Quality-Based Procedures: Clinical Handbook for **Stroke**

Health Quality Ontario &
Ministry of Health and Long-Term Care

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Ontario

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List of Abbreviations

CAN	Clinical Assessment Node
CHF	Congestive heart failure
COPD	Chronic obstructive pulmonary disease
DAD	Discharge Abstract Database
ED	Emergency department
Expert Panel	Episode of Care for Stroke Expert Advisory Panel
GRADE	Grades of Recommendation, Assessment, Development, and Evaluation
HBAM	Health-Based Allocation Model
HIG	Health-Based Allocation Model Inpatient Grouper
HQO	Health Quality Ontario
HSFR	Health System Funding Reform
ICH	Intracerebral hemorrhage
LHIN	Local Health Integration Network
Ministry	Ministry of Health and Long-Term Care
MCC	Major Clinical Category
MRDx	Most responsible diagnosis
NACRS	National Ambulatory Care Reporting System
OHTAC	Ontario Health Technology Advisory Committee
OSA	Ontario Stroke Audit
OSN	Ontario Stroke Network
OSR	Ontario Stroke Registry
PBF	Patient-Based Funding
QBF	Quality-Based Funding
QBP	Quality-Based Procedure
RCT	Randomized controlled trial
TIA	Transient ischemic attack

Preface

The content in this document has been developed through collaborative efforts between the Ministry of Health and Long-Term Care ("Ministry"), Health Quality Ontario (HQO), and the HQO Episode of Care for Stroke Expert Advisory Panel ("Expert Panel").

The template for the Quality-Based Procedures Clinical Handbook and all content in Section 1 ("Purpose") and Section 2 ("Introduction") were provided in standard form by the Ministry. All other content was developed by HQO with input from the Expert Panel.

To consider the content of this document in the appropriate context, it is important to take note of the specific deliverables that the Ministry tasked HQO with developing for this Clinical Handbook. The following is an excerpt from the HQO–Ministry Accountability Agreement for fiscal year 2012/13:

> *To guide HQO's support to the funding reform, HQO will:*
>
> 1. *Conduct analyses/consultation in the following priority areas in support of funding strategy implementation for the 2013/14 fiscal year:*
>   a) *Chronic Obstructive Pulmonary Disease,*
>   b) *Congestive Heart Failure, and*
>   c) *Stroke.*
>
> 2. *Include in their analyses/consultation noted in clause 21, consultations with clinicians and scientists who have knowledge and expertise in the identified priority areas, either by convening a reference group or engaging an existing resource of clinicians/scientists.*
>
> 3. *Work with the reference group to:*
>   a) *Define the population/patient cohorts for analysis,*
>   b) *Define the appropriate episode of care for analysis in each cohort, and*
>   c) *Seek consensus on a set of evidence-based clinical pathways and standards of care for each episode of care.*
>
> 4. *Submit to the Ministry their draft report as a result of the consultations/analysis outlined in clause 22 above on October 31st and its final report on November 30th, and include in this a summary of its clinical engagement process.*

Following sign-off on the Accountability Agreement, the Ministry subsequently asked HQO to also develop the following additional content for each of the 3 assigned clinical areas:

a) Guidance on the development of performance indicators aligned with the recommended episodes of care to inform the Ministry's Quality-Based Procedure (QBP) Integrated Scorecard.

b) Guidance on the real-world implementation of the recommended practices contained in the Clinical Handbook, with a focus on implications for multi-disciplinary teams, service capacity planning considerations and new data collection requirements.

Key Principles

At the start of this project, discussions between HQO, the 3 Episode of Care Expert Advisory Panels and the Ministry established a set of key principles or 'ground rules' to guide this evolving work:

- **HQO's work will not involve costing or pricing.** All costing and pricing work related to the QBP funding methodology will be completed by the Ministry using a standardized approach, informed by the content produced by HQO. This principle also extended to the deliberations of the Expert Panels, where discussions were steered away from considering the dollar cost of particular interventions or models of care and instead focused on quality considerations and non-cost measures of utilization, such as length of stay.

- **The scope of this phase of work will focus on hospital care.** Given that the Ministry's QBP efforts for 2013/14 focus largely on hospital payment, HQO was asked to adopt a similar focus with its work on episodes of care. Notwithstanding, all 3 Expert Panels emphasized the importance of extending this analysis beyond hospital care alone to also examine post-acute and community care. Stroke is a condition that spans all parts of the continuum of care, with hospitalization being only one piece of this continuum; future efforts will need to also address community-based care to have full impact on all parts of the health system.

  Recognizing the importance of this issue, the Ministry has communicated that, following the initial phase of deliverables, work will continue in all 3 clinical areas to extend the episodes of care to include community-based services.

- **Recommended practices, supporting evidence, and policy applications will be reviewed and updated at least every 2 years.** The limited 4-month timeframe provided for the completion of this work meant that many of the recommended practices in this document could not be assessed with the full rigour and depth of HQO's established evidence-based analysis process. Recognizing this limitation, HQO reserves the right to revisit the recommended practices and supporting evidence at a later date by conducting a full evidence-based analysis or to update this document with relevant new published research. In cases where the episode of care models are updated, any policy applications informed by the models should also be similarly updated.

  Consistent with this principle, the Ministry has stated that the QBP models will be reviewed at least every 2 years.

- **Recommended practices should reflect the best patient care possible, regardless of cost or barriers to access.** HQO and the Expert Panels were instructed to focus on defining best practice for an *ideal* episode of care, regardless of cost implications or potential barriers to access. Hence, the resulting cost implications of the recommended episodes of care are not known. However, all 3 Expert Panels have discussed a number of barriers that will challenge implementation of their recommendations across the province. These include gaps in measurement capabilities for tracking many of the recommended practices, shortages in health human resources and limitations in community-based care capacity across many parts of the province.

  Some of these barriers and challenges are briefly addressed in the section "Implementation of Best Practices." However, the Expert Panels noted that, with the limited time they were provided to address these issues, the considerations outlined here should only be viewed as an initial starting point towards a comprehensive analysis of these challenges.

Finally: HQO and the Stroke Episode of Care Expert Panel recognize that given the limitations of their mandate, much of the ultimate impact of this content will depend on subsequent work by the Ministry to incorporate the analysis and advice contained in this document into the Quality-Based Procedures policy

framework and funding methodology. This will be complex work, and it will be imperative to ensure that any new funding mechanisms deployed are well-aligned with the recommendations of the Expert Panel.

Nevertheless, the Expert Panel believes that, regardless of the outcome of efforts to translate this content into hospital funding methodology, the recommended practices in this document can also provide the basis for setting broader provincial standards of care for stroke. These standards could be linked not only to funding mechanisms, but to other health system change levers such as guidelines and care pathways, performance measurement and reporting, program planning and quality improvement activities.

Purpose

Provided by the Ministry of Health and Long-Term Care

This Clinical Handbook has been created to serve as a compendium of the evidence-based rationale and clinical consensus driving the development of the policy framework and implementation approach for stroke patients seen in hospitals.

This handbook is intended for a clinical audience. It is not, however, intended to be used as a clinical reference guide by clinicians and will not be replacing existing guidelines and funding applied to clinicians. Evidence-informed pathways and resources have been included in this handbook for your convenience.

Introduction to Quality-Based Procedures

Provided by the Ministry of Health and Long-Term Care

Quality-Based Procedures (QBPs) are an integral part of Ontario's Health System Funding Reform (HSFR) and a key component of Patient-Based Funding (PBF). This reform plays a key role in advancing the government's quality agenda and its *Action Plan for Health Care.* HSFR has been identified as an important mechanism to strengthen the link between the delivery of high quality care and fiscal sustainability.

Ontario's health care system has been living under global economic uncertainty for a considerable time. Simultaneously, the pace of growth in health care spending has been on a collision course with the provincial government's deficit recovery plan.

In response to these fiscal challenges and to strengthen the commitment towards the delivery of high quality care, the *Excellent Care for All Act* (ECFAA) received royal assent in June 2010. ECFAA is a key component of a broad strategy that improves the quality and value of the patient experience by providing them with the right evidence-informed health care at the right time and in the right place. ECFAA positions Ontario to implement reforms and develop the levers needed to mobilize the delivery of high quality, patient-centred care.

Ontario's *Action Plan for Health Care* advances the principles of ECFAA, reflecting quality as the primary driver to system solutions, value, and sustainability.

What Are We Moving Towards?

Prior to the introduction of HSFR, a significant proportion of hospital funding was allocated through a global funding approach, with specific funding for some select provincial programs and wait times services. However, a global funding approach reduces incentives for health service providers to adopt best practices that result in better patient outcomes in a cost-effective manner.

To support the paradigm shift from a culture of cost containment to that of quality improvement, the Ontario government is committed to moving towards a patient-centred, evidence-informed funding model that reflects local population needs and contributes to optimal patient outcomes (Figure 1).

PBF models have been implemented internationally since 1983. Ontario is one of the last leading jurisdictions to move down this path. This puts the province in a unique position to learn from international best practices and the lessons others learned during implementation, thus creating a funding model that is best suited for Ontario.

PBF supports system capacity planning and quality improvement through directly linking funding to patient outcomes. PBF provides an incentive to health care providers to become more efficient and effective in their patient management by accepting and adopting best practices that ensure Ontarians get the right care at the right time and in the right place.

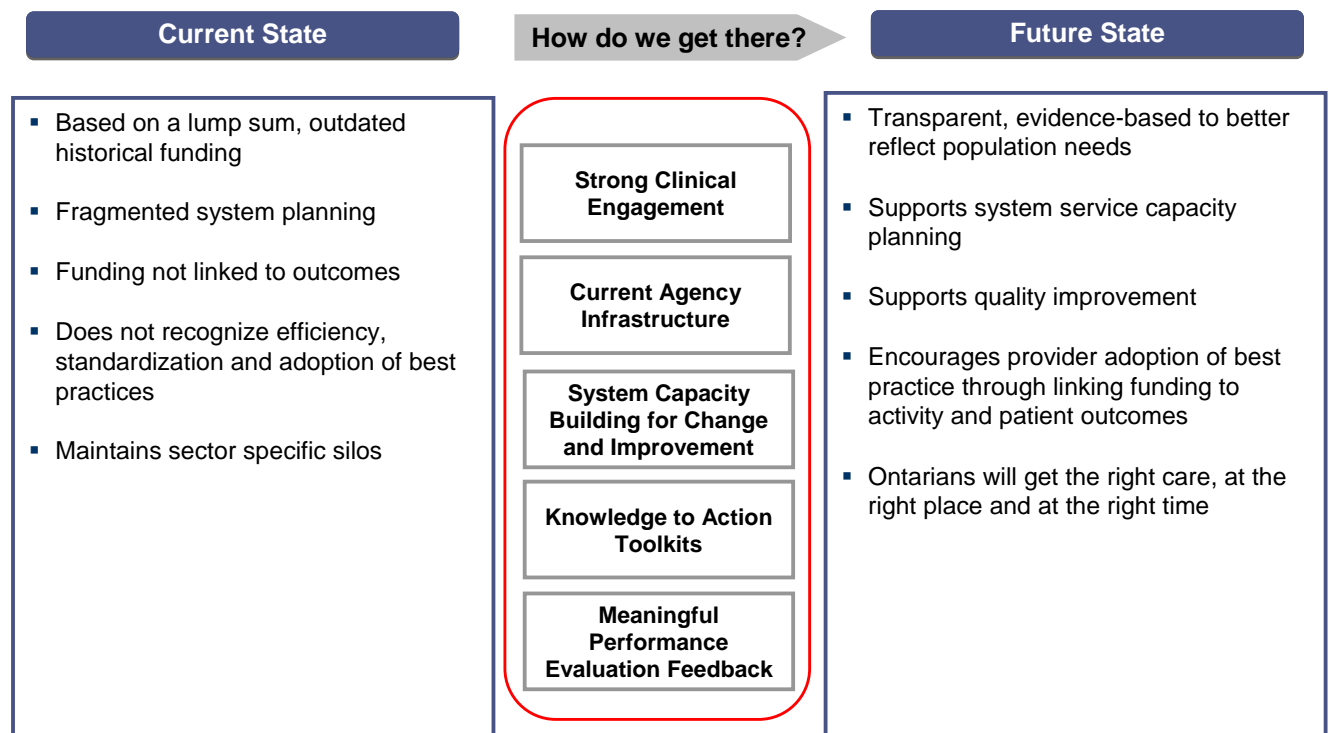| Current State	How do we get there?	Future State
▪ Based on a lump sum, outdated historical funding ▪ Fragmented system planning ▪ Funding not linked to outcomes ▪ Does not recognize efficiency, standardization and adoption of best practices ▪ Maintains sector specific silos	**Strong Clinical Engagement** **Current Agency Infrastructure** **System Capacity Building for Change and Improvement** **Knowledge to Action Toolkits** **Meaningful Performance Evaluation Feedback**	▪ Transparent, evidence-based to better reflect population needs ▪ Supports system service capacity planning ▪ Supports quality improvement ▪ Encourages provider adoption of best practice through linking funding to activity and patient outcomes ▪ Ontarians will get the right care, at the right place and at the right time

Figure 1: Current and Future States of Health System Funding

How Will We Get There?

The Ministry of Health and Long-Term Care has adopted a 3-year implementation strategy to phase in a PBF model and will make modest funding shifts starting in fiscal year 2012/13. A 3-year outlook has been provided to support planning for upcoming funding policy changes.

The Ministry has released a set of tools and guiding documents to further support the field in adopting the funding model changes. For example, a QBP interim list has been published for stakeholder consultation and to promote transparency and sector readiness. The list is intended to encourage providers across the continuum to analyze their service provision and infrastructure in order to improve clinical processes and, where necessary, build local capacity.

The successful transition from the current, provider-centred funding model towards a patient-centred model will be catalyzed by a number of key enablers and field supports. These enablers translate to actual principles that guide the development of the funding reform implementation strategy related to QBPs. These principles further translate into operational goals and tactical implementation (Figure 2).
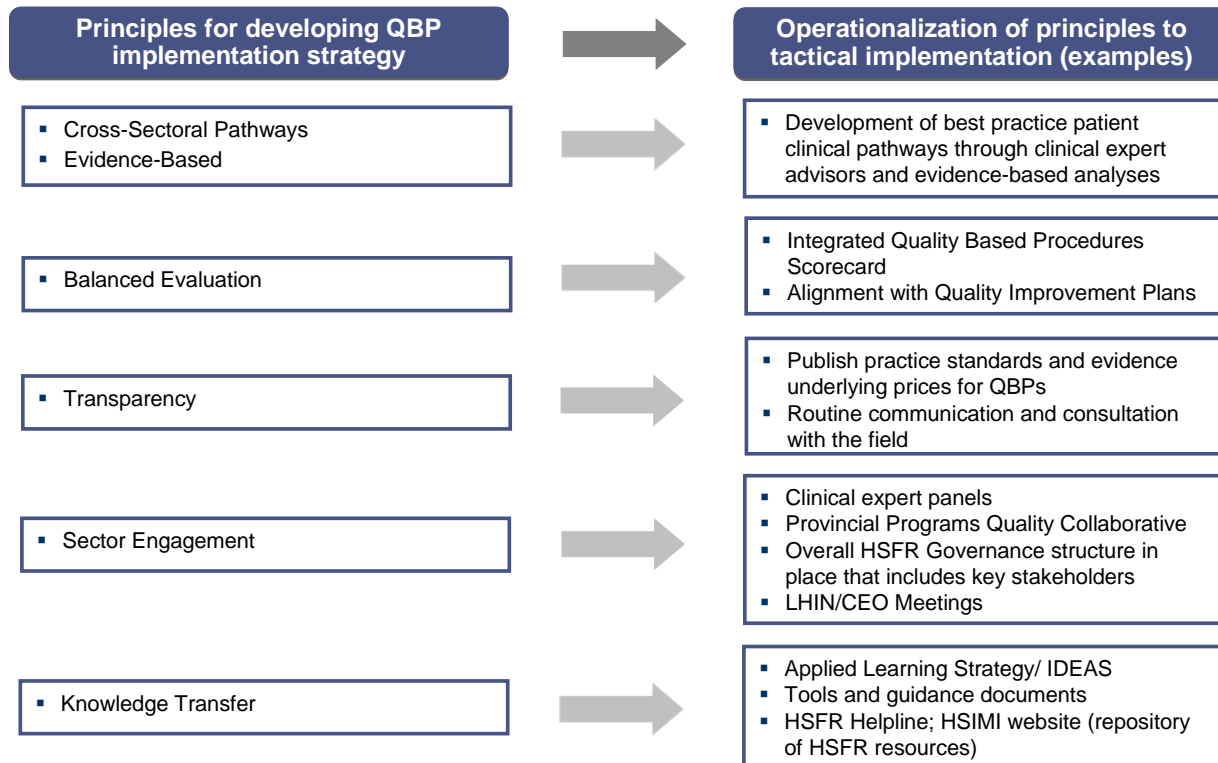
Principles for developing QBP implementation strategy	Operationalization of principles to tactical implementation (examples)
▪ Cross-Sectoral Pathways ▪ Evidence-Based	▪ Development of best practice patient clinical pathways through clinical expert advisors and evidence-based analyses
▪ Balanced Evaluation	▪ Integrated Quality Based Procedures Scorecard ▪ Alignment with Quality Improvement Plans
▪ Transparency	▪ Publish practice standards and evidence underlying prices for QBPs ▪ Routine communication and consultation with the field
▪ Sector Engagement	▪ Clinical expert panels ▪ Provincial Programs Quality Collaborative ▪ Overall HSFR Governance structure in place that includes key stakeholders ▪ LHIN/CEO Meetings
▪ Knowledge Transfer	▪ Applied Learning Strategy/ IDEAS ▪ Tools and guidance documents ▪ HSFR Helpline; HSIMI website (repository of HSFR resources)

Figure 2: Principles Guiding Implementation of Quality-Based Procedures
Abbreviations: HSFR, Health System Funding Reform; HSIMI, Health System Information Management and Investment: IDEAS, Improving the Delivery of Excellence Across Sectors; LHIN, Local Health Integration Network; QBP. Quality-Based Procedures.

