

Canadian **Best Practice**
Recommendations for
Stroke Care

TAKING ACTION TOWARDS OPTIMAL STROKE CARE

**A RESOURCE TO SUPPORT IMPLEMENTATION
OF THE CANADIAN BEST PRACTICES
RECOMMENDATIONS FOR STROKE CARE**

Produced by the Canadian Best Practices
and Standards Advisory Group and
the Acute Stroke Care Writing Group

MAY 2013



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* Content and resources to support each step in the implementation process will be released through the Canadian Stroke Best Practices Website by May 31st, 2013

ABOUT THIS RESOURCE:

Acknowledgements:

Taking Action Towards Optimal Inpatient Stroke Care

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Comments and Feedback

The Taking Action Towards Optimal Stroke Care Resource Kit has been designed to help organizations and regions organize their stroke care, build high-quality stroke programs and implement evidence-based guidelines for stroke care delivery. This is a dynamic resource that will continue to grow and evolve through the feedback and input of stroke providers globally. We invite comments, suggestions, organization and program-level success stories of stroke best practice implementation, and inquiries on the development and application of this resource and the *Canadian Best Practice Recommendations for Stroke Care*.

Please forward comments and successes to the Heart and Stroke Foundation *Stroke Best Practices and Performance* team at strokebestpractices@hsf.ca.

1.1 Purpose of the Taking Action Towards Optimal Stroke Care Resource Kit

This "Taking Action Towards Optimal Inpatient Care" resource provides guidance and tools to help stroke team members, clinicians, healthcare staff, hospital administrators and policymakers move along the pathway towards **achieving optimal inpatient stroke care** in hospitals across Canada. Optimal stroke care involves all direct care, service delivery and interactions from first contact with the healthcare system to discharge from acute inpatient care on to the next stage of care or a return to the community.

While research evidence demonstrates the unquestionable value of dedicated hospital stroke units, not all hospitals in Canada can achieve this evidence-based gold standard. By providing the path to optimal care, this guide enables hospitals and healthcare professionals to continually improve quality of care within their levels of service; and potentially strive towards additional service delivery elements that will enable them to achieve better outcomes. Improving care in this way saves lives, reduces disability and reduces the social and economic burden of stroke.

Recognizing that optimal stroke care requires capacity and commitment, it is clear that all hospitals in Canada are not at a place to deliver what is required. Half the hospitals in Canada see fewer than 20 stroke patients a year, according to The Quality of Stroke Care in Canada 2011. Hospitals with low volumes should have protocols in place to move patients to centres with the proper equipment, staff, expertise and resources to deliver more comprehensive services. Cost avoidance results reported in the Quality of Stroke Care in Canada report clearly demonstrated the savings that can be realized through optimizing the use of the clot-dissolving drug tPA, caring for patients on a stroke unit, establishing an early supported discharge program and offering stroke services through Telestroke when the services are not directly available within the organization.

Stroke unit care has some of the strongest evidence for improved patient outcomes in the stroke research literature. Stroke unit care reduces the likelihood of death and disability in men and women of any age with mild, moderate or severe stroke by as much as 30%. Meta-analyses of the stroke unit research evidence report that stroke patients receiving organized inpatient care in a stroke unit are more likely to be alive, independent, and living at home one year after the stroke. The benefits were most apparent in stroke units based in a discrete ward. No systematic increase was observed in the length of inpatient stay between patients on a stroke unit compared to non-stroke unit patients.

Striving to achieve optimal care sets hospitals apart. Accreditation Canada's Stroke Distinction Program can help hospitals improve care and ensure services are aligned with Canadian Best Practice Recommendations for Stroke Care through a rigorous and highly specialized review process.

