>	Local/regional data, chart audit, stroke registries	Also see <i>Dysphagia recommendation performance measures in Section 6.1 of this manual.</i>
	<p>ix. Proportion of admitted stroke patients who have oral problems identified on screening and receive a referral to dentistry or other oral health professional for ongoing assessment and management</p>	<p>N: Number of admitted stroke patients who have oral problems identified on screening and receive a referral to dentistry or other oral health professional for ongoing assessment and management</p> <p>D: total number of stroke patients admitted to hospital</p>	Local/regional data, chart audit, stroke registries. Administrative databases.	Administrative databases may identify a consultation to dentistry, but not to other oral healthcare professionals (dental hygienist, dentist). Chart audit will be required to capture these types of consults.

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
5. Stroke Rehabilitation				
5.1 Initial Stroke Rehabilitation Assessment	i. Median time from hospital admission for stroke to initial assessment for rehabilitation potential by each of the rehabilitation disciplines. ^c	N1: Time from hospital admission to initial assessment for stroke rehabilitation needs by any rehabilitation professional D1: All patients admitted to hospital with an acute stroke. N2: Proportion of stroke patients who receive a rehabilitation assessment within 48 hours of hospital admission. D2: All patients admitted to hospital with an acute stroke.	Local/regional data, chart audit, stroke registries	May be difficult to obtain. Need to clarify/define what constitutes an 'assessment' when reporting on this measure, and state which team members must be involved at a minimum. Consistent documentation is required indicating that an assessment has been completed and the nature of the assessment (when, by whom, extent of assessment, impression following assessment) Current Benchmark for this measure: 80% of all stroke patients should be assessed for rehabilitation needs within 48 hours of hospital admission
i. Proportion of acute stroke patients discharged from acute care to inpatient rehabilitation. ^c		N: number of stroke patients admitted to inpatient rehabilitation following discharge from acute care D: Total number of stroke patients discharged alive from acute care hospital	Administrative data	Currently, not all patients go directly to rehabilitation following hospital discharge. In some cases, patients may be discharged to home, complex care or long term care for a short time before entering inpatient rehabilitation. Therefore, both acute care and rehabilitation centre databases should be used to verify the true admission rate and these records linked where possible (e.g., link between CIHI's DAD and NRS databases). Reporting of this measure should include information on the number of patients with delayed admission to rehabilitation and the location of the patients during the lapse time when possible.

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
ii.	Proportion of stroke patients discharged to the community who receive a referral for outpatient rehabilitation prior to discharge from acute care or inpatient rehabilitation (referrals may include either facility-based or community-based programs).	<p>N: number patients discharged to the community who receive a referral for outpatient rehabilitation prior to discharge from acute care or inpatient rehabilitation</p> <p>D: number stroke patients discharged to the community from acute care or inpatient rehabilitation.</p>	Local/regional data, chart audit, stroke registries, some administrative databases (NRS)	<p>This is an important measure for stroke patients; however it pertains to an area where there are considerable gaps in data availability and data quality. Promoting measurement in this area will hopefully lead to improved data and information on the availability and impact of outpatient rehabilitation.</p> <p>Inclusion and exclusion criteria for the numerator and denominator should be clearly stated when reporting on this measure as not all patients will require a referral for outpatient rehabilitation. In addition, referrals may be made for outpatient rehabilitation after the patient is discharged from acute care or inpatient rehabilitation and there are no standardized databases available to track this information consistently.</p>
iii.	Median length of time between referral for outpatient rehabilitation and admission to a facility-based or community stroke rehabilitation program.	<p>a. time from referral being submitted to notification of acceptance into program (in days).</p>	Program referral logs, audits, specific community monitoring systems	<p>Important information yet very difficult to obtain data in a consistent way. See comments above in Section 5.1 (iii).</p> <p>Funded homecare programs with rehabilitation services may have valid and reliable data for this measure.</p>
iv.	Median length of time between referral for outpatient rehabilitation to commencement of therapy.	<p>a. Median time from referral being submitted to the outpatient rehabilitation program to the first day of therapy commencement</p> <p>b. Median time from acceptance into outpatient rehabilitation program to first day of therapy commencement</p>	Program referral logs, audits, specific community monitoring systems	<p>Standardized audit tools should be developed for consistent measurement.</p> <p>Can also calculate mean and quartiles for this measure.</p>
v.	Proportion of patients with severe stroke reassessed for rehabilitation following initial assessment.	<p>N: number stroke patients reassessed for rehabilitation following initial assessment</p> <p>D: Total number patients with severe stroke</p>	Administrative databases (DAD, NRS); local patient records; chart audits	<p>Patients with severe stroke who may not be initially eligible for rehabilitation are generally defined as having an initial NIH score of ≤ 14; or a modified Rankin score of 4 – 5 at hospital discharge. Although they may not be initially able to participate in active stroke rehabilitation, their condition may change at a later time, and it is important to track how many of these patients have access to rehabilitation when ready.</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
	<p>vi. Proportion of patients with severe stroke admitted to inpatient rehabilitation within 6 months of stroke onset.</p>	<p>N: number of severe stroke patients admitted to inpatient rehabilitation within 6 months of stroke onset</p> <p>D: Total number patients with severe stroke discharged alive from hospital following stroke event</p>	Administrative databases (e.g., CIHI's DAD, NRS)	This measure may be stratified by time frames such as admission within 30 days, 3 months, and 6 months. May need to link databases to confirm index stroke date and verify that rehabilitation admission is not following a subsequent stroke event.
	<p>vii. Proportion increase in Telehealth/telestroke coverage to remote communities to support organized stroke care across the continuum and provide rehabilitation assessments for stroke patients.</p>	<p>N: number of telestroke consults for rehabilitation assessments within an institution, community or region</p> <p>D1: number stroke patients admitted to hospital within the institution, community or region</p>	Telemedicine data systems; Local/regional data; chart audit; and stroke registries	<p>Increasing reported numbers would indicate increasing access to these resources.</p> <p>When reporting, it is important to describe and define the type of telestroke connection made – such as phone consult physician to physician, video link, imaging views reviewed electronically. This indicator is meant to focus on two-way video linkage between a stroke rehabilitation consultant and a referring centre (usually a rural or community hospital).</p>
<p>5.2 Provision of Inpatient Stroke Rehabilitation</p>	<p>i. Proportion of patients admitted to a coordinated stroke unit – either a combined acute care and rehabilitation unit, or a rehabilitation stroke unit in an inpatient rehabilitation facility – at any time during their hospital stay (acute and/or rehabilitation).</p> <p>ii. Proportion of total time during inpatient rehabilitation following an acute stroke event that is spent on a rehabilitation stroke unit.</p>	<p>N: number of stroke patients admitted to a rehabilitation facility who spent any time on a stroke unit inpatient rehabilitation stay</p> <p>D: total number of stroke patients admitted to an inpatient rehabilitation facility (TIA, ischemic, hemorrhage)</p> <p>N: Sum {all time spent on rehabilitation stroke unit}</p> <p>D: Number of stroke patients who spent any time on a rehabilitation stroke unit.</p>	Local/regional data and stroke registries	<p>Definition of stroke unit varies widely from institution to institution. Where stroke units do not exist that meet the criteria defined in the recommendation, then a hierarchy of other stroke care models could be considered: (1) dedicated stroke unit, (2) designated area within a general or mixed rehabilitation unit where clustering of stroke patients occurs, (3) mobile stroke team care and (4) management on a general rehabilitation unit by staff using guidelines and protocols.</p> <p>This measure should be reported for all strokes, and also reported separately by stroke type.</p> <p>See comments regarding definition of stroke unit in Section 5.2 (i).</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
iii. Final discharge disposition for stroke survivors following inpatient rehabilitation: including proportion of stroke rehabilitation patients discharged to their original place of residence; to a long term care facility or nursing home; or requiring readmission back to an acute care hospital for stroke related causes. c	<p>N: number stroke patients discharged from inpatient rehabilitation to each of: their original place of residence; to with or without support services; to a long term care facility or nursing home; other form of assisted living; readmission to an acute care hospital for stroke related causes</p> <p>D: All stroke patients discharged alive from an inpatient rehabilitation facility</p>	Administrative databases (NRS)	Should be reported by stroke type, and functional related groupings. This measure should be combined with rehabilitation length of stay to enhance interpretation.	
iv. Number of stroke patients initially assessed by each rehabilitation discipline, including: physiotherapist; occupational therapist; speech language pathologist; social workers, and other relevant specialists during inpatient rehabilitation.	<p>N: Number of stroke patients initially assessed by each rehabilitation discipline, including: physiotherapist; occupational therapist; speech language pathologist; social workers, and other relevant specialists during inpatient rehabilitation.</p> <p>D: total number of stroke patients admitted to inpatient rehabilitation</p>	Administrative databases (NRS); local chart audit	Not all patients will require assessment by all rehabilitation disciplines. All disciplines that have assessed each patient during inpatient rehabilitation should be counted. Administrative databases may not capture all disciplines and the data should be validated by chart audit.	
v. Frequency, duration, and intensity of therapies received from each relevant rehabilitation professional while in an inpatient rehabilitation setting following stroke.	<p>a. Mean/Median number of visits received by each type of rehabilitation professional for all stroke patients admitted to inpatient rehabilitation</p> <p>b. Mean/Median duration of visits by each type of rehabilitation professional for all stroke patients admitted to inpatient rehabilitation</p> <p>c. Mean/Median weeks of therapy received by inpatient rehabilitation stroke patients by each type of rehabilitation professional</p>	Provider databases are kept for workload measurement and may be accessible; patient diaries.	Current administrative databases generally do not track frequency, intensity, and duration of therapy. This information is very important for interpretation of the quality of care received during inpatient rehabilitation. Mechanisms should be developed and implemented to ensure consistent tracking of this information for inpatient rehabilitation services.	