What Are Quality-Based Procedures?

QBPs involve clusters of patients with clinically related diagnoses or treatments. Stroke was chosen as a QBP using an evidence- and quality-based selection framework that identifies opportunities for process improvements, clinical redesign, improved patient outcomes, enhanced patient experience, and potential cost savings.

The evidence-based framework used data from the Discharge Abstract Database (DAD) adapted by the Ministry of Health and Long-Term Care for its Health-Based Allocation Model (HBAM) repository. The HBAM Inpatient Grouper (HIG) groups inpatients based on their diagnosis or their treatment for the majority of their inpatient stay. Day surgery cases are grouped in the National Ambulatory Care Referral System (NACRS) by the principal procedure they received. Additional data were used from the Ontario Case Costing Initiative (OCCI). Evidence in publications from Canada and other jurisdictions and World Health Organization reports was also used to assist with the patient clusters and the assessment of potential opportunities.

The evidence-based framework assessed patients using 4 perspectives, as presented in Figure 3. This evidence-based framework has identified QBPs that have the potential to both improve quality outcomes and reduce costs.
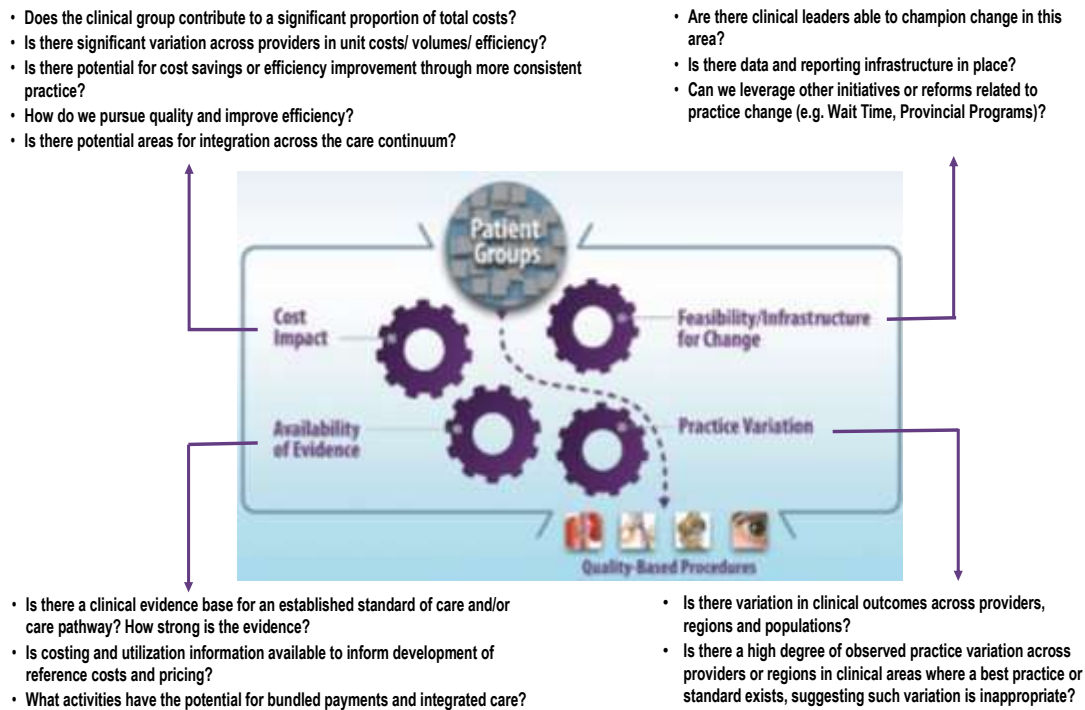
- Does the clinical group contribute to a significant proportion of total costs?
- Is there significant variation across providers in unit costs/ volumes/ efficiency?
- Is there potential for cost savings or efficiency improvement through more consistent practice?
- How do we pursue quality and improve efficiency?
- Is there potential areas for integration across the care continuum?

- Are there clinical leaders able to champion change in this area?
- Is there data and reporting infrastructure in place?
- Can we leverage other initiatives or reforms related to practice change (e.g. Wait Time, Provincial Programs)?

- Is there a clinical evidence base for an established standard of care and/or care pathway? How strong is the evidence?
- Is costing and utilization information available to inform development of reference costs and pricing?
- What activities have the potential for bundled payments and integrated care?

- Is there variation in clinical outcomes across providers, regions and populations?
- Is there a high degree of observed practice variation across providers or regions in clinical areas where a best practice or standard exists, suggesting such variation is inappropriate?

Figure 3: Evidence-Based Framework

Practice Variation

The DAD stores every Canadian patient discharge, coded and abstracted, for the past 50 years. This information is used to identify patient transition through the acute care sector, including discharge locations, expected lengths of stay and readmissions for each and every patient, based on their diagnosis and treatment, age, gender, comorbidities and complexities, and other condition-specific data. A demonstrated large practice or outcome variance may represent a significant opportunity to improve patient outcomes by reducing this practice variation and focusing on evidence-informed practice. A large number of "Beyond Expected Days" for length of stay and a large standard deviation for length of stay and costs are flags to such variation. Ontario has detailed case-costing data for all patients discharged from a case-costing hospital from as far back as 1991, as well as daily utilization and cost data by department, by day, and by admission.

Availability of Evidence

A significant amount of Canadian and international research has been undertaken to develop and guide clinical practice. Using these recommendations and working with the clinical experts, best practice guidelines and clinical pathways can be developed for these QBPs, and appropriate evidence-informed indicators can be established to measure performance.

Feasibility/Infrastructure for Change

Clinical leaders play an integral role in this process. Their knowledge of the patients and the care provided or required represents an invaluable component of assessing where improvements can and should be made. Many groups of clinicians have already provided evidence for rationale-for-care pathways and evidence-informed practice.

Cost Impact

The selected QBP should have no fewer than 1,000 cases per year in Ontario and represent at least 1% of the provincial direct cost budget. While cases that fall below these thresholds may, in fact, represent improvement opportunity, the resource requirements to implement a QBP may inhibit the effectiveness for such a small patient cluster, even if there are some cost efficiencies to be found. Clinicians may still work on implementing best practices for these patient subgroups, especially if they align with the change in similar groups. However, at this time, there will be no funding implications. The introduction of evidence into agreed-upon practice for a set of patient clusters that demonstrate opportunity as identified by the framework can directly link quality with funding.

17,287 annual acute inpatient hospitalizations for stroke

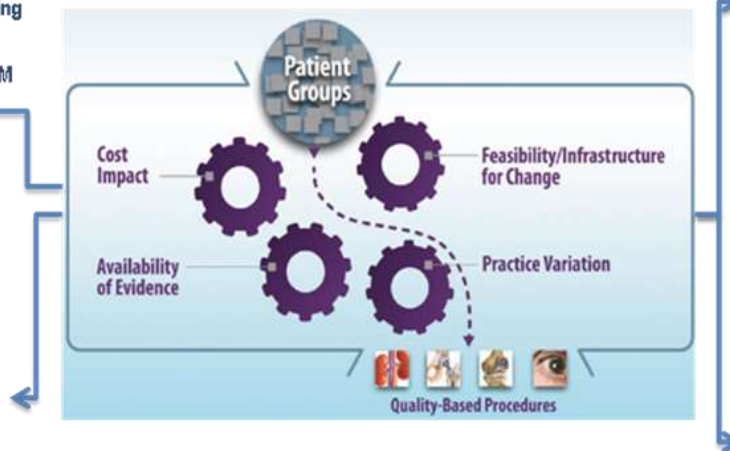Stroke costs the Ontario economy almost $1 billion annually

69,093 ALC days at a cost of $41.5 M in acute bed days, one of the leading causes of ALC in Ontario

Total acute inpatient cost: $191.4 M (1.36% of hospital global budget allocations)

Canadian Best Practices for Stroke Care provide a wealth of evidence-based guidance on quality stroke care

Ontario Stroke Network has developed an evidence base for modeling the impacts of capacity changes in the stroke system

HQO in the process of developing evidence-based analysis for stroke, to be reviewed by OHTAC

Ontario Stroke Network can play a leadership role in supporting the transformation of Ontario's stroke system

Ontario Stroke Audit / Ontario Stroke Registry have collected detail clinical measures for stroke from a broad sample of Ontario hospitals

Wide variation in mean acute length of stay across LHINs, from 24.8 to 44.5 days

Mean alternate level of care days per patient range from 7.9 to 29.4 across LHINs

In-hospital mortality rate following stroke ranges from 9.4% to 17.0% across LHINs

Patient Groups

Cost Impact

Feasibility/Infrastructure for Change

Availability of Evidence

Practice Variation

Quality-Based Procedures

Figure 4: Quality-Based Procedures Evidence-Based Framework for Stroke

Abbreviations: ALC, alternate level of care; HQO, Health Quality Ontario; LHIN, Local Health Integration Network; OHTAC, Ontario Health Technology Advisory Committee.

Sources: Hall et al, 2012 (2) Discharge Abstract Database 2010/11

How Will Quality-Based Procedures Encourage Innovation in Health Care Delivery?

Implementing evidence-informed pricing for the targeted QBPs will encourage health care providers to adopt best practices in their care delivery models and maximize their efficiency and effectiveness. Moreover, best practices that are defined by clinical consensus will be used to understand required resource utilization for the QBPs and further assist in developing evidence-informed pricing. Implementation of a "price x volume" strategy for targeted clinical areas will motivate providers to:

- adopt best practice standards
- re-engineer their clinical processes to improve patient outcomes
- develop innovative care delivery models to enhance the experience of patients

Clinical process improvement may include better discharge planning, eliminating duplicate or unnecessary investigations, and paying greater attention to the prevention of adverse events, that is, postoperative complications. These practice changes, together with adoption of evidence-informed practices, will improve the overall patient experience and clinical outcomes and help create a sustainable model for health care delivery.

Methods

Overview of the HQO Episode of Care Analysis Approach

In order to produce this work, Health Quality Ontario (HQO) has developed a novel methodology known as an *episode of care analysis* that draws conceptually and methodologically from several of HQO's core areas of expertise:

- **Health technology assessment**: Recommended practices incorporate components of HQO's evidence-based analysis methodology and draw from the recommendations of the Ontario Health Technology Advisory Committee (OHTAC).
- **Case mix grouping and funding methodology:** Cohort and patient group definitions use clinical input to adapt and refine case mix methodologies from the Canadian Institute for Health Information (CIHI) and the Ontario Health-Based Allocation Model (HBAM).
- **Clinical practice guidelines and pathways:** Recommended practices synthesize guidance from credible national and international guideline bodies, with attention to the strength of evidence supporting each piece of guidance.
- **Analysis of empirical data:** Expert Advisory Panel recommendations were supposed by descriptive and multivariate analysis of Ontario administrative data (e.g., Discharge Abstract Database [DAD] and National Ambulatory Care Reporting System [NACRS]) and data from disease-based clinical data sets (e.g., the Ontario Stroke Audit [OSA] and Enhanced Feedback For Effective Cardiac Treatment [EFFECT] databases).
- **Clinical engagement**: All aspects of this work were guided and informed by leading clinicians, scientists and administrators with a wealth of knowledge and expertise in the clinical area of focus.

The development of the episode of care analysis involves the following key steps:
1. **Defining cohorts and patient groups**
2. **Defining the scope of the episode of care**
3. **Developing the episode of care model**
4. **Identifying recommended practices, including the Rapid Review process**

The following sections describe each of these steps in further detail.

Defining Cohorts, Patient Groups, and Complexity Factors

At the outset of this project, the Ministry of Health and Long-Term Care provided HQO with a broad description of each assigned clinical population (e.g., stroke), and asked HQO to work with the Expert Panels to define inclusion and exclusion criteria for the cohort they would examine using data elements from routinely reported provincial administrative datasets. It was also understood that each of these populations might encompass multiple distinct subpopulations (referred to here as "patient groups") with significantly different clinical characteristics. For example, the stroke population includes subpopulations with ischemic strokes, hemorrhagic strokes, and transient ischemic attacks (TIA). These patient groups each have very different levels of severity, different treatment pathways, and different distributions of expected resource utilization. Consequently, these groups may need to be reimbursed differently from a funding policy perspective.

Conceptually, the process employed here for defining cohorts and patient groups shares many similarities with methods used around the world for the development of case mix methodologies, such as Diagnosis-Related Groups (DRGs) or the Canadian Institute for Health Information's (CIHI) Case Mix Groups. Case mix methodologies have been used since the late 1970s to classify patients into groups that are similar in terms of both clinical characteristics and resource utilization for the purposes of payment, budgeting and performance measurement.[1] Typically, these groups are developed using statistical methods such as classification and regression tree analysis to cluster patients with similar costs based on common diagnoses, procedures, age, and other variables. After the initial patient groups have been established based on statistical criteria, clinicians are often engaged to ensure that the groups are clinically meaningful. Patient groups are merged, split, and otherwise reconfigured until the grouping algorithm reaches a satisfactory compromise between cost prediction, clinical relevance, and usability. Most modern case mix methodologies and payment systems also include a final layer of patient complexity factors that modify the resource weight (or price) assigned to each group upward or downward. These can include comorbidities, use of selected interventions, long- or short-stay status, and social factors.

In contrast with these established methods for developing case mix systems, the patient classification approach that the Ministry asked HQO and the Expert Panels to undertake is unusual in that it *begins* with the input of clinicians rather than with statistical analysis of resource utilization. The Expert Panels were explicitly instructed not to focus on cost considerations, but instead to rely on their clinical knowledge of those patient characteristics that are commonly associated with differences in indicated treatments and expected resource utilization. Expert Panel discussions were also informed by summaries of relevant literature and descriptive tables containing Ontario administrative data.

Based on this information, the Expert Panels recommended a set of inclusion and exclusion criteria to define each disease cohort. Starting with establishing the ICD-10-CA[2] diagnosis codes included for the population, the Expert Panels then excluded diagnoses with significantly different treatment protocols from the general population, including pediatric cases and patients with very rare disorders. Next, the Expert Panels recommended definitions for major patient groups within the cohort. Finally, the Expert Panels identified patient characteristics that they believe would contribute to additional resource utilization for patients within each group. This process generated a list of factors ranging from commonly occurring comorbidities to social characteristics such as housing status.