SECTION TWO

STROKE SYSTEMS OF CARE

2.1 Stroke Continuum of Care

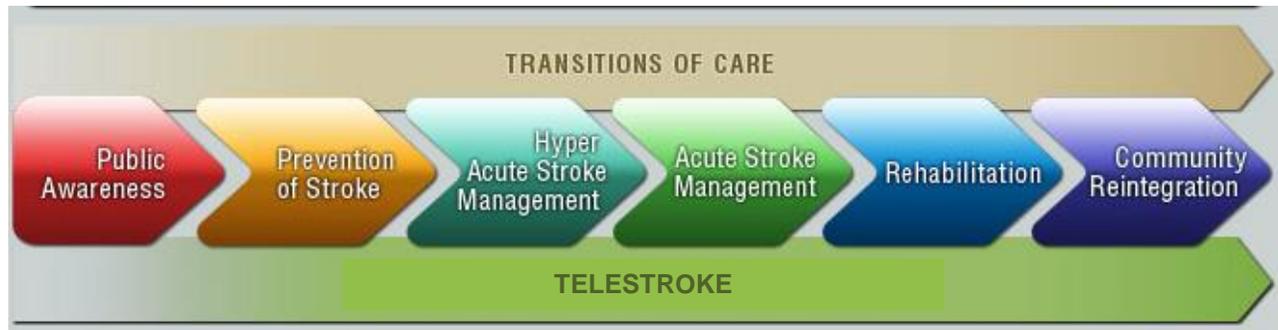


Figure 2.1: Canadian Stroke Best Practices Continuum of Care

Stroke Continuum of Care Stages – Definitions and Descriptions

Prevention

Primary prevention is an individually based clinical approach to disease prevention, directed toward preventing the initial occurrence of a disorder in otherwise healthy individuals.^{1,2} Primary prevention is usually implemented in the primary care setting, and the physician, advanced practice nurse, pharmacist or patient may initiate a discussion about stroke risk reduction. Primary prevention and health promotion recommendations related to stroke (lifestyle and risk factor management, hypertension screening, dyslipidemia screening, diabetes management, management of atrial fibrillation, and asymptomatic carotid stenosis) emphasize the importance of screening and monitoring those patients at high risk of a first stroke event. Primary prevention strategies are also promoted through health-oriented organizations and agencies such as the Heart and Stroke Foundation, Canadian Cardiovascular Society, Hypertension Canada, and Health Canada.

Primary prevention and the reduction of risk factor prevalence in the general population are not the main focus of the *Canadian Best Practice Recommendations for Stroke Care*; therefore, only selected recommendations related to primary prevention are included. A comprehensive set of recommendations in this area is being developed for inclusion in future updates. A list of existing high quality stroke prevention guidelines, including primary prevention, are provided in the reference section at the end of this chapter for further guidance (Hyperlink).

Secondary prevention is an individually based clinical approach aimed at reducing the risk of recurrent vascular events in individuals who have already experienced a stroke or transient ischemic attack (TIA) and in those who have one or more of the medical conditions or risk factors that place them at high risk of stroke.² Secondary prevention recommendations in this document are directed to those risk factors most relevant to stroke, including lifestyle (diet, sodium intake, exercise, weight, smoking, and alcohol intake), hypertension, dyslipidemia, previous stroke or transient ischemic attack, atrial fibrillation, and carotid stenosis. Secondary prevention recommendations can be addressed in a variety of settings—acute care, stroke prevention clinics, and community-based care settings. They pertain to patients initially seen in primary care, those who are treated in an emergency department

and then released, and those who are hospitalized because of stroke or transient ischemic attack.

Hyperacute Stroke Care

Hyperacute care refers to the key interventions involved in the assessment, stabilization and treatment in the first hours after stroke onset. This will represent all pre-hospital and initial emergency care for TIA, ischemic stroke, intracerebral hemorrhage, subarachnoid hemorrhage and acute venous sinus thrombosis. This includes thrombolysis or endovascular interventions for acute ischemic stroke, emergency neurosurgical procedures, and same-day TIA diagnostic and risk stratification evaluation.

The principal aim of this phase of care is to diagnose the stroke type, and to coordinate and execute the treatment plan as rapidly as possible. Hyperacute care is time-sensitive by nature, minutes for disabling stroke and hours for TIA, but specific interventions are associated with their own individual treatment windows. Broadly speaking "hyperacute" refers to care offered in the first 24 hours after stroke (ischemic and hemorrhagic) and the first 48 hours after TIA.

Acute Stroke Care

Acute care refers to the key interventions involved in the assessment, treatment or management, and early recovery in the first days after stroke onset. This will represent all of the initial diagnostic procedures undertaken to identify the nature and mechanism of stroke, interprofessional care to prevent complications and promote early recovery, institution of an individualized secondary prevention plan, and engagement with the stroke survivor and family to assess and plan for transition to the next level of care (including a comprehensive assessment of rehabilitation needs). New models of acute ambulatory care such as rapid assessment TIA and minor stroke clinics or day-units are also starting to emerge.