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
<p>5.3</p> <p>Components of Inpatient Stroke Rehabilitation</p>	<p>vi. Change in functional status using a standardized measurement tool, from time of admission to an inpatient rehabilitation unit for stroke patients, to the time of discharge from inpatient rehabilitation.</p>	<p>N: SUM [Discharge functional score – admission functional score] for all stroke patients admitted to inpatient rehabilitation</p> <p>D: Number of patients admitted to inpatient rehabilitation following an acute stroke.</p>	<p>Administrative databases; Local/regional audits of data; and stroke registries</p>	<p>Standardized measurement tool should be stated and data consistently collected from one tool. In some provinces, submission of rehabilitation data from all government funded rehabilitation beds is mandatory, and in others it is optional. In these cases, mechanisms should be in place to ensure consistent tools are used and a standard system for reporting data. Tools should be specified to enable interpretation and comparisons.</p>
	<p>i. Median time from hospital admission for stroke to initial assessment for rehabilitation potential by each of the rehabilitation disciplines. ^c</p>	<p>N1: Time from hospital admission to initial assessment for stroke rehabilitation needs by any rehabilitation professional</p> <p>D1: All patients admitted to hospital with an acute stroke.</p> <p>N2: Proportion of stroke patients who receive a rehabilitation assessment within 48 hours of hospital admission.</p> <p>D2: All patients admitted to hospital with an acute stroke.</p>	<p>Local/regional data, chart audit, stroke registries</p>	<p>May be difficult to obtain. Need to clarify/define what constitutes an 'assessment' when reporting on this measure, and state which team members must be involved at a minimum. Consistent documentation is required indicating that an assessment has been completed and the nature of the assessment (when, by whom, extent of assessment, impression following assessment)</p> <p>Current Benchmark for this measure: 80% of all stroke patients should be assessed for rehabilitation needs within 48 hours of hospital admission</p>
	<p>ii. Median length of time spent on a stroke unit during inpatient rehabilitation.</p> <p>iii. Length of time between stroke onset and admission to stroke inpatient rehabilitation.</p>	<p>N: Sum {all time spent on rehabilitation stroke unit}</p> <p>D: Number of stroke patients who spent any time on a rehabilitation stroke unit.</p> <p>Calculate: Stroke patient admission date to inpatient rehabilitation facility – stroke admission date to emergency department or acute inpatient care</p>	<p>Local/regional data and stroke registries</p> <p>Administrative data</p>	<p>Stroke unit carries many definitions. When reporting it is important to define the type of stroke unit model being measured.</p> <p>This measure should be reported for all strokes, and also reported separately by stroke type.</p> <p>Should break time down to acute inpatient admission time – alternate level of care days as inpatient (or days from ready to discharge to rehabilitation until actual discharge date). Some patients may go to another setting for a short stay before entering inpatient rehabilitation and this should also be accounted for and defined when data presented.</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
	<p>iv. Proportion of patients admitted to a coordinated stroke unit – either a combined acute care and rehabilitation unit, or a rehabilitation stroke unit in an inpatient rehabilitation facility – at any time during their hospital stay (acute and/or rehabilitation).</p>	<p>N: number of stroke patients admitted to a rehabilitation facility who spent any time on a stroke unit inpatient rehabilitation stay</p> <p>D: total number of stroke patients admitted to an inpatient rehabilitation facility (TIA, ischemic, hemorrhage)</p>	Local/regional data and stroke registries	<p>Definition of stroke unit varies widely from institution to institution. Where stroke units do not exist that meet the criteria defined in the recommendation, then a hierarchy of other stroke care models could be considered: (1) dedicated stroke unit, (2) designated area within a general or mixed rehabilitation unit where clustering of stroke patients occurs, (3) mobile stroke team care and (4) management on a general rehabilitation unit by staff using guidelines and protocols.</p> <p>This measure should be reported for all strokes, and also reported separately by stroke type.</p> <p>Should be reported by stroke type, and functional related groupings.</p> <p>This measure should be combined with rehabilitation length of stay to enhance interpretation.</p>
	<p>v. Final discharge disposition for stroke survivors following inpatient rehabilitation: including proportion of stroke rehabilitation patients discharged to their original place of residence; to a long term care facility or nursing home; or requiring readmission back to an acute care hospital for stroke related causes. c</p>	<p>N: number stroke patients discharged from inpatient rehabilitation to each of: their original place of residence with or without support services; to a long term care facility or nursing home, other form of assisted living; readmission to an acute care hospital for stroke related causes</p> <p>D: All stroke patients discharged alive from an inpatient rehabilitation facility</p>	Administrative databases (NRS)	<p>If patients transferred back to acute care for short time duration they may be coded in inpatient rehabilitation databases as a service disruption, and their record continues when the patient returns to rehabilitation. It is important to search for service disruptions as well as full discharges back to acute inpatient care to accurately track this measure.</p>
	<p>vi. Proportion of stroke patients admitted to inpatient rehabilitation who requires readmission to an acute care hospital for stroke related causes.</p> <p>vii. Median number of days spent as 'alternate level of care' in an acute care setting prior to arrival in inpatient rehabilitation setting.</p>	<p>N: number stroke patients readmitted to acute care hospital for stroke-related causes from inpatient rehabilitation</p> <p>D: number of stroke patients admitted to inpatient rehabilitation</p> <p>N: SUM [total days spent in ALC status at acute care hospital] for patients who are discharged to inpatient rehabilitation</p> <p>D: all patients discharged from acute care to inpatient rehabilitation</p>	<p>Administrative databases; Local facility records; chart audit</p> <p>Administrative data (CIHI - DAD)</p>	<p>The definition of 'alternate level of care' in an acute care setting varies considerably across institutions and across provinces. Quality of data coding and definitions for classifying alternative levels of care should be clarified at each institution prior to interpreting and reporting this data.</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
	<p>i. Change in functional status using a standardized measurement tool, from time of admission to an inpatient rehabilitation unit for stroke patients, to the time of discharge from inpatient rehabilitation.</p>	<p>N: SUM [Discharge functional score –admission functional score] for all stroke patients admitted to inpatient rehabilitation</p> <p>D: Number of patients admitted to inpatient rehabilitation following an acute stroke.</p>	<p>Administrative databases; Local/regional audits of data; and stroke registries</p>	<p>Standardized measurement tool should be used and described, and data consistently collected from one tool. In some provinces, submission of rehabilitation data from all government funded rehabilitation beds is mandatory, and in others it is optional. In these cases, mechanisms should be in place to ensure consistent tools are used and a standard system for reporting data. Tools should be specified to enable interpretation and comparisons.</p>
	<p>viii. Total length of time (days) spent in inpatient rehabilitation.</p>	<p>N: Sum [Number of days from Admission Date to Discharge Date] for inpatient rehabilitation patients</p> <p>D: Total number of patients discharged alive from inpatient rehabilitation</p>	<p>Administrative data or specific registries for collecting this data (e.g. CIHI NRS)</p>	<p>Should consider total length of stay and also active length of stay where data permits. Active length of stay would exclude any days where patient had a service disruption (such as short admission back to acute inpatient care) and also generally excludes any days patient is ready for discharge but still occupying a bed (usually due to social circumstances related to place of residence or transportation)</p>
	<p>ix. Number of patients screened for cognitive impairment using valid screening tool during inpatient rehabilitation.</p>	<p>N: Number of patients screened for cognitive impairment using valid screening tool during inpatient rehabilitation.</p> <p>D: total number of stroke patients admitted to an inpatient rehabilitation facility</p>	<p>Administrative data or specific registries for collecting this data (e.g. CIHI NRS)</p>	<p>Standardized measurement tool should be used and described, and data consistently collected from one tool. Education should be provided to enhance the quality of documentation for this measure.</p>
	<p>x. Time from stroke onset to mobilization: a) sitting; b) standing upright; c) walking with/without assistance.</p>	<p>a. Time (hours) from stroke onset to mobilization: a) sitting; b) standing upright; c) walking with/without assistance.</p>	<p>Administrative data; chart audit; specific audit tools and/or logs developed for collecting this data</p>	<p>This may occur in acute care for many stroke patients or in rehabilitation facility for more severe strokes. Regardless of location, standardized data collection tools should be developed and implemented to ensure accurate and complete data.</p>