In completing the process described above, the Expert Panel encountered some noteworthy challenges:

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1 Fetter RB, Shin Y, Freeman JL, Averill RF, Thompson JD. Case mix definition by diagnosis-related groups. Med Care. 1980 Feb;18(2):iii, 1-53.
2 *International Classification of Diseases, 10th Revision (Canadian Edition).*

1. **Absence of clinical data elements capturing important patient complexity factors.** The Expert Panels quickly discovered that a number of important patient-based factors related to the severity of patients' conditions or their expected utilization are not routinely collected in Ontario hospital administrative data. These include both key clinical measures (such as FEV_1 / FVC for chronic obstructive pulmonary disease [COPD] patients and AlphaFIM®[3] scores for stroke patients) as well as important social characteristics (such as caregiver status).[4] For stroke and congestive heart failure (CHF), some of these key clinical variables have been collected in the past through the OSA and EFFECT datasets, respectively. However, these datasets were limited to a group of participating hospitals and at this time are not funded for future data collection.

2. **Focus on a single disease grouping within a broader case mix system.** While the Expert Panels were asked to recommend inclusion/exclusion criteria only for the populations tasked to them, the 3 patient populations assigned to HQO are a small subset of the many patient groups under consideration for Quality-Based Procedures. This introduced some additional complications when defining population cohorts; after the Expert Panels had recommended their initial patient cohort definitions (based largely on diagnosis), the Ministry informed the Expert Panels that there were a number of other patient groups planned for future Quality-Based Procedure (QBP) funding efforts that overlapped with the cohort definitions.

   For example, while the vast majority of patients discharged from hospital with a most responsible diagnosis of COPD receive largely ward-based medical care, a small group of COPD-diagnosed patients receive much more cost-intensive interventions such as lung transplants or resections. Based on their significantly different resource utilization, the Ministry's HBAM grouping algorithm assigns these patients to a different HBAM Inpatient Grouper (HIG) group from the general COPD population. Given this methodological challenge, the Ministry requested that the initial cohorts defined by the Expert Panels be modified to exclude patients that receive selected major interventions. It is expected that these patients may be assigned to other QBP patient groups in the future. This document presents both the initial cohort definition defined by the Expert Panel and the modified definition recommended by the Ministry.

In short, the final cohorts and patient groups described here should be viewed as a compromise solution based on currently available data sources and the parameters of the Ministry's HBAM grouping methodology.

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3 The Functional Independence Measure (FIM) is a composite measure consisting of 18 items assessing 6 areas of function. These fall into 2 basic domains; physical (13 items) and cognitive (5 items). Each item is scored on a 7-point Likert scale indicative of the amount of assistance required to perform each item (1 = total assistance, 7 = total independence). A simple summed score of 18–126 is obtained where 18 represents complete dependence / total assistance and 126 represents complete independence.

4 For a comprehensive discussion of important data elements for capturing various patient risk factors, see Iezzoni LI, editor. Range of risk factors. In Iezzoni LI (Ed.) Risk adjustment for measuring health care outcomes, 4th ed. Chicago: Health Administration Press; 2012. p. 29-76.

Defining the Scope of the Episode of Care

HQO's episode of care analysis draws on conceptual theory from the emerging worldwide use of episode-based approaches for performance measurement and payment. Averill et al,[5] Hussey et al,[6] and Rosen and Borzecki[7] describe the key parameters required for defining an appropriate episode of care:

- **Index event:** The event or time point triggering the start of the episode. Examples of index events include admission for a particular intervention, presentation at the emergency department (ED) or the diagnosis of a particular condition.

- **Endpoint:** The event or time point triggering the end of the episode. Examples of endpoints include death, 30 days following hospital discharge, or a "clean period" with no relevant health care service utilization for a defined window of time.

- **Scope of services included:** While an "ideal" episode of care might capture all health and social care interventions received by the patient from index event to endpoint, in reality not all these services may be relevant to the objectives of the analysis. Hence, the episode may exclude some types of services such as prescription drugs or services tied to other unrelated conditions.

Ideally, the parameters of an episode of care are defined based on the nature of the disease or health problem studied and the intended applications of the episode (e.g., performance measurement, planning, or payment). For HQO's initial work here, many of these key parameters were set in advance by the Ministry based on the government's QBP policy parameters. For example, in 2013/14 the QBPs will focus on reimbursing acute care, and do not include payments for physicians or other non-hospital providers. These policy parameters resulted in there being limited flexibility to examine non-hospital elements such as community-based care or readmissions.

Largely restricted to a focus on hospital care, the Chairs of the Expert Panels recommended that the episodes of care for all 3 conditions begin with a patient's presentation to the ED (rather than limit the analysis to the inpatient episode) in order to provide scope to examine criteria for admission. Similarly, each of the Expert Panels ultimately also included some elements of postdischarge care in the scope of the episode in relation to discharge planning in the hospital and the transition to community services.

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5 Averill RF, Goldfield NI, Hughes JS, Eisenhandler J, Vertrees JC (2009). Developing a prospective payment system based on episodes of care. J Ambul Care Manage. 32(3):241-51.
6 Hussey PS, Sorbero ME, Mehrotra A, Liu H, Damberg CL (2009). Episode-based performance measurement and payment: making it a reality. Health Affairs. 28(5):1406-17.
7 Rosen AK, Borzecki AM Windows of observation. In Iezzoni LI, ed. Risk adjustment for measuring health care outcomes, 4th ed. Chicago: Health Administration Press; 2012. p. 71-94.

Developing the Episode of Care Model

HQO has developed a model that brings together the key components of the episode of care analysis through an integrated schematic. The model is structured around the parameters defined for the episode of care, including boundaries set by the index event and endpoints, segmentation (or stratification) of patients into the defined patient groups, and relevant services included in the episode. The model describes the pathway of each patient case included in the defined cohort, from initial presentation through segmentation into one of the defined patient groups based on their characteristics, and finally through the subsequent components of care that they receive before reaching discharge or death.

While the model bears some resemblance to a clinical pathway, it is not intended to be used as a traditional operational pathway for implementation in a particular care setting. Rather, the model presents the critical decision points and phases of treatment within the episode of care, respectively referred to here as *clinical assessment nodes* and *care modules*. Clinical assessment nodes (CANs) provide patient-specific criteria for whether a particular case proceeds down one branch of the pathway or another. Once patients move down a particular branch, they then receive a set of recommended practices that are clustered together as a care module. Care modules represent the major phases of care that patients receive within a hospital episode, such as treatment in the ED, care on the ward, and discharge planning. The process for identifying the recommended practices within each CAN and care module is described in the next section.

Drawing from the concept of decision analytic modelling, the episode of care model includes crude counts (N) and proportions (Pr) of patients proceeding down each branch of the pathway model. For the 3 conditions studied in this exercise, these counts were determined based on annual utilization data from the DAD, NACRS, and (for CHF and stroke) clinical registry data.

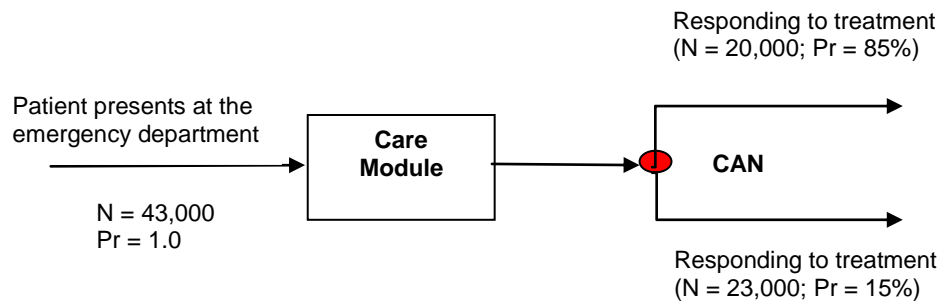Figure 4 provides an illustrative example of a care module and CAN:

Figure 4: Sample Episode of Care Pathway Model
Abbreviations: CAN, clinical assessment node; N, crude counts; Pr, proportions.

Identifying Recommended Practices

Each CAN and care module in the episode of care model contains a set of recommended practices reviewed and agreed upon through the Expert Panel. The end goal communicated by the Ministry for the QBP methodology is to develop cost estimates for the recommended practices and aggregate these to determine a total "best practice cost" for an ideal episode of care to inform the pricing of the QBP.

In keeping with HQO's mandate to support evidence-based care, considerable attention has been paid to ensure that the recommended practices here are supported by the best available evidence. For this process, HQO considers the gold standard of evidence to be official OHTAC recommendations. While there are many other organizations that release high quality clinical guidance based on rigorous standards of evidence, OHTAC recommendations are considered the highest grade of evidence in this process for several reasons:

- **Consistency:** While many guidance bodies issue disease-specific recommendations, OHTAC produces guidance in all disease areas, providing a common evidence framework across all the clinical areas analyzed.
- **Economic modelling:** OHTAC recommendations are generally supported by economic modelling to determine the cost-effectiveness of an intervention, whereas many guidance bodies assess only effectiveness.
- **Contextualization:** In contrast with recommendations and analyses from international bodies, OHTAC recommendations are developed through the contextualization of evidence for Ontario. This ensures that the evidence is relevant for the Ontario health system context.

Notwithstanding these strengths, it is also crucial to mention several important limitations in the mandate and capacity of OHTAC to provide a comprehensive range of evidence to support HQO's episode of care analyses:

- **Focus on non-drug technologies:** While evidence shows that various in-hospital drugs are effective in treating all 3 of the patient populations analyzed, OHTAC traditionally does not consider pharmaceuticals under its mandate. Recently, OHTAC has reviewed some drug technologies in comparison with non-drug technologies for a given population as part of mega-analyses.
- **Capacity constraints:** There are a considerable number of candidate practices and interventions that require consideration for each episode of care. As OHTAC makes recommendations largely based on evidence-based analyses supplied by HQO, it may be limited in its capacity to undertake new reviews in all required areas.
- **Focus on high quality evidence:** OHTAC uses the GRADE criteria[8] to assess the strength of evidence for an intervention, with randomized controlled trials (RCTs) considered the gold standard of evidence here. Not every practice within an episode of care may be appropriate or feasible to study through an RCT. For example, some interventions may be regarded as accepted clinical practice, while others may be unethical to evaluate as part of a clinical trial.

Thus, in situations where OHTAC recommendations do not exist, HQO's episode of care analysis makes use of other sources of evidence:

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8 Guyatt GH, Oxman AD, Schunemann HJ, Tugwell P, Knottnerus A. GRADE guidelines: a new series of articles in the Journal of Clinical Epidemiology. J Clin Epidemiol. 2011;64(4):380-2.

- **Guidance from other evidence-based organizations:** Each of the Expert Panels recommended credible existing sources of evidence-based guidance, such as the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines for COPD. Recommendations from these bodies were included along with their assessment of the evidence supporting the recommendation.
- **Analysis of empirical data:** The Expert Panels reviewed the results of descriptive and multivariate analysis using empirical data, including administrative data sources and clinical data sources such as the EFFECT database.
- **Expert consensus:** In areas that the Expert Panels saw as important but where evidence was limited or nonexistent, the Expert Panels relied on consensus agreement while noting the need for further research in these areas.
- **Other sources of input:** Internal and external analyses and other additional sources of evidence may be introduced and considered by the Expert Panel as needed.
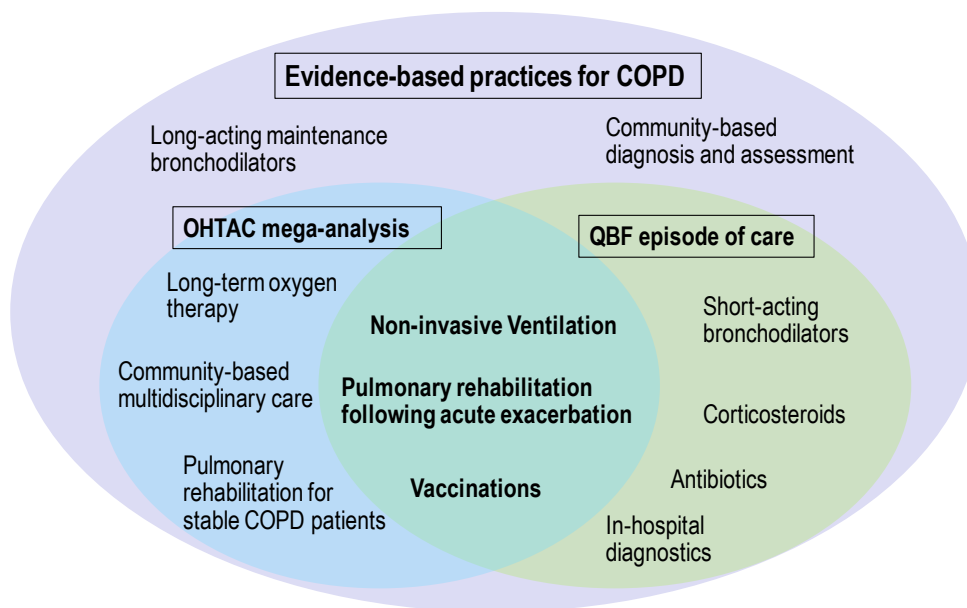

Figure 5: Example Illustrating the Alignment of OHTAC COPD Practice Recommendations with the Scope of Practices Reviewed Through the COPD Episode of Care
Abbreviations: COPD, chronic obstructive pulmonary disease; OHTAC. Ontario Health Technology Advisory Committee; QBF, Quality-Based Funding.

The process for identifying recommended practices for the episode of care involves the following steps:

1. Reviewing existing guidance from OHTAC and other selected evidence-based bodies and extracting all candidate practices for each care module and CAN;
2. Consulting with members of the Expert Panel for additional candidate interventions not included in the guidance reviewed;
3. Reviewing and summarizing the strength of evidence cited for each candidate intervention in the guidance literature, where it exists and is clearly stated;
4. Summarizing the results of steps 1 to 3 above for each phase of the episode of care model and presenting the summary to the Expert Panel for review;
5. Facilitating discussion by the Expert Panel members on contextualizing the candidate practices for the Ontario health system and arriving at a consensus recommendation; and

6. Identifying gaps in the evidence that the Expert Panel agreed are high value candidates for research questions for rapid reviews (see below) and future evidence-based analyses.

Rapid Reviews

In order to address cases where a gap in the evidence is identified and prioritized for further analysis in step 6 (above), HQO has developed a rapid evidence review process that is able to operate within the compressed timeframe of this exercise, recognizing that a full evidence-based analysis would be impractical given the short timelines.

For each question, the rapid review analysis began with a literature review using OVID MEDLINE, OVID MEDLINE In-Process and Other Non-Indexed Citations, OVID EMBASE, EBSCO Cumulative Index to Nursing & Allied Health Literature (CINAHL), the Wiley Cochrane Library, and the Centre for Reviews and Dissemination database, for studies published from January 1, 2000, to October 2012. Abstracts were reviewed by a single reviewer and full-text articles were obtained for those studies meeting the eligibility criteria. Reference lists were also examined for any additional relevant studies not identified through the search.

Articles were reviewed if they were:
- English language full-text reports
- published between January 1, 2008, and October 2012
- health technology assessments, systematic reviews, and meta-analyses

If systematic reviews were not available, RCTs, observational studies, case reports, and editorials were selected.

The methodological quality of systematic reviews was assessed using the Assessment of Multiple Systematic Reviews (AMSTAR) measurement tool.[9] The quality of the body of evidence for each outcome was examined according to the GRADE Working Group criteria.[8] The overall quality was determined to be very low, low, moderate, or high using a step-wise, structural methodology.