The principal aims of this phase of care are to identify the nature and mechanism of stroke, prevent further stroke complications, promote early recovery, and (in the case of severest strokes) provide palliation or end of life care. Broadly speaking "acute care" refers to the first days to weeks of inpatient treatment with stroke survivors transitioning from this level of care to either inpatient rehabilitation, community based rehabilitation services, home (with or without support services), continuing care, or palliative care. This acute phase of care is usually considered to have ended either at the time of acute unit discharge or by 30 days of hospital admission.

Stroke Rehabilitation

Stroke Rehabilitation is a progressive, dynamic, goal orientated process aimed at enabling a person with impairment to reach their optimal physical, cognitive, emotional, communicative, and/or social functional level. Rehabilitation interventions are a key component of acute care. Dedicated stroke rehabilitation services also include stroke rehabilitation units; outpatient stroke rehabilitation clinics, centres and programs; and early supported discharge services and teams.

Length of service or stay for stroke rehabilitation varies depending upon the type of service and the disability and needs of the stroke survivor and family although most stroke rehabilitation interventions will occur within the first six months following stroke onset.

Ambulatory Care (Community-Based Care)

Ambulatory care refers to interventions provided in on outpatient basis – either through hospital-based clinics, primary care settings or other community-based health settings – designed to confirm the mechanism and causes of stroke; provide interventions to promote secondary prevention of stroke; and offer education, support and referral to promote healthy adaptation and effective self-management. This care is provided both to patients with new symptoms of stroke or TIA in the

community (from referrals from Emergency Departments or Primary Care) and also as follow up services after hospital discharge.

Types of service that provide ambulatory stroke care include stroke prevention clinics, vascular risk reduction clinics, neurovascular clinics, chronic disease management programs, and other self-management programs including Living With Stroke. Length of service delivery varies upon the type of service and needs of the stroke survivor and family.

2.2 Canadian Stroke Best Practices Optimal Stroke Service Delivery

Acute inpatient stroke care is currently delivered through a range of different care models across Canada. Some of this variation is expected and indeed desirable. Different geographic areas have different volumes of stroke patients, urban versus rural demographics drive different types of need and service models, and staffing availability and profiles determine the specific roles and practice delivered by distinct healthcare professional groups.

Much of this variation, however, represents the challenges in achieving optimal resourcing of stroke services, and to be able to provide for the acute inpatient needs of stroke patients and their families in spite of significant evidence of the benefit of dedicated and specialized stroke services.

Increasing acute inpatient stroke care capacity in Canada is one of our biggest opportunities yet to be realized. This Optimal Stroke Care resource kit has been specifically developed for healthcare system providers in all levels of practice and management to enable them to overcome barriers and challenges and move as close as possible towards optimal stroke care delivery.

The key success factors in achieving optimal stroke care include:

- conducting a systematic review and gap analysis, at a system level, of the current levels of specialized stroke care provided by all facilities within a region/system of care
- establish clear leadership relationships, identify champions and assign accountability for system change regarding stroke services
- engaging the providers and the users in the process
- measuring what you are doing
- seeing implementation as the first part of the journey, not the last.

Several guiding principles form the basis of this discussion:

1. A geographically defined **stroke unit** and **specialized team** provide the best care according to research evidence.
2. A **systematic approach** is needed to design, develop and implement successful care.
3. **Involvement** of the clinical team, people living with stroke, and their families is critical.
4. Inpatient care should be seen as part of a **broader system**.
5. **Performance measurement and reporting** is needed to identify opportunities for improvement.

2.2a Canadian Stroke Best Practices Optimal Stroke Services Framework Overview

Optimal stroke services include access to stroke experts, diagnostic equipment and expertise, and a range of emergent and timely evidence-based treatment options. Canadian stroke audit data has revealed considerable variations in the levels of stroke care services provided within the Canadian health care system. These services can be arranged along a continuum from minimal, non-specialized services in organizations that provide general health care, to providing basic diagnostic services and management, then advanced care at a single site, and on to comprehensive stroke care across a region.

The Canadian Stroke Best Practices Optimal Stroke Services Framework, as visualized in Figure 2.2, is meant to organize and prioritize stroke services based on resource availability for a regional or geographic area. The goal set forth within this framework is for each organization involved in the delivery of stroke care services to engage in an ongoing cycle of developing the expertise, processes and protocols needed to provide optimal stroke patient care, taking into consideration the organization's geographic location, patient population, structural resources, and relationship to other centres within their healthcare region or system. Once a level of stroke services has been achieved, the organization should strive to develop and incorporate components of the next higher level for ongoing growth of stroke services where appropriate, as well as continuous quality improvement within the level of service currently provided. Within this framework, certain aspects of patient care are paramount and represent the continuum of care and cross-continuum issues (such as rehabilitation and prevention). These supporting elements (identified in the outer ring of the framework) should be considered at every healthcare encounter for patients with stroke or TIA.