	<p>xi. Number of days spent in alternate level of care (ALC) in acute care or inpatient rehabilitation while waiting for return to home or placement to a residential or long term care setting.</p>	<p>N: SUM [total days spent in ALC status at acute care hospital] for patients who are discharged to inpatient rehabilitation</p> <p>D: all patients discharged from acute care or inpatient rehabilitation to a long term care home or residential setting</p>	<p>Administrative data; chart audit</p>	<p>The definition of 'alternate level of care' in an acute care setting varies considerably across institutions and across provinces. Quality of data coding and definitions for classifying alternative levels of care should be clarified at each institution prior to interpreting and reporting this data.</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
<p>5.4</p> <p>Outpatient and Community Based Rehabilitation</p>	<p>i. Proportion of stroke patients discharged to the community who receive a referral for outpatient rehabilitation prior to discharge from acute care or inpatient rehabilitation (referrals may include either facility-based or community-based programs).</p> <p>ii. Median length of time between referral for outpatient rehabilitation and admission to a facility-based, home-based or community stroke rehabilitation program.</p> <p>iii. Median length of time between referral for outpatient rehabilitation to commencement of therapy.</p>	<p>N: number patients discharged to the community who receive a referral for outpatient rehabilitation prior to discharge from acute care or inpatient rehabilitation</p> <p>D: number stroke patients discharged to the community from acute care or inpatient rehabilitation.</p> <p>a. time from referral being submitted to notification of acceptance into program (in days).</p> <p>c. Median time from referral being submitted to the outpatient rehabilitation program to the first day of therapy commencement</p> <p>d. Median time from confirmed acceptance into outpatient rehabilitation program to first day of therapy commencement</p>	<p>Local/regional data, chart audit, stroke registries, some administrative databases (NRS)</p> <p>Program referral logs, audits, specific community monitoring systems</p> <p>Program referral logs, audits, specific community monitoring systems</p>	<p>This is an important measure for stroke patients; however it pertains to an area where there are considerable gaps in data availability and data quality. Promoting measurement in this area will hopefully lead to improved data and information on the availability and impact of outpatient rehabilitation.</p> <p>Inclusion and exclusion criteria for the numerator and denominator should be clearly stated when reporting on this measure as not all patients will require a referral for outpatient rehabilitation. In addition, referrals may be made for outpatient rehabilitation after the patient is discharged from acute care or inpatient rehabilitation and there are no standardized databases available to track this information consistently.</p> <p>Important information yet very difficult to obtain data in a consistent way. See comments above in Section 5.1 (iii).</p> <p>Funded homecare programs with rehabilitation services may have valid and reliable data for this measure.</p> <p>Standardized audit tools should be developed for consistent measurement.</p> <p>Outpatient rehabilitation may include facility-based, community-based, or home-based programs.</p> <p>Can also calculate mean and quartiles for this measure.</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
	<p>iv. Number of stroke patients initially assessed by each rehabilitation discipline, including: physiotherapist; occupational therapist; speech language pathologist; social workers, and other relevant specialists while receiving stroke rehabilitation therapy in the community.</p>	<p>N: Number of stroke patients initially assessed by each rehabilitation discipline, including: physiotherapist; occupational therapist; speech language pathologist; social workers, and other relevant specialists while receiving stroke rehabilitation therapy in the community.</p> <p>D: total number of stroke patients discharged t the community following a stroke event, either directly from acute care or following an admission to inpatient rehabilitation.</p>	Community rehabilitation program logs; local chart audit; local databases	<p>Current administrative databases generally are not available for community-based rehabilitation programs. This information is very important for interpretation of the quality of care received during home or community-based rehabilitation.</p> <p>Mechanisms should be developed and implemented to ensure consistent tracking of this information.</p> <p>Government funded home care services generally have data available to support measurement of the types of therapists working with stroke patients in the community.</p>
	<p>v. Frequency, duration, and intensity of therapies received from each relevant rehabilitation professional in a home or community-based rehabilitation setting following stroke.</p>	<p>a. Mean/Median number of visits to each type of rehabilitation professional during home or community-based rehabilitation</p> <p>b. Mean/Median duration of visits to each type of rehabilitation professional for all stroke patients during home or community-based rehabilitation</p> <p>c. Mean/Median weeks of therapy received by stroke patients by each type of rehabilitation professional during home or community-based rehabilitation</p>	Provider databases may be kept for workload measurement and may be accessible; Provider records or service-tracking systems; patient diaries.	<p>Current administrative databases generally are not available for community-based rehabilitation programs. This information is very important for interpretation of the quality of care received during home or community-based rehabilitation.</p> <p>Mechanisms should be developed and implemented to ensure consistent tracking of this information.</p> <p>Government funded home care services generally have data available to support this measurement.</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
	<p>vi. Change in functional status using a standardized measurement tool, from time of admission to an inpatient rehabilitation unit for stroke patients, to the time of discharge from home or community-based rehabilitation programs.</p>	<p>N: SUM [Discharge functional score –admission functional score] for all stroke patients participating in home or community-based rehabilitation programs.</p> <p>D: Number of patients admitted to home or community-based rehabilitation programs following an acute stroke.</p>	<p>Administrative databases; Local/regional audits of data; and stroke registries</p>	<p>Standardized measurement tool should be used and described, and data consistently collected from one tool.</p> <p>In some provinces, submission of rehabilitation data from all government funded home or community-based rehabilitation programs is mandatory, and in others it is optional. In these cases, mechanisms should be in place to ensure consistent tools are used and a standard system for reporting data. Tools should be specified to enable interpretation and comparisons.</p>
<p>vii. Proportion increase in Telehealth/telestroke coverage to remote communities to support organized stroke care across the continuum and provide rehabilitation assessments and programs for stroke patients who return to the community after hospitalization for an acute stroke.</p>	<p>N: number of telestroke consults for rehabilitation assessments within an institution, community or region</p> <p>D1: number stroke patients admitted to hospital within the institution, community or region</p>	<p>Telemedicine data systems: Local/regional data, chart audit; and stroke registries</p>	<p>Increasing reported numbers would indicate increasing access to these resources.</p> <p>When reporting, it is important to describe and define the type of telestroke connection made – such as phone consult physician to physician, video link, imaging views reviewed electronically. This indicator is meant to focus on two-way video linkage between a stroke rehabilitation consultant and a referring centre (usually a rural or community hospital).</p>	
<p>5.5 Follow-up and Community Reintegration</p>	<p>i. Proportion of patients who are discharged from acute care who receive a referral for home care/community supportive services. ^c</p>	<p>N: number of patients discharged to the community who receive a referral for supportive services prior to discharge from acute and/or inpatient rehabilitation hospital</p> <p>D: number of stroke patients discharged to the community from acute care or inpatient rehabilitation.</p>	<p>Local/regional data, chart audit, stroke registries, some administrative databases (NRS)</p>	<p>Some referrals may be made after patient discharge and these would be difficult to track using inpatient data systems. Where possible, data quality and completeness could be enhanced by cross-linking hospital databases with home care databases to ensure all stroke patients are captured.</p> <p>When collecting data, it is important to note the types of referrals made for community services and the types of services received (such as homemaker, registered nurse, rehabilitation).</p>
	<p>ii. Proportion of stroke patients discharged from acute care to the community who require readmission to an acute care hospital for stroke related causes.</p>	<p>N: number stroke patients readmitted to acute care hospital for stroke-related causes from inpatient rehabilitation</p> <p>D: number of stroke patients admitted to inpatient rehabilitation</p>	<p>Administrative databases; Local facility records; chart audit</p>	<p>Reason for readmissions should be for stroke related causes. Therefore the same ICD_10 codes that are used for identifying the original stroke cohort should also be used to identify the readmissions.</p> <p>Readmissions should be measured at 3 months, 6 months, and one year following index stroke event.</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