Study design was the first consideration; the starting assumption was that RCTs are high quality, whereas observational studies are low quality. Five additional factors—risk of bias, inconsistency, indirectness, imprecision, and publication bias—were then taken into account. Limitations or serious limitations in these areas resulted in downgrading the quality of evidence. Finally, 3 factors that could raise the quality of evidence were considered: large magnitude of effect, dose response gradient, and accounting for all residual confounding.[8]

For more detailed information, please refer to the latest series of GRADE articles.[8]

As stated by the GRADE Working Group,[7] the final quality score can be interpreted using the following definitions:

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9 Shea BJ, Grimshaw JM, Wells GA, Boers M, Andersson N, Hamel C, et al. Development of AMSTAR: a measurement tool to assess the methodological quality of sytematic reviews. BMC Med Res Methodol. 2007;7(10).

High   Very confident that the true effect lies close to the estimate of the effect

Moderate   Moderately confident in the effect estimate—the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different

Low   Confidence in the effect estimate is limited—the true effect may be substantially different from the estimate of the effect

Very Low   Very little confidence in the effect estimate—the true effect is likely to be substantially different from the estimate of effect

Description of Stroke

A stroke is a sudden loss of brain function caused by the interruption of flow of blood to the brain (ischemic stroke) or the rupture of blood vessels in the brain (hemorrhagic stroke). The interruption of blood flow or the rupture of blood vessels causes brain cells (neurons) in the affected area to die. The longer the brain goes without oxygen and nutrients supplied by the blood, the greater the risk of permanent brain damage. Strokes can also result in uncontrolled bleeding, causing permanent brain damage.

Stroke is the leading cause of adult disability in Canada and the third leading cause of death. Six percent of all deaths in Canada are due to stroke. Each year, nearly 14,000 Canadians die as a result of stroke.[10] There are over 50,000 strokes in Canada each year, or one stroke every 10 minutes. After the age of 55 years, the risk of stroke doubles every 10 years. A stroke survivor has a 20% chance of having another stroke within 2 years. About 300,000 Canadians are living with the effects of stroke.[11]

Stroke costs the Canadian economy $3.6 billion a year in physician services, hospital costs, lost wages, and decreased productivity. Canadians spend a total of 3 million days in hospital because of stroke.[11]

Of every 100 people who have a stroke,

- 15 die (15%)
- 10 recover completely (10%)
- 25 recover with a minor impairment or disability (25%)
- 40 are left with a moderate to severe impairment (40%)
- 10 are so severely disabled they require long-term care (10%)[12]

For every 1 minute delay in treating a stroke, the average patient loses 1.9 million brain cells, 13.8 billion synapses, and 12 km of axonal fibres. Each hour in which treatment does not occur, the brain loses as many neurons as it does in almost 3.6 years of normal aging.[13]

Despite a decline in hospitalization rates for acute stroke over the past 10 years, Canada's aging population, along with increasing prevalence of risk factors, is expected to result in an increased absolute number of strokes over the next 20 years.[11]

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10 Statistics Canada. Mortality, Summary List of Causes 2008. Released October 18, 2011. [Statistics Canada Catalogue No. 84F0209X].
11 Wielgosz A, Arango M, Bancej C, Bienek A, Johansen H, Lindsay P, et al. 2009 Tracking Heart Disease and Stroke in Canada, Ottawa (ON):Public Health Agency of Canada; 2009. pp. 132. [Cat.: HP32-3/2009E ISBN: 978-1-100-12541-1].
12 Heart and Stroke Canada. Stroke [Internet]. Ottawa (ON): Heart and Stroke Canada; 2012 [cited 2013 Jan]. Available from: http://www.heartandstroke.on.ca/site/c.pvI3IeNWJwE/b.3581729/k.359A/Statistics.htm#stroke.
13 Saver JL. Time is brain – Quantified. Stroke 2006;37:263-66.

Types of Stroke

There are 3 major types of stroke, each with different clinical characteristics and treatment protocols.

Ischemic Stroke

About 80% of strokes are ischemic, which means they are caused by the interruption of blood flow to the brain due to a blood clot. The buildup of plaque (cholesterol, fatty materials, calcium, and scar tissue) narrows the arteries that supply blood to the brain, interfering with, or blocking the flow of blood. This narrowing is called atherosclerosis. An ischemic stroke is either thrombotic or embolic.

Thrombotic strokes are caused by a blood clot that forms in an artery directly leading to the brain. Embolic strokes occur when a clot develops somewhere else in the body and travels through the blood stream to the brain.

Transient Ischemic Attack

Transient ischemic attacks (TIAs), also known as a "mini-strokes." are caused by a temporary interruption of blood flow to the brain. Plaque refers to a buildup of cholesterol, fatty deposits, and other substances. It gathers inside the wall of an artery and narrows the size of the blood vessel (also called atherosclerosis). The most common cause of a TIA is a blood clot or plaque that prevents blood from flowing to the brain. The symptoms are similar to an ischemic stroke, except they go away within a few minutes or hours. Many people can have a TIA without even knowing it. A TIA is an important warning sign that indicates increased risk of a full-blown stroke.

Each year, about 15,000 people in Canada experience a TIA. Many more go unreported. People who have had a TIA are 5 times more likely to have a stroke over the next 2 years than the general population. Many people who have a stroke had 1 or more TIAs before their stroke.[14]

People with atrial fibrillation (a fast, irregular heart rate), problems with your heart valves, a patent foramen ovale (a defect in the wall between the 2 upper chambers of the heart), or a weak heart muscle are at higher risk of a TIA.

Hemorrhagic Stroke

About 20% of strokes are hemorrhagic, which means they are caused by uncontrolled bleeding in the brain. This bleeding interrupts normal blood flow in the brain and, by flooding the brain, kills brain cells.

There are 2 main types of hemorrhagic stroke:
- *Subarachnoid hemorrhage* is uncontrolled bleeding on the surface of the brain, in the area between the brain and the skull.
  Intracerebral hemorrhage occurs when an artery deep within the brain ruptures.

Both types of hemorrhage can be caused by structural problems with the blood vessels in the brain. These include:
- *Aneurysm:* A weakened area in the wall of the blood vessel that fills with blood and bulges. High blood pressure or trauma can cause the bulge to rupture, resulting in uncontrolled bleeding into the brain.

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14 Field TS, Green TL, Roy K, Pedersen J, Hill MD. Trends in hospital admission for stroke in Calgary. Can J Neurol Sci. 2004;31:387-93.

- *Arteriovenous malformation:* A malformation of the blood vessels in the brain, usually present at birth, that causes the artery walls to be weak and increases the risk of hemorrhagic stroke.

Ontario Stroke Statistics

- Stroke is the third leading cause of death in Ontario; nearly 6,000 Ontarians die from stroke annually.
- There are approximately 22,000 stroke/TIA visits to Ontario emergency departments (EDs) annually.[15]
- There are approximately 15,300 annual inpatient admissions for stroke:[15]
    - 67% for ischemic stroke
    - 18% for TIAs
    - 15% for hemorrhagic stroke
- In 2007/2008, 56% of stroke/TIA patients were discharged home from hospital, 23% to rehabilitation and 7% to long-term care.[15]
- At least 90,000 are living with the effect of stroke; stroke costs the Ontario economy almost $1 billion annually.[5]

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15 Hall R, O'Callaghan C, Bayley M, Meyer S, Khan F, Liu Y, et al. Ontario stroke evaluation report 2010: technical report. Toronto (ON): Institute for Clinical Evaluative Sciences; 2010.

Recommended Stroke Cohort Definition and Patient Grouping Approach

Initial Stroke Cohort Inclusion/Exclusion Criteria

It was recommended that this analysis adopt the age criteria and diagnosis codes included in the Canadian Stroke Strategy Case Definitions 2010 and the Ontario Stroke Network's (OSN) stroke cohort definition, with some modifications:

- **Care Setting:** Emergency department (ED), acute inpatient care, and inpatient rehabilitation. The role for the community and outpatient settings in providing high quality stroke care and reducing hospitalization is significant, specifically in the area of transient ischemic attack (TIA) management, early supported discharge, and community-based stroke rehabilitation programs. The Episode of Care for Stroke Expert Advisory Panel recommended that the other sectors form a second phase of work immediately following the completion of the ED and inpatient work.

- **Age:** Patients aged 18 years and older. The pediatric stroke population is both very heterogeneous and significantly different from the adult stroke population, and a different mix of experts would be required on the Panel. In addition, the number of pediatric strokes is very small relative to the overall stroke population, and these patients tend to be treated in specialized children's hospitals. This population should be considered for future work.

- **Stroke Type:** Identified using most responsible diagnosis (MRDx) code, as identified by the OSN, are shown in Table 1. In addition, given their complex nature, subarachnoid hemorrhages were excluded from this initial work. Note that strokes occurring as post-admit complications (type 2 diagnosis) are also excluded.

Table 1: Identification of Stroke Type

Stroke Type	ICD-10-CA Code
TIA	G45 (excluding G45.4)
ICH	I61
Ischemic	I63 (excluding I63.6), H34.1
Unable to Determine[a]	I64

Abbreviations: ICD-10-CA, International Classification of Diseases, 10th Revision (Canadian Edition); ICH, intracerebral hemorrhage; TIA, transient ischemic attack.
[a]Unable to Determine: stroke not specified as hemorrhagic or ischemic.

Table 2 shows the patient volumes presenting to the ED for the included stroke types.

Table 2: Number of Adult Patients Presenting to the Emergency Department, by Stroke Type, 2008/09–2010/11

Stroke Type	2008/09	2009/10	2010/11
Ischemic	1,749	1,890	2,245
ICH	1,266	1,382	1,343
TIA	7,122	7,380	6,917
Unable to Determine[a]	8,674	8,674	8,484
Total	18,811	19,326	18,989

Abbreviations: ICH, intracerebral hemorrhage; NACRS, National Ambulatory Care Reporting System; TIA, transient ischemic attack.
Inclusion criteria: Unique patients aged ≥18 years discharged from an ED with a diagnosis of stroke (ischemic or hemorrhagic) or TIA. Based on unique patients (does not include multiple patient visits).
Exclusion criteria: Patients with a scheduled ED visit.
[a]Unable to determine: stroke not specified as hemorrhagic or ischemic.
Data source: NACRS 2008/09–2010/11.

Table 3 includes the volumes of strokes admitted to an acute inpatient setting. Note that the higher number of ischemic strokes and intracerebral hemorrhages (ICHs) admitted into acute care compared with those in the ED can be attributed to one of three factors. The main factor is that patients are moved from the "Unable to Determine" code to either an ischemic or hemorrhagic code as a result of completion of the diagnostic work. Secondly, it is not uncommon for the ED record associated with the inpatient stay to not have included TIA or stroke as the main problem. Thirdly, some stroke patients are admitted directly to an acute inpatient bed.

Table 3: Number of Adult Patients Admitted to Acute Care Hospitals for Stroke, by Stroke Type, 2008/2009–2010/11

Stroke Type	2008/09	2009/10	2010/11
Ischemic stroke	6,461	6,816	7,880
ICH	1,521	1,629	1,524
TIA	2,666	2,720	2,763
Unable to Determine[a]	3,774	3,492	2,619
Total	14,422	14,657	14,786

Abbreviations: DAD, Discharge Abstract Database; ICH, intracerebral hemorrhage; TIA, transient ischemic attack.
Inclusion criteria: Unique patients aged ≥18 years discharged from an inpatient stay with a diagnosis of stroke (ischemic or hemorrhagic) or TIA. Based on unique patients (does not include multiple patient visits).
Exclusion criteria: Patients with an elective admission.
[a]Unable to Determine: stroke not specified as hemorrhagic or ischemic.
Data source: DAD 2008/09-2010/11.

Inclusion/Exclusion Criteria for QBP Funding Purposes

The following inclusion and exclusion criteria have been recommended by the Ministry of Health and Long-Term Care for the purposes of funding stroke through the Quality-Based Procedure (QBP) funding mechanism:

Stroke Inclusion Criteria:

- Any ICD-10-CA diagnosis code starting with:
    - G45 except for G45.4 <u>or</u>
    - I61 <u>or</u>
    - I63 except for I63.6 <u>or</u>
    - I64 <u>or</u>
    - H34.1
- Diagnosis types: MRDx codes / main problem only
- Age: ≥ 18 years

Stroke Exclusion Criteria:

- Diagnosis types: strokes coded as post-admit complications (type 2 diagnosis) or "Q" prefix associated with the main problem.

Interventions Excluded:

- If not assigned to an intervention-based Health-Based Allocation Model Inpatient Grouper (HIG) cell based on the current HIG methodology (i.e., MCC_partition variable is not "I").

    Rationale: The Ministry has requested some cases be excluded from the Expert Panel's original cohort definition due to issues with adopting the original cohort for the Ministry's HIG case mix algorithm.

- Case mix grouping algorithms of the sort used by the Ministry to fund the QBPs typically assign cases to groups based on either Principal Intervention (typically a major qualifying procedure, such as a surgery) or, in cases where there is no major qualifying procedure, by MRDx code. Case mix groups need to be mutually exclusive, that is, the logic of the grouping algorithm should assign a case to one group or another, not both.

- The original stroke inclusion criteria identified by the Expert Panel led to a substantial amount of overlap with other HIGs based on surgical interventions—in the HIG methodology, these cases are not assigned to one of the major stroke HIGs (TIA, ischemic stroke, ICH, Unable to Determine) but instead are assigned to a surgical HIG (e.g., open carotid endarterectomy). See Table 4 for the distribution of the cohort across HIG cells.

Table 4: Stroke Cohort Distribution by Health-Based Allocation Model Inpatient Groupers, 2011/12

HIG	HIG Description	Count, n	Percent, %
001[a]	Intracranial vessel intervention except extraction, open approach	8	0.0
002[a]	Intracranial vessel intervention except extraction, percutaneous approach	17	0.1
003[a]	Other vascular intervention with nervous system diagnosis	75	0.5
004[a]	Craniotomy for drainage	20	0.1
005[a]	Insertion of shunt / brain monitor	111	0.7
006[a]	Cranium intervention	22	0.1
008[a]	Other site/non-major intervention on spine / spinal canal / vertebra	3	0.0
009[a]	Excision/repair of brain	19	0.1
010[a]	Drainage/release of brain	13	0.1
011[a]	Management of nervous system device / other minor intervention	6	0.0
012[a]	Open carotid endarterectomy	89	0.6
013[a]	Major nerve intervention or intervention on other site	2	0.0
025	Hemorrhagic event of central nervous system	1,534	9.6
026	Ischemic event of central nervous system	8,963	55.8
027	Cerebrovascular disorder	32	0.2
028	Unspecified stroke	2,028	12.6
029	Transient ischemic attack	2,885	18.0
064	Major ophthalmology disorder	18	0.1
214	Cardiac valve disease, except endocarditis	1	0.0
901[a]	MCC 01 Unrelated intervention	212	1.3
902[a]	MCC 02 Unrelated intervention	2	0.0

Abbreviation: HIG, Health-Based Allocation Model Inpatient Grouper.
[a]Cases assigned to nonstroke HIG based on MCC_partition variable 'I', that is, major intervention.

In total, cases assigned to other HIGs account for approximately 4% of all cases in the initial stroke cohort. Stroke cases in these excluded HIGs may be good candidates for further review at a later time; many of these cases demonstrate higher costs and longer lengths of stay than the general stroke population.

Recommended Practices for Stroke

Illustrated in Figure 7, the episode of care model for stroke has been developed through clinical consensus and the use of administrative data to map the typical pathways stroke patients follow over their course of care. Care settings included in the stroke episode of care include the emergency department (ED), acute inpatient care, and inpatient rehabilitation. These settings were included based on the scope of the episode of care examined by the Episode of Care for Stroke Expert Advisory Panel; there are many other important components of stroke care, such as community-based services, that are not included in this model. Based on the best available evidence, the Expert Panel has identified recommended practices for each care setting.

