Organization of Stroke Care Services:
Review of the Evidence, Policies and Experiences

Summary

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May 2011
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Introduction
In its 2005-2010 Action Plan for Seniors Who Have Lost Autonomy, the Ministère de la Santé et des Services sociaux (MSSS) aimed to consolidate organized health services for people with or at risk of stroke and their families and informal caregivers. The ministry asked the Agence d’évaluation des technologies et des modes d’intervention en santé (AETMIS) to provide a perspective on the best way to organize these services and to provide details on the structural entities, and their components, that should be part of the continuum of stroke care services. At the same time, the ministry established a working group of experts in the field with the mandate to support the implementation of the continuum, and AETMIS worked in collaboration with this group. It should be noted that on January 19, 2011, the Institut national d’excellence en santé et en services sociaux (INESSS) succeeded AETMIS and the Conseil du médicament by decree, in accordance with a law enacted on June 10, 2010.

Background
Stroke has a major impact in terms of mortality and morbidity, owing to its associated physical and psychological effects. In industrialized countries, stroke is the third leading cause of mortality in adults, after heart disease and cancer, and the leading cause of severe disability. According to available statistics, in 2005-2006, a total of 38,341 hospitalizations were attributable to acute stroke in Canada; in Quebec, 11,940 stroke hospitalizations occurred in 2008-2009. It is estimated that approximately one-third of those who experience a stroke or transient ischemic attack (TIA) and who are seen in emergency rooms are not hospitalized. Strokes can be ischemic (insufficient blood supply) or hemorrhagic (non-traumatic intracranial or subarachnoid bleed). The severity of the consequences of ischemic stroke, which accounts for nearly 80% of all strokes, is highly dependent on the delay to thrombolytic treatment (time-sensitiveness).

In 2008, an expert advisory report carried out for the ministry on the state of stroke care in Quebec found several problems affecting healthcare service accessibility, continuity and quality. With respect to accessibility, treatment delays appeared to relate to the lack of a hierarchical structure in physical health services: people experiencing a stroke were often not initially received at the facility best suited to meet their needs. The report also deplored both a lack of secondary prevention settings to effectively manage risk factors in people suspected of having had a first stroke, and the wait times for diagnostic tests for these clients. Lastly, the report highlighted the challenge of providing timely access to rehabilitation services with the intensity required.

With respect to continuity, the lack of service corridors between the various healthcare facilities was notably recognized as an important problem. Various factors compromised the quality of services, such as a non-systematic application of recognized best practices and the lack of formal quality assurance and continuous improvement measures.

It is essential that the management of patients with stroke or TIA be part of a continuum of care. According to the Canadian Stroke Strategy launched in 2008 and updated in December 2010, the continuum of stroke care includes the following elements: primary prevention, health promotion and public awareness, hyperacute and acute stroke management, stroke rehabilitation, prevention of stroke recurrence (secondary prevention) and community reintegration. The present report focuses on acute stroke management, secondary stroke prevention and stroke rehabilitation, in accordance with its given mandate.

Methodology
The assessment questions in this report address the expected minimum requirements regarding structure, human and technical resources, and processes of care, as well as minimum client volumes, for each of the following entities forming the organizational framework for a stroke care continuum, in order to provide quality services:
(1) stroke units;
(2) stroke centres;
(3) secondary prevention clinics;
(4) rehabilitation services, and, as a complement to this framework,
(5) stroke telemedicine.

Given the nature of the given mandate and the abundance of information on these topics in general, the literature search and data extraction focused on clinical practice guideline documents, existing systematic reviews and healthcare policies and experiences in stroke observed outside Quebec. Critical analysis of these documents and their reviews of the evidence formed the basis of the extraction of data for this report. Information on the Quebec context arose from the 2008 advisory report on development of the continuum of stroke care services in Quebec and from interactions with the MSSS expert working group as its work progressed (in the period 2009-2010).

**Organization of care in England, Australia and Ontario**

The stroke care experiences of three healthcare systems – England, Australia and Ontario – were examined for this report. The criteria for selecting these jurisdictions were the following: existence of a well-developed stroke/TIA care policy, availability of literature on stroke care organization, and evaluation of performance of the stroke/TIA strategy.