	<p>iii. Proportion of stroke patients with documentation that information was given to patient/family during a healthcare encounter in the community. Topics that should be covered in educational sessions may include: formal/informal educational programs, care after stroke, available services, process to access available services, and services are covered by health insurance.</p>	<p>N: Number of stroke patients who have documentation in their community healthcare record of the occurrence of patient/caregiver education (settings may include emergency department, family practice, outpatient rehabilitation, homecare nursing services)</p> <p>D: Total number of stroke patients managed within the defined setting.</p>	<p>Local chart audits; Patient/caregiver surveys; Patient education logs or diaries.</p>	<p>Currently there is significant variation and lack of standardization of documenting patient education encounters in any healthcare setting, and in particular in community settings. This makes the quality, validity, and reliability of data very difficult to determine, and results should be interpreted with caution.</p> <p>Ideally, documentation of patient education should include the persons providing the education, scope of the education and content covered, time spent and materials provided. Ideally this is done using a standardized patient education documentation tool.</p>
	<p>iv. Proportion of stroke patients referred to secondary prevention services after being discharged from acute care or inpatient rehabilitation following a stroke event</p>	<p>N: number of patients referred to secondary prevention after being discharged from acute care or inpatient rehabilitation</p> <p>D: number of patients discharged from acute care or inpatient rehabilitation</p>	<p>Local/regional data, chart audit, stroke registries,</p>	<p>Should clearly define the type of secondary prevention services that patients are referred to for interpretation and comparability (e.g., outpatient or community-based clinic).</p> <p>Also important to clearly define the denominator for the population included in this measure.</p>
	<p>v. Median/mean number of visits to primary care for stroke related follow-up after discharge from acute care or inpatient rehabilitation following a stroke event</p>	<p>N: number of visits by stroke patients to primary care for stroke related follow-up after discharge from acute care or inpatient rehabilitation.</p> <p>D: number of patients discharged from acute care or inpatient rehabilitation</p>	<p>Local/regional data; primary care charts; chart audit, stroke registries, patient diaries.</p>	<p>Results should be stratified by type of primary care services – family physician, nurse practitioner, other.</p> <p>Time frames for analysis should include within first 3 6 months and one year following discharge from hospital for index stroke event.</p> <p>Reasons for visits should be noted and included in analysis and reports of findings.</p>
	<p>vi. Median/mean number of visits to an emergency department for stroke related issues after discharge from acute care or inpatient rehabilitation following a stroke event</p>	<p>N: number of visits by stroke patients to an emergency department for stroke related follow-up after discharge from acute care or inpatient rehabilitation.</p> <p>D: number of patients discharged from acute care or inpatient rehabilitation</p>	<p>Administrative data; chart audit; local emergency department records; patient diaries</p>	<p>Results should be stratified by type of primary care services – family physician, nurse practitioner, other.</p> <p>Time frames for analysis should include within first 3 6 months and one year following discharge from hospital for index stroke event.</p> <p>Reasons for visits should be noted and included in analysis and reports of findings.</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
	vii. Proportion of patients who return home following stroke rehabilitation who receive community support services (e.g., homecare or respite).	<p>N: number of patients discharged to community following acute care or inpatient rehabilitation for stroke, who receive community support services</p> <p>D: number of patients discharged to community following acute care or inpatient rehabilitation for stroke</p>	Community care databases; service provider databases; patient diaries	<p>Important to include a description of the type of community support services received when reporting this measure.</p> <p>Data collection will be a challenge but the information is very important for planning service needs of the stroke population</p>
	viii. Length of time from hospital discharge to initiation of community support services following discharge from acute care or inpatient rehabilitation	<p>a. Median time from referral for community stroke services to commencement of services.</p> <p>b. Median time from discharge from acute care or inpatient rehabilitation following stroke to commencement of community support services.</p>	Community care databases; service provider databases; patient diaries	<p>Important to include a description of the type of community support services received when reporting this measure.</p> <p>Data collection will be a challenge but the information is very important for planning service needs of the stroke population</p>
	ix. Frequency and duration of community support services, provided by each service type received by stroke patients following discharge from acute care or inpatient rehabilitation	<p>a. Median/average number of visits/service encounters by each type of community support service received</p> <p>b. Median/average duration of each encounter by service type</p> <p>c. Median/average number of weeks of service received by each service type</p>	Provider databases for service tracking or kept for workload measurement may be accessible; patient diaries.	<p>Important to include a description of the type of community support services received when reporting this measure.</p> <p>Data collection will be a challenge but the information is very important for planning service needs of the stroke population</p>
	x. Proportion of stroke patients discharged from inpatient rehabilitation to the community who require readmission to an acute care hospital for stroke related causes.	<p>N: number stroke patients readmitted to an acute care hospital from inpatient rehabilitation for stroke-related causes</p> <p>D: number of stroke patients admitted to inpatient rehabilitation</p>	Administrative databases; Local facility records; chart audit	<p>Reason for readmissions should be for stroke related causes. Therefore the same ICD_10 codes that are used for identifying the original stroke cohort should also be used to identify the readmissions.</p> <p>Readmissions should be measured at 3 months, 6 months, and one year following index stroke event.</p>
	xi. Proportion of patients who return to the community from acute hospital stay or following inpatient rehabilitation who require admission to long term care/nursing home. c	<p>N: number of stroke patients with admissions to long term care following discharge from acute care or inpatient rehabilitation back to the community</p> <p>D: number of stroke patients discharged to the community following acute care or inpatient rehabilitation.</p>	Home care provider databases; provincial long term care databases; administrative databases for long term care	<p>Admissions to long-term care homes should be measured and reported for 3 months, 6 months, and one year following index stroke event.</p> <p>Reasons for admission to long term care should be determined and included as explanatory information in reports of findings for this measure.</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
	<p>xii. Median wait time from referral of a stroke patient for admission to along term care/nursing home until admission to the facility</p>	<p>a. Median time from referral to admission (days) to long term care home</p>	<p>Home care provider databases; provincial databases; administrative databases for long term care</p>	<p>Quartiles should be reported, and this measure should be reported by regions to account for variations in access to long term care beds across geographic regions.</p> <p>Reasons for admission and reasons for extended delays for admission to long term care should be determined and included as explanatory information in reports of findings for this measure. Measures of functional status should also be reported with this measure where possible to aid in understanding of reasons for admission.</p>
	<p>xiii. Proportion of stroke patients discharged to the community that have documentation to indicate that screening for fitness to drive was completed and related patient counseling was performed.</p>	<p>N: number of stroke patients with documentation of initial driving status and fitness to drive screening before discharge from acute inpatient care or inpatient rehabilitation to the community</p> <p>D: number of stroke patients discharged to the community following acute care or inpatient rehabilitation.</p>	<p>Local/regional data, chart audit, stroke registries, patient diaries</p>	<p>A standardized screening tool for fitness to drive should be used with all stroke patients being discharged back to the community. The tools used for screening should be described and reported on in conjunction with this measure.</p> <p>Screening for fitness to drive may occur in many settings along the continuum by different healthcare providers. It should be measured and reported at all transition points.</p> <p>Advocacy for improved documentation of screening for fitness to drive may be required as a component of implementing this measure to improve data quality and availability.</p>
	<p>xiv. Proportion of stroke patients referred for driving assessment by an occupational therapist or other trained healthcare professional after discharge to the community.</p>	<p>N: number of stroke patients referred for driving assessment by an occupational therapist or other trained healthcare professional after discharge to the community.</p> <p>D: number of stroke patients discharged to the community following acute care or inpatient rehabilitation.</p>	<p>Local/regional data, chart audit, stroke registries, patient diaries.</p> <p>Occupational therapist workload databases or case notes may provide information.</p>	<p>Driving is an important issue especially for the younger stroke patients and monitoring this measure provides important information on community reintegration for this population.</p> <p>Mechanisms should be in place to facilitate access to data for this measure, such as identifying potential providers who perform driving assessments and establish a data collection process with them.</p>