Evidence Sources Used to Develop Recommended Practices

The process for identifying recommended practices for episodes of care is described fully in the Methods section. The Stroke Episode of Care Expert Panel used the following major sources to inform the development of their recommendations:

- o **Health Quality Ontario (HQO) evidence-based analyses and rapid reviews**

- o **Canadian Best Practices Recommendations for Stroke Care (2010)**[16]

- o **Canadian Best Practices Recommendations for Stroke Care (2012)**[17]

- o **American Heart Association / American Stroke Association Guidelines (2007)**[18]

- o **Ontario Stroke Network (OSN) Stroke Reference Group Best Practices (2012)**[19]

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16 Canadian Stroke Strategy. Canadian best practice recommendations for stroke care: update 2010. Ottawa (ON): Canadian Stroke Network; 2010 [cited 2013 Jan]. Available from: http://www.strokebestpractices.ca/wp-content/uploads/2011/04/2010BPR_ENG.pdf
17 Lindsay MP, Gubitz G, Bayley M, Phillips S, editors; Canadian Stroke Best Practices and Standards Working Group. Canadian best practice recommendations for stroke care, 4th ed. Ottawa (ON): Canadian Stroke Network; 2012 [updated 2012 Sep; cited 2013 Jan]. Available from: http://www.strokebestpractices.ca/wp-content/uploads/2012/10/20120BPR_Ch2_Prevention_Final-Version_20Sept-2012F-1.pdf
18 Broderick JP, Connolly S, Feldmann E, Hanley D, Kase C, Krieger D, et al. Guidelines for the management of spontaneous intracerebral hemorrhage in adults: a guideline from the American Heart Association/American Stroke Association stroke Council, High Blood Pressure Research Council, and the Quality of Care and Outcomes in Research Interdisciplinary Working Group. Stroke. 2007 [cited 2013 Jan];38:2001-23. Available from: http://stroke.ahajournals.org/content/41/9/2108.full.pdf
19 Meyer M, O'Callaghan C, Kelloway L, Hall R, Teasell R, Meyer S, et al. The impact of moving to stroke rehabilitation: best practices in Ontario: final report. Ontario Stroke Network; 2012 Oct [cited 2013 Jan]. Available from: http://www.ontariostrokenetwork.ca/pdf/The_impact_of_moving_to_stroke_rehabilitation_best_practices_in_Ontario_OSN_Final_Report_Sept_14_2012.pdf

Similar to GRADE, the Canadian Best Practice Recommendations for Stroke Care employ a standard rating system for grading the evidence supporting each recommendation. These grades are included in italics next to each recommendation and explained in the table below:

Table 5: Canadian Best Practices Recommendations for Stroke Care Evidence Grading Criteria

Evidence Grade	Criteria
A	Strong recommendation. Evidence from RCTs or meta-analyses of RCTs. Desirable effects clearly outweigh undesirable effects, or vice versa
B	Single RCT or well-designed observational study with strong evidence; or well-designed cohort or case-control analytic study; or multiple time series or dramatic results of uncontrolled experiment. Desirable effects closely balanced with undesirable effects
C	At least one well-designed, nonexperimental descriptive study (e.g., comparative studies, correlation studies, case studies) or expert committee reports, opinions and/or experience of respected authorities, including consensus from development and/or reviewer groups

Abbreviations: RCT, randomized controlled trial.
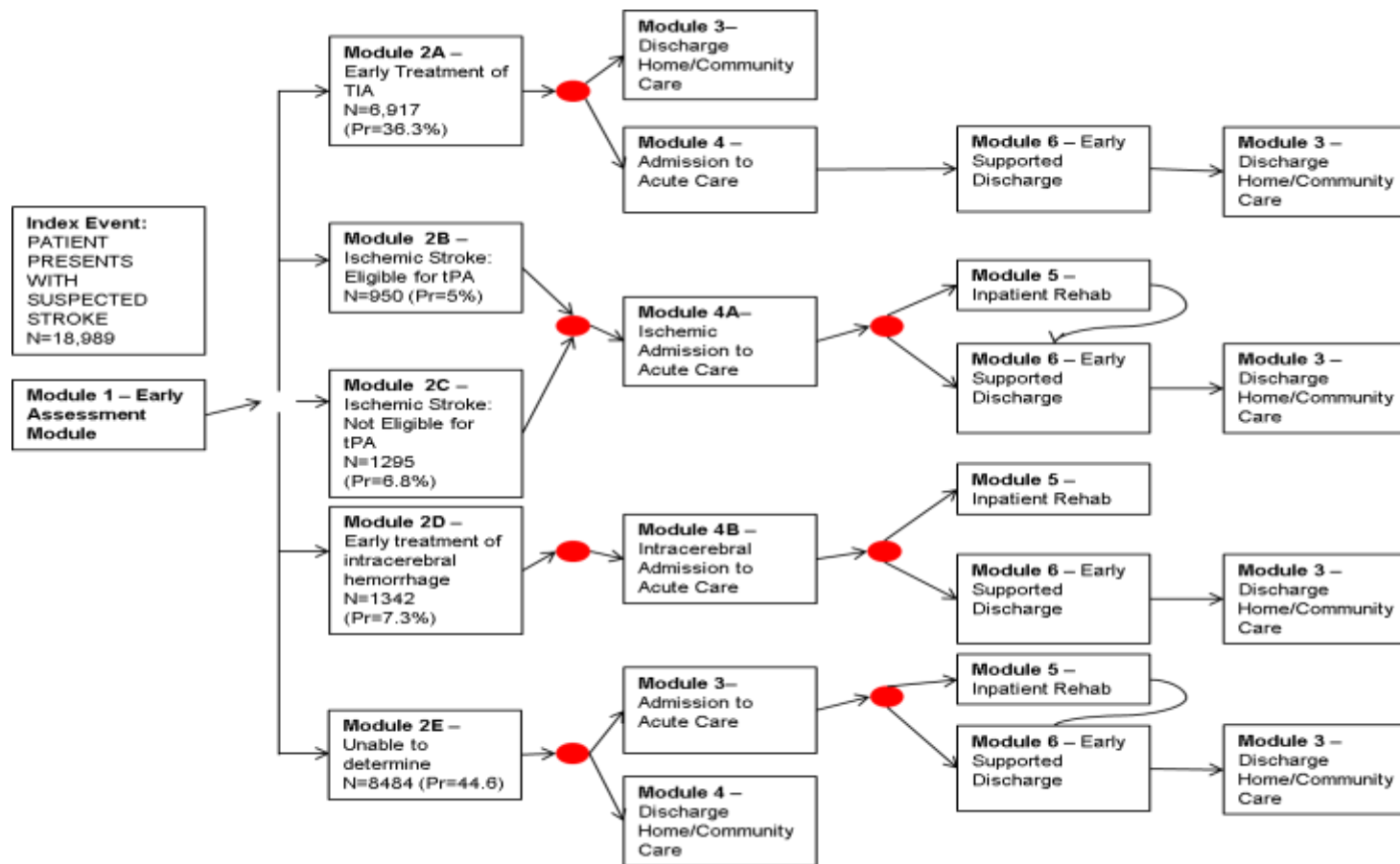*Source: Canadian Best Practice Recommendations for Stroke Care.*

Figure 7: Episode of Care Model for Stroke

Abbreviations: ED, emergency department; N, crude counts; outpt, outpatient; Pr, proportions; rehab, rehabilitation; tPA, tissue plasminogen activator; TIA, transient ischemic attack.

Note: Crude counts and proportions based on the number of unique patients ≥18 years discharged from an ED with a diagnosis of stroke (ischemic or hemorrhagic) or TIA 2008/09–2010/11. Does not include multiple patient visits or patients with a scheduled ED visit.

Data source: National Ambulatory Care Reporting System, 2008/09–2010/11.

Module 1: Early Assessment

This module identifies best practices for the early assessment of suspected transient ischemic attack (TIA) / stroke patients. While patients typically present at the ED, the same practices should be followed at an outpatient clinic or when patients are directly admitted to the acute care setting.

Table 6: Early Assessment

Recommended Practice	Guidelines/Evidence Considered
Rapid initial evaluation for airway, breathing, circulation	Canadian Best Practices Recommendations for Stroke Care, 2010 *(Evidence Level B)*
All patients should undergo a neurological examination to determine focal neurological deficits and assess stroke severity (Evidence Level B) on a standardized stroke scale (either the NIHSS or CNS for stroke)	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level B)*
All patients should undergo brain imaging (MRI or CT) immediately and vascular imaging of the brain and neck arteries as soon as possible (1)	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level A)*
All patients should undergo vascular imaging of the brain and neck arteries as soon as possible	*(Evidence Level B)*
All patients presenting within 48 hours of symptom onset or with persistent or fluctuating motor or speech symptoms should undergo immediate vascular imaging of the neck arteries (carotid ultrasound, CTA, or MRA) for patients eligible for revascularization (unless the patient is clearly not a candidate for revascularization)	*(Evidence Level B)*
ECG should be completed to detect atrial fibrillation and other acute arrhythmias[20]	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level B)*
All patients should have the following blood work: • CBC • Electrolytes • Creatinine • Urea • Glucose • INR • Partial thromboplastin time • TSH • Creatine kinase • Troponin test • HbA1c • If hypercoagulability or vasculitis is suspected refer to a Stroke Prevention Clinic or neurologist	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level B)* Canadian Best Practices Recommendations for Stroke Care 2012 *(Evidence Level C)* Expert opinion

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20 Chest x-ray should be considered based on clinical need.

Recommended Practice	Guidelines/Evidence Considered
All patients with stroke should be placed NPO and have their swallowing ability screened using a simple, valid, reliable, bedside testing protocol as part of their initial assessment and before initiating oral medication, fluid, or foods	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level B)*
For patients not admitted to hospital, refer to a designated Stroke Prevention Clinic or stroke specialist for further timely investigations and management	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level B)*

Abbreviations: CBC, complete blood count; CNS, Canadian Neurological Scale; CT, computed tomography; CTA, computed tomography angiography; ECG, electrocardiogram; HbA1c, glycosylated hemoglobin; INR, international normalized ratio; MRA, magnetic resonance angiography; MRI, magnetic resonance imaging; NIHSS, National Institutes of Health Stroke Scale; NPO, nothing by mouth; TSH, thyroid-stimulating hormone.

Module 2A: Early Treatment of Transient Ischemic Attack

This module identifies best practices for the ED treatment of TIA. **The majority of TIA patients do not require admission to hospital and should be referred to an urgent TIA/Stroke Prevention Clinic or comparable ambulatory care setting for rapid diagnostic and medical evaluation (ideally within 48 hours of symptom onset)** and to initiate secondary stroke prevention therapies. Those TIA patients who present within 48 hours of symptom onset with fluctuating or crescendo motor or speech symptoms may be considered for admission to hospital. Please see the attached review of the evidence.

The following practices are recommended for any patient with TIA regardless of referral to a TIA clinic.

Table 7: Early Treatment of Transient Ischemic Attack

Recommended Practice	Guidelines/Evidence Considered
All patients presenting within 48 hours of symptom onset or with persistent or fluctuating motor or speech symptoms should undergo immediate vascular imaging of the neck arteries (carotid ultrasound, CTA or MRA) for eligibility for revascularization (unless the patient is clearly not a candidate for revascularization)	Canadian Best Practice Recommendations for Stroke Care 2012 *(Evidence Level B)* Taking Action in Stroke Prevention - A Quick Response Guide
Patients with TIA or nondisabling stroke with ipsilateral 50%–99% internal carotid artery stenosis (measured by 2 concordant noninvasive vascular imaging modalities such as Doppler ultrasound, CTA, or MRA) should be evaluated by a stroke expert. Selected patients should be offered carotid endarterectomy with the goal of operating within 14 days of the incident event once the patient is clinically stable	Canadian Best Practices Recommendations for Stroke Care 2012 *(Evidence Level A)*
Patients with TIA or nondisabling ischemic stroke who are not on an antiplatelet agent at time of presentation should be started on antiplatelet therapy immediately with one of the following after brain imaging has excluded intracranial hemorrhage: • ECASA 160mg loading dose, followed by (81-325mg) daily. Most patients should be on a maintenance dose of 81mg/day • clopidogrel 300 mg loading dose, followed 75 mg daily or • extended-release dipyridamole 200 mg / ASA 25 mg bid (could load with ECASA 160–325 mg first)	Canadian Best Practices Recommendations for Stroke Care 2012 *(Evidence Level A)*
All patients with ischemic stroke or TIA should be prescribed antiplatelet therapy for secondary prevention of recurrent stroke unless there is an indication for anticoagulation	Canadian Best Practices Recommendations for Stroke Care 2012 *(Evidence Level A)*
Patients with TIA and atrial fibrillation, immediately after brain imaging has excluded intracranial hemorrhage or large infarct, should begin oral anticoagulation with: Dabigatran, rivaroxaban, apixaban (pending approval for use in Canada), or warfarin	Canadian Best Practices Recommendations for Stroke Care 2012 *(Evidence Level B)* *(Evidence Level A)*
Patients who have had a TIA should have treatment to lower blood pressure to stay consistently < 140/90 mm Hg[21]	Canadian Best Practice Recommendations for Stroke Care 2012 *(Evidence Level B)*

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21 Ideally, TIA patients should be referred to a TIA/Stroke Prevention Clinic and seen within 48 hours of symptom onset for further assessment, risk factor management (including lipids), and lifestyle support or at minimum be referred to primary care for immediate follow-up and medication management (expert consensus).

Recommended Practice	Guidelines/Evidence Considered
Blood glucose measurement should be repeated if the first random glucose value is >10 mmol/L • Repeat measures should include fasting glucose and HbA1c. If elevated (fasting glucose > 7 mmol/L; HbA1c > 7%), consider using antihyperglycemic agents • Hypoglycemia should be corrected immediately	Canadian Best Practice Recommendations for Stroke Care 2012
Patients with TIA or nondisabling stroke who smoke should be offered assistance with the initiation of a smoking attempt – either directly or through referral to appropriate resources. A combination of pharmalogical therapy and behavioural therapy should be considered .	Canadian Best Practice Recommendations for Stroke Care 2012 *(Evidence Level B)*
For patients with suspected hypercoagulability or with no evident cause of stroke, the following investigations may be required: • antiphospholipid antibody • lupus anticoagulant • protein S • protein C • antithrombin III • prothrombin gene mutation • factor V Leiden mutation	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level C)*
For patients with suspected vasculitis, the following investigations may be required: • erythrocyte sedimentation rate • C-reactive protein • antinuclear antibody • syphilis screen	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level C)*

Abbreviations: ASA, acetylsalicylic acid; CTA, computed tomography angiography; ECASA, enteric-coated acetylsalicylic acid; HbA1c, glycosylated hemoglobin; MRA, magnetic resonance angiography; TIA, transient ischemic attack.

Module 2B: Early Treatment of Ischemic Strokes in Patients Eligible for Tissue Plasminogen Activator

This module identifies best practices for the early treatment of ischemic stroke patients who are eligible for acute thrombolytic therapy. Note that the Expert Panel did not include intra-arterial (IA) stroke treatment (IA stroke thrombolysis or IA clot retrieval) in this QBP as the evidence is still evolving. IA thrombolysis is excluded as it is an intervention-based HIG.