Optimally, in Canada, all acute stroke patients should be initially managed in centre providing either advanced or comprehensive stroke services. It is acknowledged that in a small number of cases this may not be required or it may not be possible as a result of geography or resource availability (e.g., ambulances leaving a small community for a long duration for a transport, or a patient with mild resolving symptoms). Advanced and comprehensive centres not only provide access to acute thrombolysis, they also have active stroke teams that can be mobilized in a timely manner to rapidly assess, diagnose and implement management strategies to reduce the risk of stroke recurrence or poor outcomes.

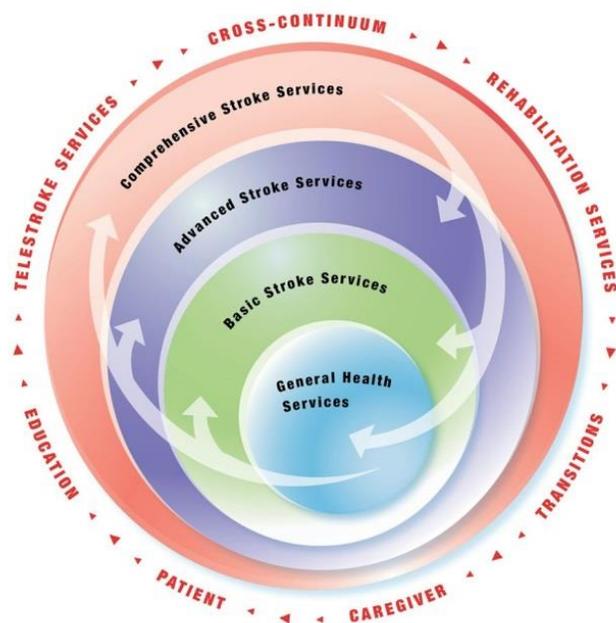


Figure 2.2:
Canadian Stroke Best Practices
Optimal Stroke Services Framework

2.2b Canadian Stroke Best Practices Optimal Stroke Services Framework – Detailed Description of Specialization Levels

The Optimal Stroke Services Framework has been created to symbolize service growth and development. The model differentiates between four levels of increasing stroke service specialization:

- **General healthcare facilities**
- **Basic stroke centres**
- **Advanced stroke centres**
- **Comprehensive stroke centres**

Effective stroke care at an individual level requires the coordinated effort of a range of healthcare providers, each being critical to the overall outcome. In the same way, an effective stroke system requires the coordination of a range of different facilities and teams, each of which may play a different role with increasing levels of specialization. Each system should have an appropriate mix of levels to serve the patient population in their system. This may require rationalization and re-organization of existing resources, as well as ongoing improvement within a particular level of care.

The goal for all stroke service providers is to continue to develop expertise and mechanisms to deliver high-quality evidence-based stroke care, optimizing structural resources (e.g., human, equipment, and space), geographic factors and patient populations. Therefore each increasing level of care described in the framework includes all elements, functions and services described for the preceding level plus additional elements, functions and resources with increasing levels of complexity and expertise involved. Once all elements identified for one level of stroke services has been achieved, the organization should consider developing the expertise and some critical components of the next higher level of service. It is important to emphasize that it is not just a matter of what services are available, but how well are they being provided.

Organizations should use this framework for active self-assessment of their ability to provide optimal stroke care, and importantly to identify gaps and challenges. The insights they gain should provide valuable direction and identify priorities for ongoing improvements in stroke services, and these improvements should be guided by the recommendations and supporting information contained in the Canadian Best Practice Recommendations for Stroke Care.