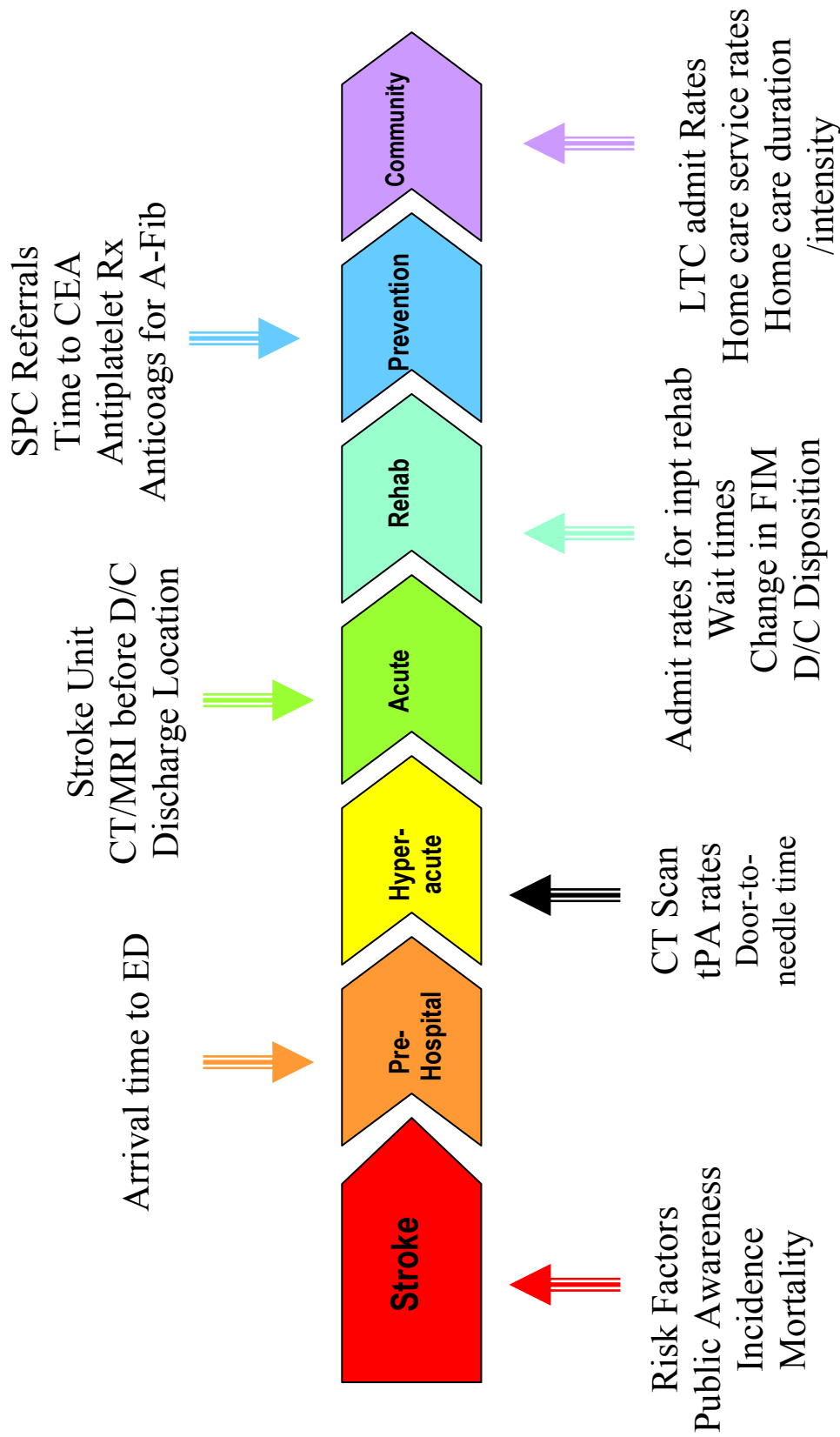
Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
	<p>xv. Measure of burden of care for family and care givers of stroke survivors living in the community.</p>	<p>N: Total burden of care on family members once stroke survivor returned to the community</p> <p>D: number of families surveyed.</p>	Local surveys	Identify validated and standardized tool to use for measurement of burden of care. Findings should be stratified by patient/caregiver age categories and gender, as well as stroke type and stroke severity as these have been found to be important factors that impact burden of care.
6. Selected Topics in Stroke Management				
6.1 Dysphagia Assessment	<p>i. Proportion of stroke patients with documentation that an initial dysphagia screening was performed during admission to the emergency department, acute care, and/or inpatient rehabilitation.</p> <p>ii. Proportion of stroke patients who have concerns identified on initial dysphagia screening who then receive a comprehensive assessment by a speech language pathologist or other appropriately trained health care professional.</p> <p>iii. Median time from patient arrival in the emergency department to initial swallowing screening by a trained clinician. (in minutes)</p>	<p>N: number of all stroke patients who have documentation that a dysphagia screening was performed</p> <p>D: total number of stroke patients admitted to the emergency department, acute inpatient care or inpatient rehabilitation.</p>	Local/regional data; chart audits; stroke registries.	<p>Need to clearly define and describe what constitutes a screen for dysphagia in the settings where this measure is being monitored and reported. Where possible a standardized dysphagia screening tool should be used and data collection should reflect the contents and outcomes of the tool.</p> <p>All types of stroke should be included in denominator.</p> <p>Dysphagia status may change (improve or worsen) during the first few months following stroke so this measure should be implemented at all transition points including return to the community and follow-up by home care and primary care.</p> <p>Dysphagia status may change (improve or worsen) during the first few months following stroke so this measure should be implemented at all transition points including return to the community and follow-up by home care and primary care.</p> <p>This measure should be monitored and reported in conjunction with performance measure 6.1 (ii).</p> <p>Median is preferred statistic as mean could be skewed. Both should be calculated.</p> <p>The types of healthcare specialists performing advanced swallowing assessment should be identified and described in the results for this measure.</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
6.2 Identification and Management of Post-Stroke Depression	<p>i. Proportion of stroke patients with documentation to indicate screening for depression was performed either informally or using a formal assessment tool in the acute care or inpatient rehabilitation setting following an acute stroke event.</p> <p>ii. Proportion of stroke patients who have concerns identified on initial depression screening who then receive a referral for a comprehensive assessment by a psychiatrist, psychologist, or other appropriately trained health care professional.</p> <p>iii. Proportion of stroke patients treated with antidepressants at 1 month, 3 months, 6 months and one year following initial stroke event</p>	<p>N: number of stroke patients with documentation to indicate screening for depression was performed either informally or using a formal assessment tool in the acute care or inpatient rehabilitation setting following an acute stroke event.</p> <p>D: Total number of stroke patients admitted to acute care or inpatient rehabilitation</p> <p><i>* This should be conducted at other transition points as well, and denominator altered to reflect the setting and appropriate cohort.</i></p> <p>N: number of patients with a referral made for assessment and investigation of post-stroke depression</p> <p>D: Total number of stroke patients admitted to acute care or inpatient rehabilitation</p> <p><i>* This should be conducted at other transition points as well, and denominator altered to reflect the setting and appropriate cohort.</i></p> <p>N: number of stroke patients treated with anti-depressants at 1 month/3 months/6 months/ 1 year following index stroke</p> <p>D: number of stroke patients admitted to acute care or inpatient rehabilitation</p>	<p>Local/regional data; chart audits; stroke registries.</p> <p>Local/regional data; chart audits; stroke registries.</p> <p>Local/regional data; chart audits; stroke registries; primary care billing records; provincial drug databases (may be limited to persons >65 in some provinces)</p>	<p>In reporting of this measure, include a description of whether the screening was done using a standardized depression tool or whether an informal assessment was conducted. If validated tool used for depression screening, results should reflect the content and outcomes of the tool.</p> <p>Post stroke depression status may change (improve or worsen) during the year or more following stroke so this measure should be implemented at all transition points including return to the community and follow-up by home care and primary care.</p> <p>This measure should be monitored and reported in conjunction with performance measure 6.2 (i).</p> <p>Post stroke depression status may change (improve or worsen) during the year or more following stroke so this measure should be implemented at all transition points including return to the community and follow-up by home care and primary care.</p> <p>Post stroke depression status may change (improve or worsen) during the year or more following stroke so this measure should be tracked at all transition points and through a range of providers including acute care, rehabilitation, and primary care.</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
<p>6.3</p> <p>Vascular Cognitive Impairment and Dementia</p>	<p>i. Proportion of persons with stroke who undergo a brief cognitive screening at each transition point along the continuum of care following inpatient discharge, and at any time when there is a <i>suspected</i> change in a patient's cognitive status.</p>	<p>N: number of stroke patients with documentation to indicate screening for vascular cognitive impairment was performed either informally or using a formal assessment tool in the acute care or inpatient rehabilitation setting following an acute stroke event.</p> <p>D: Total number of stroke patients admitted to acute care or inpatient rehabilitation</p> <p><i>* This should be conducted at other transition points as well, and denominator altered to reflect the setting and appropriate cohort.</i></p>	<p>Local/regional data; chart audits; stroke registries.</p>	<p>A standardized screening tool for vascular cognitive impairment (e.g. the MOCA) should be used and data collection should reflect the contents and outcomes of the tool.</p> <p>Signs of vascular cognitive impairment may change (improve or worsen) during the year or more following stroke so this measure should be tracked at all transition points and through a range of providers including acute care, rehabilitation, and primary care.</p> <p>Transition points may include: discharge from acute inpatient care and/or inpatient rehabilitation; visits to outpatient and ambulatory clinics and Stroke Prevention Clinics; during primary care follow-up; admission to long term care; and by other appropriate service providers.</p>
<p>ii.</p>	<p>Proportion of stroke patients who have concerns identified on initial screening for vascular cognitive impairment who then receive a referral for a comprehensive cognitive/neuropsychological assessment by a neuropsychologist, or other appropriately trained health care professional.</p>	<p>N: number of patients with a referral made for assessment and investigation of vascular cognitive impairment</p> <p>D: Total number of stroke patients admitted to acute care or inpatient rehabilitation</p> <p><i>* This should be conducted at other transition points as well, and denominator altered to reflect the setting and appropriate cohort.</i></p>	<p>Local/regional data; chart audits; stroke registries.</p>	<p>Signs of vascular cognitive impairment may change (improve or worsen) during the year or more following stroke so this measure should be tracked at all transition points and through a range of providers including acute care, rehabilitation, and primary care.</p> <p>Transition points may include: discharge from acute inpatient care and/or inpatient rehabilitation; visits to outpatient and ambulatory clinics and Stroke Prevention Clinics; during primary care follow-up; admission to long term care; and by other appropriate service providers.</p>
<p>iii.</p>	<p>Percentage improvement in control of high blood pressure and other vascular risk factors in patients with vascular cognitive impairment.</p>	<p>N: number of stroke patients with vascular cognitive impairment (VCI) with controlled blood pressure and other variable risk factors</p> <p>D: All patients with vascular cognitive impairment and identified vascular risk factors</p>	<p>Local chart audits; National Surveillance systems for blood pressure, diabetes, stroke</p>	<p>See performance measures in section 2.0 – Prevention of Stroke – in this manual for a full list of performance measures related to this area.</p>