Table 8: Early Treatment of Ischemic Strokes Eligible for Tissue Plasminogen Activator

Recommended Practice	Guidelines/Evidence Considered
All patients with *disabling* acute ischemic stroke who can be treated within 4.5 hours of symptom onset should be evaluated *without delay* to determine their eligibility for treatment with intravenous tPA (alteplase) in accordance with criteria adapted from NINDS tPA Stroke Study and ECASS III Every effort should be made to deliver treatment as soon as safely possible as the evidence suggests outcomes are optimized by delivery as close to onset of cerebral ischemia as possible	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level A)*
Telestroke networks should be implemented wherever acute care Facilities do not have on-site stroke care expertise to provide 24/7 acute stroke assessement and treatment with tPA in accordance with current treatment guidelines or Standardized protocols should be established to ensure a coordinated and efficient approach to telestroke service delivery in the hyperacute phase of stroke to facilitate delivery of tPA in referring sites	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level B)*
All eligible patients should receive intravenous tPA (alteplase) as soon as possible after hospital arrival with a target door-to-needle time of < 60 minutes	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level C)*
Ischemic stroke patients receiving tPA should have very high blood pressure (> 185/110 mm Hg) treated to reduce the risk of secondary intracranial hemorrhage	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level B)*
Patients with stroke whose first random glucose value > 10 mmol/L should have fasting glucose and an HbA1c test ordered. If levels are elevated, antihyperglycemic agents should be considered	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level B)*
Administration of intravenous tPA (alteplase) should follow the American Stroke Association guidelines: total dose 0.9 mg/kg up to a maximum of 90 mg with 10% (0.09 mg/kg) given as intravenous bolus over 1 minute and the remaining 90% (0.81 mg/kg) given as an intravenous infusion over 60 minutes	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level A)*
For patients with stroke treated with tPA, ≥160 mg ASA dose should be delayed until after the 24 hour postthrombolysis brain imaging (CT/MRI) has excluded intracranial hemorrhage	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level A)*
All patients treated with tPA should receive brain imaging (CT/MRI imaging) 24 hours after the administration of tPA to exclude intracranial hemorrhage and to evaluate stroke evolution	American Heart Association / American Stroke Association Guidelines 2007 Canadian Best Practice Recommendations for Stroke Care 2010

Recommended Practice	Guidelines/Evidence Considered
Patients with stroke should be placed NPO and have their swallowing ability screened using a simple, valid, reliable, bedside testing protocol as part of their initial assessment and before initiating oral medications, fluids, or food Patients who are not alert within the first 24 hours should be monitored closely and dysphagia screening performed when clinically appropriate	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level B)* Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level C)*
If not done as part of initial assessment extracranial vascular imaging (carotid ultrasound, CTA, or MRA) should be done as soon as possible to better understand the etiology of the stroke and guide secondary stroke prevention management	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level B)*
All risks factors for cerebrovascular disease must be aggressively managed through pharmacological and nonpharmacological means to achieve optimal control	Expert opinion

Abbreviations: ASA, acetylsalicylic acid; CT, computed tomography; CTA, computed tomography angiography; ECASS, European Cooperative Acute Stroke Study; ED, emergency department; HbA1c, glycosylated hemoglobin; MRA, magnetic resonance angiography; MRI, magnetic resonance imaging; NINDS, National Institute of Neurological Disorders and Stroke; NPO, nothing by mouth; QBF, Quality-Based Funding; tPA, tissue plasminogen activator.

Module 2C: Early Treatment of Ischemic Strokes in Patients Not Eligible for Tissue Plasminogen Activator

This module identifies best practices for the early treatment of ischemic stroke patients who are <u>not</u> eligible for acute thrombolytic therapy. The best practices for these patients are identical to those of Module 2B **except for the administration of tPA**.

Module 2D: Early Treatment of Intracerebral Hemorrhages

This module identifies best practices for the early treatment of patients with intracerebral hemorrhage (ICH).

Table 9: Early Treatment of Intracerebral Hemorrhage

Recommended Practice	Guidelines/Evidence Considered
Patients with ICH must be treated as a medical emergency. ICH should be promptly recognized, and patients should be evaluated immediately by physicians with expertise in stroke management (10)	Canadian Best Practices Recommendations for Stroke Care 2010 (Evidence Level A)
Patients with suspected intracerebral hemorrhage should undergo a CT or MRI immediately to confirm diagnosis,location and extent of hemorrhage if not already completed in ED	Canadian Best Practices Recommendations for Stroke Care 2010 (Evidence Level A)
Evaluation of patients with acute ICH should include questions about anticoagulant therapy, measurement of platelet count, PTT, and INR	Canadian Best Practices Recommendations for Stroke Care 2010 (Evidence Level A)
Patients with acute ICH should be considered for CTA or other imaging modality to exclude an underlying lesion such as an aneurysm, arteriovenous malformation, or tumour	Canadian Best Practices Recommendations for Stroke Care 2010 (Evidence Level B)
Patients with acute ICH and established coagulopathy or a history of anticoagulant use should be treated appropriately to reverse the coagulopathy (prothrombin complex concentrate / factor IX, Vitamin K, or fresh-frozen plasma)	Canadian Best Practices Recommendations for Stroke Care 2010 (Evidence Level B)
The majority of patients with acute supratentorial ICH do not require neurosurgical evacuation; however, select patients with supratentorial ICH and posterior fossa ICH patients may require neurosurgical consultation	Canadian Best Practices Recommendations for Stroke Care 2010 (Evidence Level B)
Though there are no specific evidence-based targets for systolic and diastolic blood pressure in patients with ICH, hypertension is associated with increased death and dependency. Patients presenting with systolic blood pressure > 180 mm Hg should undergo acute lowering of blood pressure	Canadian Best Practice Recommendations 2010 (Evidence Level C) American Stroke Association/American Heart Association Guidelines for Management of Spontaneous Intracerebral Hemorrhage 2010
Medically stable patients with acute ICH should be admitted to a stroke unit or neuro/intensive care unit[22] and undergo interprofessional stroke team assessment to determine their rehabilitation and other care needs	Canadian Best Practices Recommendations for Stroke Care 2010 (Evidence Level B)
Patients with stroke should be placed NPO until they have had their swallowing ability screened using a simple, valid, reliable, bedside testing protocol as part of their initial assessment and before initiating oral medications, fluids, or food	Canadian Best Practice Recommendations for Stroke Care 2010 (Evidence Level B)
Patients who are not alert within the first 24 hours should be monitored closely and dysphagia screening performed when clinically appropriate	
Patients with stroke whose first random glucose value > 10 mmol/L should have fasting glucose and an HbA1c test ordered. If levels are elevated, antihyperglycemic agents should be considered	Canadian Best Practice Recommendations for Stroke Care 2010 (Evidence Level B)

Abbreviations: CTA, computed tomography angiography; HbA1c, glycosylated hemoglobin; ICH, intracerebral hemorrhage; INR, international normalized ratio; NPO, nothing by mouth; PTT, partial thromboplastin time.

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22 Including "general" intensive care units (expert consensus).

Module 2E: Unable to Determine

This module identifies best practices for the early treatment of "Unable to Determine" (not specified as hemorrhagic or ischemic) stroke patients that are <u>not</u> eligible for acute thrombolytic therapy. It is believed that most of these individuals have stroke-like symptoms usually due to ischemic stroke that is not evident on the initial computed tomography (CT) scan in the ED. The best practices for these patients are identical to module 2B except for the administration of tPA.

Module 3: Discharged Home / Community Care

This module identifies best practices for the majority of TIA patients who do not require admission to hospital. They should be referred to an urgent TIA/Stroke Prevention Clinic or comparable ambulatory care setting for rapid diagnostic and medical evaluation, ideally within 48 hours, to initiate secondary stroke prevention therapies. Those TIA patients who present within 48 hours from symptom onset with fluctuating or crescendo motor or speech symptoms may be considered for admission to hospital. **The Expert Panel recommends it continues its work to identify and include best practices related to TIA management in the community setting.** Access to community-based services is an integral part of providing high quality care for TIA patients in Ontario.

Module 4A: Acute Inpatient Admission of Ischemic Stroke Patients

This module identifies best practices for acute inpatient admission of ischemic stroke patients. To optimize outcomes and efficiencies, stroke volumes should be at least 165 ischemic stroke patients per year per organization. Greater volumes are likely to confer additional benefits (based on an analysis of the Discharge Abstract Database, 2002–2009[23]). The appropriate critical mass for an integrated stroke unit (a specialized inpatient stroke unit that provides both acute and rehabilitation interventions) has not been determined. Guidelines for the development of stroke units are available at www.strokebestpractices.ca.

Table 10: Acute Admission for Ischemic Stroke Patients

Recommended Practice	Guidelines/Evidence Considered
Patients should be admitted to a specialized, geographically defined hospital unit dedicated to the management of stroke patients	HQO stroke evidence-based analysis *(Moderate quality evidence)* Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level A)*
The core stroke unit team should consist of health care professionals with stroke expertise in medicine, nursing, occupational therapy, physiotherapy, speech–language pathology, social work, and clinical nutrition (a dietitian).	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level A)*
To have the necessary stroke expertise, the health care professionals spend the vast majority of their time treating stroke patients and regularly complete education about stroke care	Canadian Best Practices Recommendations for Stroke Care 2010 Foley et al. 2012[24]
Stroke patients should be placed NPO and have their swallowing ability screened using a simple, valid, reliable, bedside testing protocol as part of their initial assessment and before initiating oral medications, fluids, or food.	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level B)*
Patients who are not alert within the first 24 hours should be monitored closely. Dysphagia screening should be performed when clinically appropriate	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level C)*
Patients with stroke presenting with features indicating dysphagia or pulmonary aspiration should receive a full clinical assessment of their swallowing ability by a S–LP or appropriately trained specialists who would advise on swallowing ability and required consistency of diet and fluids	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level B)*

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23 The most recent 7 years of Ontario DAD data show that hospitals admitting < 130 ischemic stroke patients/year had 38% higher odds of a 30-day mortality compared to hospitals admitting 205–470 ischemic stroke patients/year.
24 Foley N, Meyer M, Salter K, Bayley M, Hall R, Liu Y, Willems D, McClure JA, Teasell R. Inpatient stroke rehabilitation in Ontario: are dedicated units better? Int J Stroke. 2012 Feb 15. doi: 10.1111/j.1747-4949.2011.00748.x. [Epub ahead of print]

Recommended Practice	Guidelines/Evidence Considered
All stroke patients admitted to hospital with acute stroke should be mobilized early and as frequently as possible and preferably within 24 hours of stroke symptom onset, unless contraindicated Therapy to promote recovery of motor impairments should commence within 48 hours of stroke according to best practices	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level B)* HQO Rapid Review: Nonsignificant differences in mortality and dependency for very early mobilization (within 24 hours post stroke) as compared with usual care *(Very Low Quality Evidence)* Canadian Best Practices Recommendations for Stroke Care 2010
The interprofessional team should assess stroke patients within 48 hours of admission to hospital and formulate a management plan	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level C)*
Clinicians should use standardized, valid assessment tools to evaluate patients' stroke-related impairments and functional status AlphaFIM® should be completed on day 3 [25]	Canadian Best Practice Recommendations for Stroke Care 2010 OSN Stroke Reference Group
LOS of 5 days for ischemic stroke patients is recommended	OSN Stroke Reference Group
All risks factors for cerebrovascular disease must be aggressively managed through pharmacological and nonpharmacological means	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level A)*
A statin drug should be prescribed to most ischemic stroke patients[26] to achieve LDL cholesterol < 2.0 mmol/L or a 50% reduction in LDL cholesterol from baseline	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level A)*
Stroke patients with diabetes should have their diabetes assessed and optimally managed: • HbA1c should be measured as part of a comprehensive stroke assessment • Although glycemic targets must be individualized, most patients with type 1 or type 2 diabetes should be treated to achieve HbA1c ≤ 7.0% • To achieve HbA1c ≤ 7.0%, patients should aim for fasting plasma glucose or preprandial plasma glucose of 4.0–7.0 mmol/L • If 2-hour postprandial HbA1c of 5.0–10.0 mmol/L cannot be achieved, further postprandial blood glucose lowering, to 5.0–8.0 mmol/L, can be considered • Unless contraindicated, low dose ASA therapy (81–325 mg/day) is recommended in all patients with diabetes with evidence of cardiovascular disease such as stroke	Canadian Best Practice Recommendations for Stroke Care 2012 *(Evidence Level A)* *(Evidence Level C)* *(Evidence Level B)* *(Evidence Level C)* *(Evidence Level A)*
All stroke patients should be assessed for risk of developing venous thromboembolism. Patients at high risk include those who: • are unable to move one or both lower limbs • are unable to mobilize independently • have a previous history of venous thromboembolism	Canadian Best Practice Recommendations for Stroke Care 2010

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25 AlphaFIM® may need to be repeated for more severe patients or if clinical status changes.
26 The decision to use statins in this setting should be based on the patient's global cardiovascular risk. It is unclear whether statins are of benefit in patients with a combination of atrial fibrillation and stroke.

Recommended Practice	Guidelines/Evidence Considered
• are dehydrated • have comorbidities e.g., malignant disease Early mobilization and adequate hydration should be encouraged for all acute stroke patients to help prevent venous thromboembolism	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level C)*
Stroke patients at high risk of venous thromboembolism should be started on venous thromboembolism prophylaxis immediately: • low molecular weight heparin should be considered for patients with acute ischemic stroke • unfractionated heparin should be considered for patients with renal failure	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level A)* Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level B)*
• The use of antiembolic (compression) stockings for post stroke venous thrombo-embolism prophylaxis alone is not recommended	Canadian Best Practice Recommendations for Stroke Care 2012 *(Evidence Level A)*
Temperature should be evaluated as part of routine vital signs every 4 hours for first 48 hours. For temperature > 37.5°C • increase frequency of monitoring • initiate temperature-reducing measures • investigate potential infection, and • initiate antipyretic and antimicrobial therapy as required	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level C)* Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level C)* Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level B)*
All stroke patients should be screened for urinary incontinence and retention, fecal incontinence, and constipation	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level C)*
• a portable ultrasound is the preferred noninvasive painless method for assessing postvoid residual urine volume in the bladder	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level C)*
• indwelling catheters should be avoided due to the risk of urinary tract infection. If used, indwelling catheters should be assessed daily and removed as soon as possible	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level A)*
• a bladder-training program should be implemented in patients who are incontinent of urine, and	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level C)*
• should include should include timed and prompted toileting on a consistent schedule	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level B)*
• a bowel management program should be implemented for stroke patients with persistent constipation or bowel incontinence	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level A)*
The nutrition and hydration status of stroke patients should be screened within the first 48 hours of admission using a valid screening tool. Stroke patients with nutritional concerns, hydration deficits, dysphagia, or other comorbidities should be referred to a dietician. Referral to a dietitian should be made within 7 days of admission for recommendations and consideration of enteral nutrition support for those patients who are unable to meet nutritional and fluid requirements.	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level B)*

Recommended Practice	Guidelines/Evidence Considered
All stroke patients should have an oral/dental assessment including screening for signs of dental disease, level of oral care, and appliances. An appropriate oral care protocol should be used for every patient including those who use dentures.	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level C)*
The oral care protocol should be consistent with the Canadian Dental Association recommendations and should include: • frequency of oral care (≥ twice/day) • types of oral care products (toothpaste, floss, and mouthwash) • management for patients with dysphagia	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level B)*
All patients with stroke should be screened at admission for risk of falls by an experienced clinician.	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level C)*
A falls risk assessment should include comprehensive interprofessional assessment of medical functional history and examination of mobility, vision, perception, cognition, and cardiovascular status.	*(Evidence Level B)*
Based on assessment, an individualized fall-prevention strategy should be implemented	*(Evidence Level C)*
All stroke patients with vascular risk factors and clinically evident stroke should be considered at high risk of vascular cognitive impairment	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level B)*
All high-risk patients[27] should be screened for cognitive impairment using a validated screening tool	*(Evidence Level B)*
Screening to investigate a person's cognitive status should address arousal, alertness, attention, orientation, memory, language, agnosia, visuospatial/perceptual function, praxis, and executive functions such as insight, judgment, social cognition, problem- solving, abstract reasoning, initiation, planning, and organization	*(Evidence Level C)*
The Montreal Cognitive Assessment is considered more sensitive to cognitive impairment than the Mini-Mental Status Exam in patients with vascular cognitive impairment. Its use is recommended when vascular cognitive impairment is suspected	*(Evidence Level B)*
Patients with identified cognitive impairments should receive additional cognitive or neuropsychological assessments to guide management	*(Evidence Level B)*
Patients should be screened for depression using a validated tool, especially if there is evidence of depression or mood change noted. All patients with stroke should be screened to determine if they have a history of or risk factors for depression	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level B)*
Patients identified at risk for depression during screening should be referred to a healthcare professional with expertise in diagnosis and management of depression in stroke patients	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level B)*
Patients, families, and caregivers should be prepared for transitions between care environments through education and training, emotional support, and information related to community services specific to the transition they are undergoing.	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level B)*
Patient and family education should occur at all stages of stroke care	Canadian Best Practice Recommendations for Stroke Care 2010

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27 Those with vascular risk factors such as hypertension, age > 65 years, hyperlipidemia, diabetes, clinical stroke, neuroimaging findings of covert stroke or white matter disease, hypertension-associated damage to other target organs, and/or those patients with cognitive or functional changes that are clinically evident or reported during history-taking (Canadian Best Practice Recommendations for Stroke Care 2010).