**England** (and the United Kingdom, in general) has shown growing interest in improving stroke care and in evaluating the implementation of best practices. Periodic audits, clinical practice guidelines and organizational frameworks have all been published. The National Sentinel Stroke Audit was first conducted in 1998 in three U.K. countries (England, Wales and Northern Ireland), and has since been performed every two years. In 2009, all organisations managing acute care hospitals in England (known as acute trusts) which admitted stroke patients had stroke units; 71% of acute trusts provided thrombolytic treatment. Furthermore, England is the only region studied that has established hyperacute stroke units (HASUs), offering specialized services (e.g. brain imaging, thrombolysis) 24 hours a day. The latest organizational audit (conducted in 2010) showed that 45% of acute trusts in England, Wales and Northern Ireland have access to specialized stroke teams for early supported discharge from hospital.

In 2002, **Australia** implemented a policy on establishing stroke units, the National Stroke Unit Program, that focused on providing equitable and best practice care throughout the country. Stroke services have undergone major development since 2000. Substantial investment was made in 2003-2004 to improve existing stroke units or to establish new ones. Organizational frameworks, national clinical practice guidelines and performance measurement methods have been developed since the start of the program, and audits have been conducted on both acute and post-acute services.

In 1997, the **Ontario** government established a stroke strategy that required an investment of $70 million and led to the development of eleven regional stroke networks. The Ontario Stroke Network (OSN) currently aims to improve access to evidence-based preventive and curative services with a view to reducing stroke incidence, mortality and resulting disability. The OSN is responsible for ensuring the continuum of services by promoting organizational change, educating the public and offering professional development. The Institute for Clinical Evaluative Sciences (ICES) has conducted two audits of stroke care in Ontario. Rehabilitation within the continuum of care was addressed in a consensus report which defined the components of a provincial stroke rehabilitation network and specified practice standards.

Using available performance indicators, a comparison of the experience in stroke care in these three healthcare systems was carried out, keeping in mind several limitations of this analysis, such as data arising from different time periods. Results indicate that England (at times based on data combined with Wales and Northern Ireland) has shown the greatest progress in the use of stroke units: three out of four stroke patients spent at least part of their acute hospital stay in a stroke unit (in 2008), compared with one out of two patients in Australia (in 2009) and one out of five patients in Ontario (in 2004-2005). In addition, the three U.K. countries recorded the highest overall proportion of ischemic stroke patients who received intravenous thrombolysis, at 9% (in 2009), compared with 3% in Australia (2009) and nearly 4% in Ontario (2004-2005). Australia, on the other hand, had the best results in terms of imaging services: about 90% of patients requiring computed tomography in 2009 were tested within 24 hours of stroke onset. The comparable percentages for Ontario (2004-2005)
and England (2008) were 69 and 57%, respectively. Lastly, regarding other available results from similar time periods (i.e., comparing England and Australia), England seems to be the jurisdiction that has made the most headway in multidisciplinary assessment of stroke patients.

Synthesis of the evidence and policies

The extracted information in this report is organized according to three themes: the acute care phase, the post-acute rehabilitation phase and secondary prevention.

Acute care

To date, the effectiveness of stroke units has been demonstrated in multiple studies, including a key review by The Cochrane Collaboration. The evidence on the organizational parameters specific to stroke units and the policy documents of the three healthcare systems examined allowed for identification of elements in common. On an organizational level, a stroke unit should meet the following criteria:

- a geographically-defined unit;
- access to staff with specialized expertise in stroke and rehabilitation;
- access to a multidisciplinary team (that meets at least once a week);
- use of care protocols by the healthcare professionals;
- early rehabilitation for all patients; and
- quality assurance activities.

A critical volume of patients, of roughly 100 per year in urban areas, is necessary. All three healthcare systems studied have established a hierarchical structure for stroke services. The facilities for stroke patients are classified according to the level of care. Access to brain imaging and the annual number of admissions for stroke play a central role in this classification. However, given that stroke is a time-sensitive emergency, a critical factor is timely access to thrombolysis (tPA) for patients likely to benefit. There are three levels of facilities in general:

- hospitals with or without access to tPA (primary level);
- hospitals with a stroke unit (secondary level); and
- highly specialized hospitals for treating complex stroke cases (tertiary level).