Best Practice Recommendation	Recommended Performance Measures	Calculation Formulas	Data Sources	Additional Comments
<p>6.4</p> <p>Shoulder Pain Assessment and Treatment</p>	<p>i. Length of stay during acute care hospitalization and inpatient rehabilitation for patients experiencing shoulder pain</p> <p>ii. Proportion of stroke patients who experience shoulder pain in acute care hospital, inpatient rehabilitation, and following discharge into the community.</p> <p>iii. Proportion of stroke patients who report shoulder pain at 3 months and 6 month following a stroke.</p> <p>iv. Pain intensity rating change from baseline to defined measurement periods.</p> <p>v. Motor score change from baseline at defined measurement periods.</p> <p>vi. Range of shoulder external rotation before and after treatment for shoulder pain.</p> <p>vii. Proportion of patients with restricted range of motion related to shoulder pain.</p>	<p>N: Median length of stay from admission to discharge from acute care or inpatient rehabilitation for all patients who have documentation of shoulder pain following stroke</p> <p>D: number of stroke patients in an inpatient acute care or rehabilitation facility with documentation of shoulder pain following stroke</p> <p>N: number of patients with documentation of shoulder pain</p> <p>D: number of stroke patients admitted to each setting</p> <p>N: number of patients experiencing shoulder pain at 3 and/or 6 months following discharge</p> <p>D: number of stroke patients with shoulder pain during hospitalization who are included in follow-up assessments</p> <p>a. Median/average change in pain score from previous pain score assessment to current pain score assessment</p> <p>a. Median/average change in motor functional score from previous assessment to current assessment</p> <p>a. Median/average change in external rotation score from previous assessment to current assessment</p> <p>N: number of stroke patients with upper limb contractures at 30 days and 3 months following stroke</p> <p>D: total number of stroke patients who have documented shoulder pain</p>	<p>Administrative data</p> <p>Local/regional data; chart audits; stroke registries</p> <p>Local/regional data; chart audits; stroke registries</p> <p>Local/regional data; chart audits; stroke registries; patient diaries.</p> <p>Local/regional data; chart audits; stroke registries; patient diaries</p> <p>Local/regional data; chart audits; stroke registries</p> <p>Local/regional data; chart audits; stroke registries</p> <p>Local/regional data; chart audits; stroke registries</p>	<p>Length of stay for stroke patients with shoulder pain should be compared to length of stay for stroke patients without documentation of shoulder pain to determine the impact of shoulder pain on length of stay.</p> <p><i>Also see comments for performance measure 4.2 (ii) regarding calculating and reporting length of stay data.</i></p> <p>Shoulder pain is not routinely coded in administrative databases as a condition that arises after hospital admission so administrative databases are generally not reliable for measuring this outcome.</p> <p>Require mechanism to conduct follow-up assessments, if patient has left inpatient rehabilitation facility prior to the assessment time frames.</p> <p>A standardized pain scale should be selected for use by all patients, and time frames for measurement should be determined and clearly stated. This will enable clear interpretation of the findings and comparisons.</p> <p>A standardized motor functional scale should be selected for use by all patients, and time frames for measurement should be determined and clearly stated.</p> <p>A standardized external rotation measurement scale should be selected for use by all patients, and time frames for measurement should be determined and clearly stated.</p> <p>A standardized range of motion measurement scale should be selected for use by all patients, and time frames for measurement should be determined and clearly stated.</p>