Recommended Practice	Guidelines/Evidence Considered
Patients who smoke should be strongly advised to quit immediately and be provided with pharmacological and nonpharmacological means to do so	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level B)*
Discharge planning should be initiated as soon as possible after the patient is admitted to hospital	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level B)*
Risk factor management should be included in any discharge planning	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level C)*
Information about discharge issues and possible needs of patients following discharge should be provided to patients and their families and caregivers as soon as possible after admission	
Discharge planning activities should include patients and their family in team meetings and cover discharge and transition care plans, a predischarge needs assessment, caregiver training, postdischarge follow-up plan, and a review of patient and family psychosocial needs	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level B)*

Abbreviations: ASA, acetylsalicylic acid; EDS, Evidence Development and Standards; HbA1c, glycosylated hemoglobin; LDL, low-density lipoprotein; LOS, length of stay; NPO, nothing by mouth; OSN, Ontario Stroke Network; S–LP, speech–language pathologist.

Module 4B: Acute Inpatient Admission of Intracerebral Hemorrhage Patients

This module identifies best practices for stroke patients with intracerebal hemorrhage (ICH) admitted to the acute inpatient setting. The care of these patients is identical to that for ischemic stroke patients as outlined in Module 4A except for the following:

- The recommended length of stay is 7 days[19]
- There is insufficient evidence on the safety and efficacy of anticoagulant deep vein thrombosis prophylaxis after ICH. Antithrombotics and anticoagulants should be avoided for at least 48 hours after onset[16]

Module 5: Admission to Inpatient Rehabilitation

This module identifies best practices for inpatient rehabilitation of stroke patients. In general, patients who qualify for inpatient rehabilitation are those with an early AlphaFIM® score of 40–80. Age, availability of a caregiver, severity of cognitive/perceptual needs, severe aphasia/dysphagia, and profound inattention/neglect are other considerations.

Table 11: Admission to Inpatient Rehabilitation

Recommended Practice	Guidelines/Evidence Considered
All patients who require rehabilitation should be referred to a specialist rehabilitation team in a geographically defined unit as soon as possible after admission	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level A)*
Procedures should enable admission 7 days/week	OSN Stroke Reference Group
All patients admitted to hospital with acute stroke should have an initial assessment by rehabilitation professionals as soon as possible, preferably within 24-48 hours of admission	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level A)*
The interprofessional rehabilitation team should assess patients within 24–48 hours of admission and develop a comprehensive individualized rehabilitation plan that reflects the severity of the stroke and the needs and goals of the stroke patient	*(Evidence Level C)*
The interprofessional rehabilitation team should consist of a physician, nurse, physical therapist, OT, S–LP, psychologist, SW,recreation therapist, pharmacist, patient, and family and/or caregivers	*(Evidence Level A)*
Recommended staffing ratios for inpatient rehabilitation are: • PT/OT: 1 each per 6 inpatient beds • S–LP: 1:15	OSN Stroke Reference Group
Clinicians should use standardized valid assessment tools to evaluate the patient's stroke-related impairments	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level B)*
The FIM tool should be used as a standard assessment tool	OSN Stroke Reference Group
All patients with stroke should begin rehabilitation therapy within an active and complex stimulating environment	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level C)*
Rehabilitation should begin as early as possible once medical stability is reached	*(Evidence Level A)*
	HQO Rapid Review: Shorter time to start of rehabilitation is associated with better functional outcome at discharge *(Very Low Quality Evidence)*
Patients with moderate or severe stroke who are rehabilitation ready and have rehabilitation goals should be given an opportunity to participate in inpatient stroke rehabilitation	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level A)*

Recommended Practice	Guidelines/Evidence Considered
Stroke patients should receive, through an individualized treatment plan, at least 3 hours of direct task-specific therapy per day by the interprofessional stroke team for at least 5 days per week Stroke patients should receive the above therapy for at least 6 days a week[28]	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level A)* OSN Stroke Reference Group HQO Rapid Review: No evidence for improved functional recovery (as measured using the Barthel Index or Functional Independence Measures) with higher intensity of rehabilitation as compared with standard rehabilitation *A full HQO Evidence-based Analysis on this topic is pending*
Providing a higher intensity of rehabilitation should lead to decreases in patient length of stay	Expert Opinion
Stroke unit teams should conduct at least one formal interprofessional meeting per week at which they • identify patient problems • set rehabilitation goals • monitor patient progress • plan post discharge support	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level B)*
Patients who fail a swallowing screen or present with features indicating dysphagia or aspiration should receive a full clinical assessment of their swallowing ability by an S–LP	Canadian Best Practices Recommendations for Stroke Care 2010 *(Evidence Level B)*
Therapy to promote motor and physical recovery should be provided according to best practice recommendations, i.e., SCORE recommendations for upper and lower limb post-stroke management	Canadian Best Practice Recommendations for Stroke Care 2010 Sections 5.4 and 5.5 *(Evidence Levels A - C)*
Patients with stroke as well as their families and caregivers should be prepared for transitions between care environments by being given education, training, emotional support, and information related to community services specific to the transition they are undergoing	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level B)*
Patients with stroke and their families should be educated at all stages of stroke care	Canadian Best Practice Recommendations for Stroke Care 2010
All patients with stroke should be screened using a validated tool to determine if they have a history of or risk factors for depression. Screening should take place during early rehabilitation and prior to discharge to the community and whenever clinical presentations occur Patients identified as being at risk of depression during screening should be referred to a health care professional with expertise in diagnosis and management of depression in stroke	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level A)* *(Evidence Level B)*
All patients with stroke should be screened at admission for risk of falls by an experienced clinician. This screening should include comprehensive interprofessional assessment of medical functional history and examination of mobility, vision, perception, cognition, and cardiovascular status. Based on assessment, an individualized fall-prevention strategy should be implemented	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level C)*

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[28] Rehab Intensity is defined as the patient time spent in individual rehabilitation therapy that is aimed at achieving therapy goals based on physical, functional, cognitive, perceptual and social means in order to maximize the patients recovery. Time that a patient is engaged in active face to face treatment which is monitored or guided by a rehabilitation therapist. Ontario Stroke Reference Group 2012

Recommended Practice	Guidelines/Evidence Considered
All stroke patients with vascular risk factors should be considered at high risk of vascular cognitive impairment and should be screened for cognitive impairment using the Montreal Cognitive Assessment. The Montreal Cognitive Assessment is considered more sensitive to cognitive impairment than the Mini-Mental Status Exam in patients with vascular cognitive impairment.	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level B)*
Patients with identified cognitive impairments should receive additional cognitive or neuropsychological assessments to guide management	*(Evidence Level B)*
Discharge planning should be initiated as soon as possible after the patient is admitted to hospital	Canadian Best Practice Recommendations for Stroke Care 2010 *(Evidence Level B)*
LOS in rehabilitation is determined by the benchmarks proposed by the OSN stroke reference group for each Rehabilitation Practice Group (RPG) and recommended as : 1100 = LOS 48.9 days 1110 = LOS 41.8 days 1120 = LOS 25.8 days 1130 = LOS 25.2 days 1140 = LOS 14.7 days 1150 = LOS 7.7 days 1160 = LOS 0 days	OSN Stroke Reference Group

Abbreviations: FIM, Functional Independence Measure; LOS, length of stay; OT, occupational therapist; PT, physiotherapist; SCORE, Stroke Canada Optimization of Rehabilitation through Evidence; S–LP, speech–language pathologist.

Module 6: Early Supported Discharge for Rehabilitation

Early supported discharge and outpatient/community rehabilitation are essential components of best practice stroke care to achieve optimal outcomes and efficiencies. In this module, an interprofessional team provides rehabilitation and educational interventions in the community in the first few days and weeks after discharge from either inpatient acute care or rehabilitation care. These teams have been shown to reduce length of stay and will be an essential support to consistent achievement of the targets noted previously for inpatient care. These modules will be developed as part of the ongoing phase 2 work of the Expert Panel.

Module 7: Outpatient/Community Rehabilitation

In this module, as interprofessional team provides rehabilitation and educational interventions in the first 8-12 weeks after discharge from either inpatient acute care or rehabilitation care. These teams have been shown to reduce length of stay and will be an essential support to consistent achievement of the targets noted previously for inpatient care. These modules will be developed as part of the ongoing phase 2 work of the Expert Panel

Performance Measurement

Following the start of the Episode of Care for Stroke Expert Advisory Panel's process for examining the stroke episode of care, the Ministry of Health and Long-Term Care requested that, as part of this work, Health Quality Ontario (HQO) and the Expert Panel also develop recommendations around performance indicators. The intent is for these performance indicators to be aligned with the recommended practices for the episode, allowing the Ministry to measure changes in clinical practice resulting from the implementation of the Quality-Based Procedures (QBP) funding model. The Ministry has proposed an "Integrated Scorecard" that would gather similar indicators from each of the QBP clinical areas.

The Expert Panel recognized that given the very limited time allotted for the task of identifying performance indicators within the context of their other work, any recommendations in this area would be made at a very high level and draw on existing Ontario work in stroke performance measurement. In contrast with performance indicator recommendations for the congestive heart failure (CHF) and chronic obstructive pulmonary disease (COPD) episodes of care, stroke has the benefit of a well-developed provincial performance measurement infrastructure that includes several years of detailed clinical variable data collection through the Ontario Stroke Audit (OSA) and the annually published Ontario Stroke Evaluation Report and scorecard. This infrastructure has enabled the Expert Panel members to have confidence in the pre-existing feasibility and validity of many of the indicators they have considered.

Process for Selecting Performance Indicators

The set of recommended performance indicators included here was identified over the span of several weeks, beginning with a discussion at the final Stroke Episode of Care Expert Panel meeting to develop a pool of potential indicators, followed by an Expert Panel teleconference and final email vote to prioritize this list of indicators. It is important to note that this process was far less rigorous and comprehensive than a typical Delphi process for the development of performance indicators; hence, the recommended indicators here should be seen as a starting point toward a comprehensive performance framework to monitor changes in the recommended practices.

Feasibility and Data Sources Required for Calculating Recommended Performance Indicators

Of the 13 recommended indicators described in Table 12, the Expert Panel believes that 11 are *potentially* feasible to measure over the short-term. Of these indicators, 7 are currently measured and reported through the Ontario Stroke Network (OSN) Stroke Evaluation and Quality Committee (SEQC) Stroke Report Card. Of the 11 feasible indicators, 7 can be collected through routine provincial administrative datasets (Discharge Abstract Database [DAD], National Ambulatory Care Reporting System [NACRS], National Rehabilitation Report System [NRS], and the Registered Persons Database [RPDB]). The majority of these require record-level linkage across these databases, a capability held by the Ministry and Institute for Clinical Evaluative Sciences (ICES).

Of the 11 feasible indicators (plus 1 additional developmental indicator), 4 are calculated using data from the OSA dataset. The OSA collects a wide range of stroke-related clinical variables and process measures through chart review that are not available in current administrative data. The OSA dataset is housed at ICES, where it is linked with Ontario administrative datasets. Each year the OSA is collected, it includes a sample of approximately 20% of all eligible stroke patients in Ontario, and includes nearly all hospitals that provide stroke care (about 140). The OSA was collected in fiscal years 2002/3, 2004/5, 2008/9 and 2010/11,

during which it was funded by the Ministry. The OSA is currently not funded for future data collection; hence, given the limitations of current data, 2010/11 is the final year with data available to measure 5 of the 13 proposed indicators.

Of the recommended indicators, 2 (*Proportion of Patients with an AlphaFIM [Target Completion Day 3] of 40–80 Discharged to Inpatient Rehabilitation and AlphaFIM Over 80 Discharged to Outpatient / Community Rehabilitation* and *Hours of Rehabilitation Therapy Provided in Inpatient Rehabilitation*), 2 are developmental in nature and will require development and validation. In the case of *Hours of Rehabilitation Therapy*, new data collection from rehabilitation providers will also be required.

Table 12: Recommended Stroke Performance Indicators

Proposed Indicator	Rationale	Feasibility	Data Source	Comments
Performance Dimension: Effectiveness				
Percentage of stroke/TIA patients admitted to a LTC facility within 1 year of stroke / TIA inpatient hospitalization	Reflects the effectiveness of post-stroke care. If the QBF changes are effective, LTC admission should be reduced. Requires all of the best practice elements (hospital and community) to be in place	Will be reported from FY 2012/13 onwards to inform OSN targets	DAD linked to CCRS-LTC	All LTC facilities reported to CCRS-LTC as of FY 2010/11. Exclude patients who were LTC residents prior to event. This indicator is 1 the 4 OSN targetsfor 2016
30-day stroke/TIA risk-adjusted mortality	Even though mortality is tracked routinely by hospitals, mortality is an important component of the stroke QBP "score card." Greater access to acute stroke best practices should result in decreased mortality	YES – SEQC Evaluation Report	DAD linked to RPDB	NACRS not included as it cannot be risk adjusted. Modified version of "get with the guidelines" is used for risk adjustment per SEQC Report. Consider developing a composite index of 90-day readmissions/mortality
90 day stroke/TIA readmission rate following hospitalization for stroke/TIA	Readmissions at 90 days was selected as this will include both acute care and rehabilitation sectors including recurrence. Greater access to best practices across these sectors should result in reduced readmissions. Requires all of the best practice elements (hospital and community) to be in place	YES – SEQC Evaluation Report	DAD/NACRS	Question whether Charlson score can be used to adjust for severity (if so, will only be with DAD data). Can this score be calculated by all facilities? 30-day stroke/TIA readmission is one the 4 OSN 2016 targets

Proposed Indicator	Rationale	Feasibility	Data Source	Comments
Proportion of patients with an AlphaFIM (target completion day 3) of 40–80 discharged to inpatient rehabilitation and > 80 discharged to outpatient / community rehabilitation	The AlphaFIM is the standard by which acute care facilities will assess eligibility for rehabilitation (inpatient and outpatient). Many centres are already successfully using the AlphaFIM for rehabilitation triage	This indicator is developmental in nature AlphaFIM available in the biennial OSA through retrospective chart audit	OSA	This indicator is developmental as it is not currently available in administrative data sets. The Expert Panel will work to better define the indicator including defining outpatient/community/ESD services. In FY 2010/11, 86 hospitals were calculating AlphaFIM. Provincial licensing and data field in DAD is required It is recommended that sites be required to enter the AlphaFIM in DAD as part of the QBF. The DAD discharge data fields need to be modified to include a category for outpatient/community rehab. Remove acute to acute transfers or link to NRS
Performance Dimension: Appropriateness				
Discharge disposition of TIA / stroke patients from acute care: home w/out services, home w/ services, IP rehabilitation; CCC / LTC	Reflects access to best practices. Current provincial performance is below the expected level of ~ 40%	YES - SEQC Evaluation Report	DAD linked to NRS	
Percentage of RPG 1150, 1160 (mild) and moderate and severe stroke patients (RPG 1120,30,40 and RPG 1100,1110, respectively) receiving inpatient rehabilitation	Will provide information according to stroke severity on appropriateness and access to rehabilitation. Requires all of the best practice elements (hospital and community) to be in place. Proportion of mild stroke admitted to inpatient rehab should decrease outpatient capacity	YES - SEQC Evaluation Report	NRS	RPGs would not be available for those not going to rehab, therefore need to use AlphaFIM, therefore the importance of E5 "rehab intensity" as an indicator. Algorithm available using age, admission motor FIM, and cognitive FIM to assign RPG. Remove acute to acute transfers or link to NRS
Hours of rehabilitation therapy provided in inpatient rehabilitation	Demonstrates whether centres are achieving the required level of intensity (3 hours/day), a critical element in achieving better outcomes and reduced LOS	No	Not Available	Work is underway to define therapy duration time at the patient level and to be captured in the NRS Recommended that sites be required to enter hours of rehab intensity as part of QBP
Percentage of inpatient rehabilitation patients achieving target RPG LOS	This is a reflection of achieving the required intensity of therapy and can be currently collected	No	NRS	