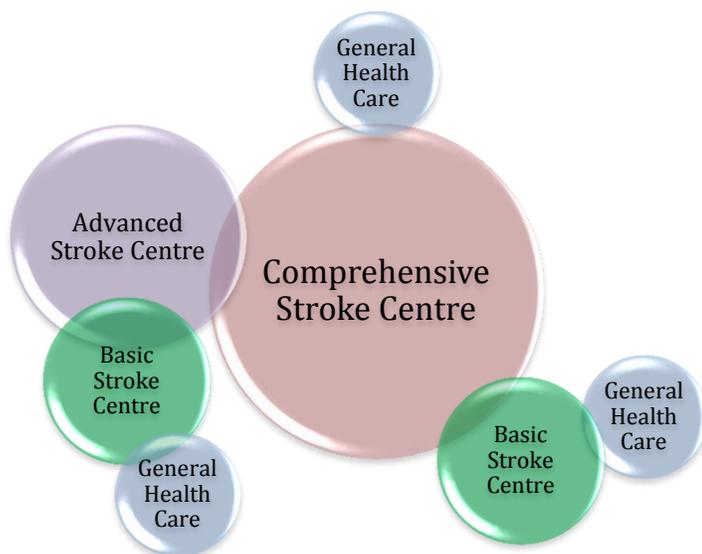


Figure 2.4: Depiction of Stroke System of Care

Detailed descriptions of all four levels of the stroke services model are described in the following section. Table 2.2 provides a summary of

2.2b Detailed Descriptions of Stroke Service Levels

Level 1: General Healthcare Facilities

Description: General health care is provided in smaller rural or remote hospitals, outpost medical stations, and/or primary care centres. Care is provided by clinicians and teams without specialized stroke or neuroscience expertise. Care in these hospitals or centres is usually provided by a team that includes primary care physicians, general medicine specialists, general surgeons, non-neuroscience nurses and allied health staff, and a limited number of additional specialists. They do not have specialized stroke care services, stroke specialists on site, or advanced diagnostic resources such as a CT scanner. They do not provide acute thrombolysis either by their staff independently or through Telestroke supported delivery.

Example of Centres providing General/Non-Specialized Services:

- Small rural or remote hospitals or health centres (with emergency services and/or inpatient units)
- Primary Care Centres, family physician practices or walk-in clinics
- Non-stroke specific follow-up or treatment clinics
- Non-stroke specific self-management or chronic disease management services
- Continuing care facilities or palliative care facilities

Critical Activities: When a patient with suspected hyperacute stroke or TIA arrives at a General Healthcare Hospital, the priorities for the hospital staff are to recognize, mobilize and transfer these patients, as described in Box 1. For patients who remain in their care, all possible elements of the Canadian Best Practice Recommendations for Stroke Care should be implemented. An individualized stroke recovery and prevention management plan should be established with each stroke and TIA patient and their family.

Additional activities and services provided by these non-specialized sites may include:

- Application of Stroke Best Practice Recommendations
- Preliminary triage, medical or nursing assessment – **NOT TO DELAY TRANSFER TO A MORE APPROPRIATE LEVEL OF SPECIALIZED STROKE CARE**
- Basic laboratory services
- Cardiovascular investigations such as electrocardiogram, carotid Doppler, echocardiogram
- Receive stroke patients for ongoing transitional or continuing care following discharge from more specialized stroke services
- Provide stroke prevention services to all stroke and TIA patients
- Possible access to single discipline rehabilitation therapists
- Ensure appropriate home and community services (such as rehabilitation) and support are organized and accessed as required
- Provide ongoing non stroke-specialized ambulatory care
- Continuing care and palliation

Box 1: General Healthcare Critical Activities

- **Recognize** a stroke or TIA patient on arrival to hospital
- Rapidly **mobilize** available resources to stabilize the patient
- **Transfer** stroke patients to the closest facility providing Advanced or Comprehensive Stroke Services
- **Optimize** stroke prevention therapy with an individualized management plan

Implications for Patient Flow to ensure appropriate level of care:

- Patients who may benefit from specialized stroke services in the hyperacute phase should be transferred to a more appropriate level of stroke specialized service (i.e., Advanced or Comprehensive Stroke Services) without delay to ensure rapid access to acute thrombolytic therapy within the 4.5 hour time window; this includes protocols for direct transport where hospitals providing General Healthcare Services should be initially bypassed when possible and safe for the patient;
- Patients who may benefit from specialized acute or rehabilitation stroke care should be transferred to a more appropriate level of stroke specialized service as soon as possible;
- Patients may be transferred back to this general level of care once an acute or rehabilitation episode of care is completed, and ongoing inpatient care or palliative care is still required;
- Patients may receive ongoing follow-up care after discharge from more specialized stroke services.