Appendix One: Canadian Stroke Strategy Core Performance Measures (2005 Consensus)



Appendix 1b:

Recommended Core Indicators for the Canadian Stroke Strategy <i>(Based on results of 2005 CSS Information and Evaluation Consensus Process)</i>	
1.0 Overall Stroke Incidence	
1.1	The incidence of stroke in each province by stroke type.
1.2	The stroke mortality rates across provinces and territories, including in-hospital, 30 – day and one-year.
1.3	The proportion of patients in the population who have identified risk factors for stroke including: hypertension, obesity, smoking history, low physical activity, hyperlipidemia, diabetes mellitus, atrial fibrillation
2.0 Public Awareness and Primary Stroke Prevention	
2.1	Proportion of the population aware of 2 or more signs of stroke
3.0 Pre-Hospital and Emergency Stroke Care	
3.1	Proportion of acute stroke patients who arrive at hospital within 2.5 hours of stroke symptom onset for all stroke types
3.2	Proportion of all ischemic stroke patients who receive acute thrombolytic therapy (tPA).
3.3	Proportion of all thrombolysed ischemic stroke patients who receive acute thrombolytic therapy (tPA) within one hour of hospital arrival.
4.0 In-Hospital Stroke Care	
4.1	The proportion of all acute stroke patients who are managed on a designated acute stroke unit at any point during hospitalization.
4.2	Proportion of acute ischemic stroke patients discharged on antithrombotic therapy unless contraindicated.
4.3	Proportion of acute stroke patients with atrial fibrillation who are treated with anti-coagulant therapy unless contraindicated.
4.4	Proportion of stroke patients who receive a brain CT/MRI prior to hospital discharge.
4.5	Proportion of patients discharged to their home or place of residence following an inpatient admission for stroke.
5.0 Stroke Rehabilitation	
5.1	Proportion of acute stroke patients discharged from acute care to inpatient rehabilitation.
5.2	Wait times for inpatient and outpatient stroke rehabilitation services.
5.3	Proportion of patients discharged home or to place of residence following an inpatient rehabilitation admission for stroke.
6.0 Secondary Stroke Prevention	
6.1	Proportion of patients with TIA who are discharged from the emergency department who are seen within 24 or 72 hours in a designated hospital-based or community secondary prevention clinic.
6.2	Median wait time from stroke symptom onset to carotid endarterectomy surgery
7.0 Community Stroke Care and Re-Engagement	
7.1	Proportion of acute stroke patients discharged from acute care to a long-term care home (who were not previously a resident of a LTC home).
7.2	Proportion of patients who are discharged from acute care who receive a referral for home care/community supportive services.

Appendix 2: Stroke Case Definitions

The following stroke code groupings should be applied when identifying stroke cases for performance measurement and monitoring. Activities related to this may include quality improvement, surveillance and research in stroke.