Proposed Indicator	Rationale	Feasibility	Data Source	Comments
Integration				
Percentage of TIA / stroke patients treated on a stroke unit (including neuro/ICU) for at least 80% of their LOS	Access to acute stroke unit care is a core best practice. The majority of the LOS should be provided on a stroke unit	Yes - SEQC Evaluation Report	OSA, DAD mandatory FY 2011/12	It has been suggested to identify a minimum number of days rather than a percentage. NB: Stroke unit care only became a mandatory element in DAD in FY 2011/12. Data quality unknown. Only 52% of hospitals reported participating in DAD 340 in FY 2011/12. DAD would need to be modified so LOS on stroke unit is captured. This is a 2016 OSN target
Percentage of stroke / TIA ALC days to total LOS	This indicator will demonstrate whether the QBF has been successful in reducing ALC	Yes - SEQC Evaluation Report	DAD	NRS does not capture ALC days. ALC-S captures ALC days in rehab but unsure if this is local or could be evaluated at an LHIN level
Proportion of ischemic stroke patients arriving in ED within 3.5 hours who are eligible for TPA that received stroke thrombolysis	Measure of organitation integration and speed of diagnosis and TPA delivery for those patients who arrive in TPA window	Yes - SEQC Evaluation Report	OSA, DAD, NACRS mandatory FY 2011/12	The majority of the Expert Panel supported the recommended indicator. Consideration should be given to having the NIHSS score, although it was noted that contra-indications should be included. One panel member supported the door-to-needle time as hospitals have more control over this process indicator. NB: Only 52% of hospitals reported participating in DAD 340, 15% in NACRS, 340 in FY 2011/12. Data quality unknown
Access				
Percentage of Stroke/TIA discharged on antithrombotics	This is an indicator of appropriate prevention strategies to mitigate the risk of another vascular event or death. All stroke/TIA patients should be D/C'd on antithrombotics	Yes	OSA, DAD, NACRS mandatory FY 2011/12	Mandatory data element in DAD as of FY 2011/12. Data quality unknown. Previously collected through the OSA
Proportion of ischemic stroke / TIA patients who received brain imaging (CT scan or MRI) within 24 hours of arrival at ED or the proportion of patients with ischemic stroke with an anterior circulation event who received Doppler ultrasound or CT Angiography, or MRA within 24 hours of admission for stroke	Brain and vascular imaging are the standard of care for diagnosis and determining appropriate management / interventions	Yes	OSA - acute and Stroke Prevention Clinic	The Expert Panel was unable to come to consensus on which of the 2 indicators should be recommended. Considerations include CT scan within 24 hours of arrival in ED. Data collected in CIHI: overall provincial and LHIN performance is good but there is facility variation with poor performance at smaller centres; vascular imaging: more room for improvement but data is not readily available

Abbreviations: ALC, alternate level of care; CCC, complex continuing care; CCRS, Continuing Care Reporting System; CT, computed tomography; DAD, Discharge Abstract Database; ESD, Early Supported Discharge; FIM, Functional Independence Measure; FY, fiscal year; ICU, Intensive Care Unit; IP, inpatient; LHIN, Local Health Integration Network; LOS, length of stay; LTC, long-term care; MRI, magnetic resonance imaging; NACRS, National Ambulatory Care Reporting System; NIHSS, National Institutes of Health Stroke Scale; NRS, National Rehabilitation Report System; OSA, Ontario Stroke Audit; OSN, Ontario Stroke Network; QBF, Quality-Based Funding; RPDB, Registered Persons Database; RPG, Rehabilitation Practice Group; SEQC, Stroke Evaluation and Quality Committee; TIA, transient ischemic attack.

Implementation of Best Practices

The Episode of Care for Stroke Expert Advisory Panel believes that implementation of best practices related to stroke care will require significant investment. The following points highlight some of the key issues for and barriers towards the successful implementation of the stroke best practices discussed:

1. It will not be possible to promote the movement of appropriate patients to community or ambulatory care and achieve the associated cost efficiencies without addressing out-of-hospital incentives for best practices (for example, developing rapid assessment clinics for those with transient ischemic attack (TIA) and adequate outpatient rehabilitation services postdischarge.).

2. A transitional approach to funding is recommended so as to enable the building of capacity in the community and to avoid the consequences of patients receiving no service.

3. If changes to length of stay and discharge into the community targets are not achieved, it may be difficult to increase the number of patients who can be seen in stroke units. Shorter lengths of stay will help create the capacity through increased turnover of available stroke unit beds.

4. To achieve the critical mass of expertise and stroke unit admissions, each Local Health Integration Network (LHIN) will need to consider consolidation of stroke care in a fewer number of hospitals in their region. Thus, stroke-related bed days will be moved from smaller centres to those with stroke units.

5. Acute centres may require capital expenditure to implement stroke unit care as well as rehabilitation centres to provide outpatient/day rehabilitation services.

6. The need for a critical mass and access to the acute and rehabilitation stroke unit "best practice infrastructure" may necessitate patients and their families travelling longer distances to participate in the rehabilitation process. However, length of acute and rehabilitation care will be shorter and with better outcomes.

7. Transportation supports will need to be in place to support access to rehabilitation services, particularly when an outpatient- or facility-based rehabilitation program is the optimal model.

8. The location of Telestroke sites will need to be considered. If a site does not have the capacity for a stroke unit, arrangements should be made to "drip and ship" to a hospital that has a stroke unit. The Ontario Stroke Network (OSN) is currently working with the regional stroke networks and LHINs to develop and confirm locations of Telestroke sites.

9. The inpatient rehabilitation targets are very aggressive and represent a substantial change in practice. These changes will not be possible without achieving the recommended standards across the entire system including intensification of rehabilitation and availability of outpatient/community services.

10. Patients arriving at rehabilitation facilities will be more acute. This will be a particular challenge for "stand-alone" rehabilitation facilities that will need to collaborate with their referring sites to

facilitate timely transfer and negotiate agreements to expedite acute care readmission if required. Rehabilitation services may need to expand skills in management of acute care interventions such as feeding tubes, intravenous lines, etc.

11. To facilitate earlier transfer to rehabilitation, the priority will be to complete acute care diagnostic testing and assessments in a shorter time frame.

12. To provide 7 day-per-week admission to inpatient rehabilitation, access to pharmacy, dietary, and medical coverage, among others, will need to be available.

13. It is recommended that AlphaFIM® be used to inform eligibility for rehabilitation. There is currently no reliable mechanism to collect this data, as the Ontario Stroke Registry (OSR) / OSA is not funded for 2013/14. It is recommended that sites be required to enter the AlphaFIM® in an optional field in the Discharge Abstract Database (DAD) with a longer term plan to work with the Canadian Institute for Health Information (CIHI) to establish AlphaFIM® as a permanent field.[29]

14. There is a concern that there may be an increased need for AlphaFIM® training resulting in additional costs.

15. The OSN will not have funding in FY 2013/14 to complete the Ontario Stroke Registry (OSR)/Ontario Stroke Audit. While CIHI is collecting most of the key indicators, data quality is a concern.

16. Patient flow through rehabilitation is an important success factor. It is recommended that rehabilitation facilities also have priority access to long-term care admission to avoid alternate levels of care (ALC) in rehabilitation.

17. Human resource shortages may be a challenge in some regions of the province.

18. Existing strategies for measuring nature and intensity of rehabilitation (workload measurements systems) will need to be modified to ensure the recommended intensity is provided.

19. The Ontario Stroke Network and the 11 Stroke Regions have played a critical role in the development of the quality best practices and will be key to supporting uptake of the best practices.

20. It is recommended that the impact of the QBP be analyzed year-to-year and components such as volume of admissions be re-assessed.

21. Stakeholders have repeatedly raised concerns over using the top performing/best practice facilities as a benchmark for QBP in that some hospitals may be unfairly punished and not given the opportunity to improve.

22. Stakeholders have raised concerns with access to the Home First Program for stroke patients with < 40FIM® in order to avoid ALC LTC and/or inappropriate hospitalization.

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29 In the 2010/11 OSA, 86 out of 135 hospitals were using AlphaFIM®, though documentation could not be found in 37 out of the 86 hospitals.

Expert Panel Membership

Expert Panel for Health Quality Ontario: Episode of Care for Stroke

Name	Role	Organization
Dr. Mark Bayley	Medical Director, Brain and Spinal Cord Rehabilitation Program, Program Associate Professor, Division of Physiatry	Toronto Rehabilitation Institute, UHN
Ms. Christina O'Callaghan	Executive Director	Ontario Stroke Network
Dr. Gustavo Saposnik	Director, Stroke Outcomes Research Centre, Associate Professor of Medicine, Division of Neurology, St. Michael's Hospital	Institute for Clinical Evaluative Sciences, University of Toronto
Dr. Richard Swartz	Director, University of Toronto Stroke Program Medical Director, NE-GTA Regional Stroke Program, Associate Professor, Division of Neurology, Department of Medicine,	Sunnybrook Health Sciences Centre, University of Toronto
Dr. Robert Teasell	Professor of Physical Medicine and Rehabilitation, Schulich School of Medicine	Western University Lawson Research Institute St. Joseph's Health Care London
Dr. Paul E. Cooper	Senior Medical Director – Medicine, Chief, Department of Clinical Neurological Sciences	London Health Sciences Centre
Dr. Paul Ellis	Emergency Physician	University Health Network
Dr. Andrew Samis	Physician Stroke Champion and Staff Intensivist, Division of Critical Care	Quinte Health Care, Belleville Ontario
Dr. Moira Kapral	Division of General Internal Medicine & Clinical Epidemiology, Associate Professor, Department of Medicine, Scientist	University of Toronto Institute for Clinical Evaluative Sciences (ICES)
Dr. Murray Krahn	Director, THETA, F. Norman Hughes Chair and Professor, Department of Medicine and Faculty of Pharmacy	University of Toronto
Dr. Daniel Brouillard	Stroke Survivor/Internist	Kingston Heart Clinic
Dr. R. Loch MacDonald	Keenan Endowed Chair in Surgery Head, Division of Neurosurgery, Professor of Surgery, University of Toronto	St. Michael's Hospital
Dr. Ruth Hall	OSN Evaluation Lead and Adjunct Scientist	Ontario Stroke Network,

Name	Role	Organization
		Institute for Clinical Evaluative Sciences
Linda Kelloway	Best Practices Leader	Ontario Stroke Network
Rhonda Whiteman	Clinical Nurse Specialist, Stroke Best Practice Coordinator	Hamilton Health Sciences Centre
Rebecca Fleck	Occupational Therapist, Regional Stroke Education and Research Coordinator, Central South Regional Stroke Network	Hamilton Health Sciences Centre
Deborah Willems	Regional Rehabilitation Coordinator, Southwestern Ontario Stroke Network	London Health Sciences Centre
Holly Sloan	Speech–Language Pathologist	Trillium Health Centre Site, Credit Valley Hospital and Trillium Health Centre
Matthew Meyer	Project Coordinator	Ontario Stroke Network
Kathleen Lee	Social Worker	Health Sciences North
Linda Welham	Professional Resource, Case Costing and Decision Support	Southlake Regional Health Centre
Lori Marshall	Executive Vice President, Strategy, Performance and Aboriginal Health	Thunder Bay Regional Health Sciences Centre
Jin-Hyeun Huh	Pharmacy Director of Inpatient Operations, Department of Pharmacy	University Health Network
Derek Leong	Clinical Pharmacist, General Internal Medicine	University Health Network – Toronto General Hospital
Ministry Representatives		
Peter Biasucci	Manager, Acute and Rehabilitative Care Unit, Health Policy and Care Standards Branch, Health System Strategy and Policy Division	Ministry of Health and Long-Term Care
Jason Lian	Senior Methodologist, Health System Funding Policy Branch	Ministry of Health and Long-Term Care
Thomas Smith	Acting Program Manager, Provincial Programs Branch	Ministry of Health and Long-Term Care

Appendices

Appendix I: Stroke Patient Group—ICD-10-CA Details

G45   **Transient cerebral ischaemic attacks and related syndromes**
Excludes:
Neonatal cerebral ischaemia (P91.0)

   G45.0 **Vertebro-basilar artery syndrome**
   G45.1 **Carotid artery syndrome (hemispheric)**
   G45.2 **Multiple and bilateral precerebral artery syndromes**
   G45.3 **Amaurosis fugax**
   G45.8 **Other transient cerebral ischaemic attacks and related syndromes**
   Includes:
Subclavian steal syndrome

   G45.9 **Transient cerebral ischaemic attack, unspecified**
   Includes:
Spasm of cerebral artery
Transient cerebral ischaemia NOS
Use additional code from category (E10-E14) with fourth and fifth digits .52 to classify any associated diabetes mellitus

I61   **Intracerebral haemorrhage**
Use additional code from category (E10-E14) with fourth and fifth digits .52 to classify any associated diabetes mellitus.

   Excludes:
Sequelae of intracerebral haemorrhage (I69.1)

   I61.0   Intracerebral haemorrhage in hemisphere, subcortical
   Includes:
Deep intracerebral haemorrhage

   I61.1   Intracerebral haemorrhage in hemisphere, cortical
   Includes:
Cerebral lobe haemorrhage
Superficial intracerebral haemorrhage

   I61.2 **Intracerebral haemorrhage in hemisphere, unspecified**
   I61.3 **Intracerebral haemorrhage in brain stem**
   I61.4 **Intracerebral haemorrhage in cerebellum**
   I61.5 **Intracerebral haemorrhage, intraventricular**

I61.6   **Intracerebral haemorrhage, multiple localized**
I61.8   **Other intracerebral haemorrhage**
I61.9   **Intracerebral haemorrhage, unspecified**

I63   **Cerebral infarction**
Includes:
Occlusion and stenosis of cerebral and precerebral arteries, resulting in cerebral infarction
Use additional code from category (E10-E14) with fourth and fifth digits .52 to classify any associated diabetes mellitus

Excludes:
Sequelae of cerebral infarction (I69.3)

I63.0   **Cerebral infarction due to thrombosis of precerebral arteries**
I63.1   **Cerebral infarction due to embolism of precerebral arteries**
I63.2   **Cerebral infarction due to unspecified occlusion or stenosis of precerebral arteries**
I63.3   **Cerebral infarction due to thrombosis of cerebral arteries**
I63.4   **Cerebral infarction due to embolism of cerebral arteries**
I63.5   **Cerebral infarction due to unspecified occlusion or stenosis of cerebral arteries**
I63.8   **Other cerebral infarction**
I63.9   **Cerebral infarction, unspecified**

I64   **Stroke, not specified as haemorrhage or infarction**
Includes:
Cerebrovascular accident (CVA) NOS
Use additional code from category (E10-E14) with fourth and fifth digits .52 to classify any associated diabetes mellitus.
Excludes:
Sequelae of stroke (I69.4)

H34.1 **Central retinal artery occlusion**

Appendix II: Rapid Review Methodology

Table A1 and Figure A1 outline the process and components comprising the Evidence Development and Standards Branch Rapid Review process.

Table A1: Rapid Review Methodology

Steps	Components
1. Develop research question	Develop PICOS in consultation with experts, end users, applicant, etc.
	Limited scoping of question (e.g., Blue Cross Blue Shield, AETNA, CIGNA)
	Determine study selection criteria (inclusion/exclusion)
	Determine a maximum of 2 outcomes to GRADE in step 5
2. Conduct literature search	5 years
	English
	MEDLINE, EMBASE, Cochrane, Centre for Reviews and Dissemination
	SRs, MAs, HTAs (establish in advance that these study designs exist for your topic)
3. Screen and select studies	Selection of SRs, MAs, HTAs
	Rate SRs with AMSTAR
	Retrieve primary studies from SRs, MAs, HTAs for step 4
4. Conduct data extraction and analysis[a]	Extract data on 2 outcomes from primary studies
5. Apply GRADE assessment outcomes[a]	GRADE maximum of 2 outcomes
6. Write up findings	Write findings using Rapid Review template

Abbreviations: AMSTAR, Assessing the Methodological Quality of Systematic Reviews; GRADE, Grades of Recommendation, Assessment, Development, and Evaluation; HTA, health technology assessment; MA, meta-analysis; PICOS, population, intervention, comparison, outcome, setting; SR, systematic review.
[a]These steps are required if the identified SRs, MAs, and/or HTAs did not use GRADE to assess relevant outcomes.