Several recent publications have synthesized the evidence on the effectiveness of telemedicine. This modality in systems of stroke care, known as telestroke, may be useful at various stages in the continuum of care (secondary prevention, professional development, rehabilitation) but focuses most often on the transmission of radiological images during the hyperacute and acute phases of stroke care, in order to support the decision whether to administer thrombolysis.

Post-acute care (rehabilitation)

The post-acute phase in the continuum of stroke care services, which focuses on rehabilitation, proceeds via two modalities: services for people admitted to rehabilitation centres, and services received on an outpatient basis or at home. After discharge from an acute care hospital, patients needing rehabilitation and unable to function safely in their home environment are referred to inpatient facilities offering specialized post-acute rehabilitation. Among the essential elements for specialized stroke rehabilitation facilities in the literature examined are:

- an interdisciplinary team dedicated to stroke care and offering coordinated, organized services;
- an initial assessment of patients referred to these services, including those with mild impairments, as soon as possible;
- interventions with appropriate intensity governed by a plan adapted to patients’ needs and their individual tolerance;
- professional development and education;
- participation of patients and their families/informal caregivers;
- discharge planning, as early as possible; and
- access to outpatient rehabilitation services.

Secondary prevention

Secondary prevention is a clinical approach established on a case-by-case basis and aimed at reducing the risk of recurrent strokes in people with a prior stroke or
TIA, and in those presenting with one or more health conditions or factors increasing their risk of stroke. Several healthcare systems have established secondary prevention clinics for stroke and TIA. While the target clientele, services offered and staffing requirements are context-specific, two general types of clients can be distinguished. One type presents with a TIA, a suspected stroke or a mild stroke and requires urgent assessment and access to diagnostic tests (especially brain imaging) and to treatments. According to the evidence, this rapid strategy allows for a reduction in the risk of recurrence and could be cost effective for all patients with a confirmed diagnosis of TIA or stroke. The other type of client is medically stable but needs support for risk factor control; this intervention can be offered in primary care as part of an integrated follow-up approach for chronic disease risk factors.

**Application to Quebec**

In 2008, the first expert advisory committee provided an overview of Quebec’s context and situation regarding stroke care and services. Through interactions with AETMIS (INESSS), the current ministerial expert working group examined various proposals that would be most appropriate in order to provide a better continuum of stroke care services in Quebec. These proposals related to the following:

- a hierarchical division of infrastructure into three levels;
- the expected characteristics of acute care hospitals treating stroke patients, according to the facility’s level in the hierarchy;
- the expected characteristics of specialized rehabilitation centres;
- service pathways for stroke patients in the hyperacute and acute phases of care, including a decisional algorithm for the referral pathways for patients suspected of acute stroke;
- service pathways for rehabilitation clients during the post-acute phase of care.

The above proposals are discussed in detail in the report.

**Conclusions**

At the end of this assessment, INESSS identified several points of consensus on the expected characteristics of the main structures that should provide services along the continuum of stroke care, and on the optimal pathways for patients or clients in the hyperacute, acute and post-acute phases. Relating these to the particular context of Quebec allowed for concrete proposals chiefly regarding the following points:

- hierarchical organization of acute care hospitals, with links for patient transfer;
- timely access to diagnostic imaging;
- development of stroke units in all secondary and tertiary acute care hospitals with the critical volume of patients required to maintain expertise;
- timely access to thrombolysis through the use of prehospital service pathways;
- clinical decision support and local administration of intravenous thrombolysis through telemedicine in primary acute care hospitals unequipped with stroke units in remote regions;
- early rehabilitation for all stroke patients, regardless of the type of hospital where they are admitted;
- participation of patients and their families/informal caregivers throughout the care process;
- planning of early supported discharge;
- equitable eligibility criteria for specialized rehabilitation services, whether offered in an institution, on an outpatient basis, or at home;
- access to local follow-up services offered by CSSS (Centres de santé et de services sociaux), including community reintegration support and non-specialized rehabilitation, after the specialized rehabilitation stage;
- timely access to secondary prevention clinics linked to hospital services and primary care;
- application of clinical practice guidelines by all healthcare professionals;
- periodic performance measurement, coupled with feedback to all stakeholders concerned.

The MSSS expert working group is continuing its work defining the organizational models and tools to support for Quebec, including such issues as the appropriateness and feasibility of on-call stroke triage teams, clinical triage instruments, organizational models for secondary prevention, clinical tools used in rehabilitation and telestroke.