The CSS is working in collaboration with the Public Health Agency of Canada Surveillance division on several initiatives. The case definitions for stroke contained in the following table are aligned with codes used in PHAC reports on stroke care and will be applied to the stroke component of the National Diabetes and Chronic Disease Surveillance System (NDCSS).

	Stroke subcategory	ICD-9 codes*	ICD-10 codes*
1.	Acute stroke	430 431 434 436 362.3 ^b	I60 I61 I63 (excl. I63.6) ^a I64 ^d H34.1 ^b
2.	Ischemic stroke (includes acute but ill-defined cerebrovascular)	433 ^c 434 ^c 436	I63 (excl. I63.6) ^a I64 ^d
3.	Subarachnoid hemorrhage	430	I60
4.	Intracerebral hemorrhage	431	I61
5.	Transient ischemic attack	435	G45 (excl. G45.4) ^c
6.	Cerebral Cortical Vein Thrombosis or Intracranial Venous Sinus Thrombosis (nonpyogenic)	437.6	I63.6 ^a I67.6
7.	Arteriovenous Malformation (cerebral) Arterial Malformation (cerebral)	747.6 747.81	I60.8 (Ruptured) ^f
8.	All Cerebrovascular diseases (Adult)	430 431 432 ^A 433 434 436 437 (excl 437.6) 438	I60 I61 I62 ^e I63 (Excl. I63.6) I64 I65 I66 I67 (excl. I67.6) I68 I69

Notes:

- * In all case selections, ICD9 and ICD10 coding should be applied to the 5th digit (ICD9) or 4th digit (ICD10) where available. See specific notes below regarding exceptions and exclusions to the case codes.
 - a. 437.6, I63.6, I67.6 – *Cerebral venous thrombosis*. This is uncommon in adults (<<1% of all stroke) and has a different pathology compared to arterial stroke. In children a much greater proportion of strokes are due to venous thrombosis. Therefore we exclude from the adult acute stroke case definitions and include in the paediatric stroke cases (0 – 18 year age group). [Note: codes 325 and G08 refer to septic intracranial venous thrombophlebitis and are excluded here.]
 - b. 362.3/H34.1 - *Central Retinal Artery Occlusion*. Impractical to include retinal vascular occlusion if 4th digit coding is not available; include where information is available. Huge variation will exist across provinces for this code, however. Overall impact of including this code may be small.
 - c. 433/434 – Both require 5th digit coding and should not be used if it is not available; include where information is available and the fifth digit is coded as a ‘1’ indicating infarction present (ie. 433.x1 or 434.x1, where x can be any number)
 - d. I64 – *Stroke, not specified as hemorrhage or infarction*. Generally included in overall acute stroke. Cannot be counted on its own as a separate stroke type. Efforts should be made to reduce use of this code as almost all stroke patients receive a CT scan and based on the scan they should be able to be categorized as ischemic or hemorrhagic. Generally, the issue seems to be that health records abstractors are not trained in all the possible terminology that may be used for ischemic stroke, and they look for the word ‘infarction’ to classify I-63. This term is not used as frequently as the following list: ischaemic stroke, small vessel stroke, lacunar stroke, stroke from atrial fibrillation, ischemic cerebrovascular insult presumably from an embolic location, right MCA stroke, L MCA distribution secondary to small vessel ischemia. Abstractors should be provided with this additional list and efforts made to reduce use of I-64 category.
 - e. I62, 432 – Codes for non-specific hemorrhage or subdural hemorrhage are excluded. To be consistent with past coding practices for comparison purposes, these codes are included in the “all cerebrovascular disease” category. Some patients with these codes will have a hemorrhagic stroke syndrome rather than simply a subdural hemorrhage.
 - f. Unruptured AV malformations and aneurysms are not considered stroke and are therefore not included in acute stroke case definitions. They are coded as Q28 in ICD_10, with Q28.2 and Q.28.3 specifically being for the cerebral vessels.

Appendix 3: Stroke-Related Investigation Codes

<u>Stroke Investigations</u>	<u>ICD9 (CCP)</u>	<u>ICD10 (CCI)</u>
Chest X-ray ⁱ	87.39, 87.44, 87.49	3GY10
ECG ⁱ	89.52	2HZ24
CT Scan ⁱⁱ	87.03	3AN20 <i>Brain</i> 3ER20 <i>Head</i>
MRI ⁱⁱ	88.91	3AN40 <i>Brain</i> 3ER40 <i>Head</i>
Carotid Doppler ⁱ	88.71	3JE30
Leg Dopplers ⁱ	88.77	3KG30
Echocardiogram (2D) ⁱ	88.72	3IP30
Echocardiogram (TEE) ⁱ		
tPA Administration ⁱⁱⁱ (prior to April 1st, 2009)	99.10 ⁱⁱ	1ZZ35HAC1 or 1JW35HAC1 ⁱⁱⁱ
Carotid Endarterectomy	50.12	1.JE.50, 1.JE.57, 1.JE.87

Notes:

- i. The diagnostic investigations listed in this table with a superscript 'i' have not been designated as mandatory data elements to be reported in the Canadian Institute for Health Information Discharge Abstract Database (DAD) and the National Ambulatory Care Reporting System (NACRS). Reporting is sporadic and results should be considered an underestimate of actual diagnostics that stroke patients receive. Data for these investigations should be confirmed through chart audit, diagnostic imaging databases and other targeted tracking mechanisms.
- ii. CT scans and MRI are designated for mandatory reporting in some provinces where they are a component of wait-time strategies, and optional to report in administrative databases in other provinces. In addition, individual institutions across Canada have designated CT and MRI as mandatory reporting for internal purposes. Results for these investigations in administrative data should be considered an underestimate of actual diagnostic rates for stroke patients. Data for these investigations should be confirmed through chart audit, diagnostic imaging databases and other targeted tracking mechanisms.
- iii. ICD_9 and ICD_10 (until March 31st, 2009) do not include dedicated unique codes for acute thrombolysis administration (tPA). The codes provided here have been designated by the Canadian Institute for Health Information for use in coding tPA. However, validation studies have shown that these codes are not consistently or exclusively used for tPA in the Discharge Abstract Database (DAD) and the National Ambulatory Care Reporting System (NACRS), therefore data from these sources on tPA administration is unreliable and should be validated with chart audit and other tracking systems. Effective April 1st, 2010, a dedicated ICD_10 code will be assigned for tPA administration. This code has not been made available as of the publication date of this manual. A bulletin will be posted on the CSS website when the codes are made public.

APPENDIX 4: ICD10 codes for select comorbidities and potential complications

Condition	ICD-9 ^	ICD-10 ^
Hypertension	401	I-10
Angina	411, 413.9	I-20
Atrial Fibrillation	427.3	I-48
Acute Myocardial Infarction	410	I-21
Diabetes mellitus	250	E10 - E14
Gastrointestinal hemorrhage	578	K-92.2
Venous thrombo-embolism of deep vessels of lower extremity	453.41, 453.42	I-80
Pneumonia	480 - 487	J-13, J-14, J-15
New Stroke	<i>See Appendix 2 for stroke case definitions</i>	

Notes:

- ^ The condition codes provided in this list are derived from the International Classification of Disease manuals (versions 9 and 10). The hypertension, acute myocardial infarction and diabetes codes have been validated in published studies. We provide codes in this manual for common conditions related to stroke – either as risk factors or potential complications. Codes used in these contexts should be further validated as required prior to being applied in research or performance measurement activities.