Level 2: Basic Stroke Care Hospitals

Description: Basic Stroke Care is provided in mid-size hospitals and smaller rural hospitals by teams with basic neuroscience preparation and training. These facilities have advanced diagnostic imaging available on-site, including a CT scanner; however, they do not have stroke expertise and do not provide acute thrombolysis. Care in these centres is usually provided by primary care physicians, general medicine specialists, surgeons, non-neuroscience specialized nurses and allied health staff and a limited number of additional specialists.

Example of Centres with Basic Stroke Services

- Rural or remote hospitals and small urban hospitals Family physician practices or walk-in clinics
- Vascular secondary prevention or stroke prevention follow-up clinic services
- Non-stroke specific self-management or chronic disease management service
- Continuing care facilities or palliative care facilities

Critical Activities: When a patient with suspected hyperacute stroke or TIA arrives at a hospital providing basic stroke services, the priorities for the hospital staff are to recognize a suspected stroke or TIA, have a brain CT scan done without delay, contact the closest hospital providing advanced or comprehensive stroke care, mobilize and transfer these patients, as described in Box 2. For patients who remain in their care, all possible elements of the Canadian Best Practice Recommendations for Stroke Care should be implemented. An individualized stroke recovery and prevention management plan should be established with each stroke and TIA patient and their family.

Additional activities and services provided by these non-specialized sites may include:

- Application of Stroke Best Practice Recommendations

Box 2: Basic Stroke Care Critical Activities

- **Recognize** a stroke or TIA patient on arrival to hospital
- Rapidly **mobilize** available resources to stabilize the patient
- Perform a brain **CT scan** without delay
- **Transfer** stroke patients to the closest facility providing Advanced or Comprehensive Stroke Services
- Provide access to **specialized** stroke rehabilitation therapy
- **Optimize** stroke prevention therapy with an individualized management plan

- Preliminary triage, medical or nursing assessment – **NOT TO DELAY TRANSFER TO A MORE APPROPRIATE LEVEL OF SPECIALIZED STROKE CARE**
- Immediate neurovascular imaging (brain CT)
- Laboratory services
- Cardiovascular investigations such as electrocardiogram, carotid Doppler, echocardiogram
- Receive stroke patients for ongoing transitional or continuing care following discharge from more specialized stroke services
- Cohorting of stroke inpatients on a consistent hospital ward with implementation of stroke protocols based on Canadian Best Practice Recommendations for Stroke Care
- Ensure appropriate ambulatory, community and home-based services (such as rehabilitation) and family support services are organized and accessed as required
- Possible access to single discipline rehabilitation therapists
- Provide stroke prevention services to all stroke and TIA patients
- Provide a degree of specialized follow-up in vascular secondary prevention or stroke prevention ambulatory care clinic
- Continuing care and palliation

Implications for Patient Flow to ensure appropriate level of care::

- Patients who may benefit from specialized stroke services in the hyperacute phase should be transferred to a more appropriate level of stroke specialized service (i.e., Advanced or Comprehensive Stroke Services) without delay to ensure rapid access to acute thrombolytic therapy within the 4.5 hour time window; this includes protocols for direct transport where hospitals providing basic stroke services should be initially bypassed when possible and safe for the patient;
- Patients who may benefit from specialized acute or rehabilitation stroke care should be transferred to a more appropriate level of stroke specialized service as soon as possible (i.e. monitoring for possible surgical intervention such as hemicraniectomy or suboccipital craniectomy);
- Patients may remain at a hospital providing Basic Stroke Services if they are not potential candidates for acute thrombolysis, and if all their stroke care needs can be met at this level of services;
- Patients may be transferred back to this basic level of stroke care once an acute or rehabilitation episode of care is completed, and ongoing inpatient care or palliative care is still required;
- Patients may receive ongoing follow-up care after discharge from more specialized stroke services;
- Transition of care issues should be planned and coordinated between basic stroke care facilities and advanced/comprehensive sites as part of overall discharge planning.

Level 3: Advanced Stroke Care (Primary Stroke Centre, District Stroke Centre)

Description: Advanced Stroke Care Services are provided in larger hospitals by specialized stroke care teams. These facilities have advanced diagnostic imaging available on-site, staff with stroke expertise, and they provide acute thrombolysis either through on-site expertise or with support through a Telestroke link to another Advanced or Comprehensive Stroke Centre. Medical care in these centres is usually provided by neurologists, internists, physiatrists or other specialized stroke physicians. Neurosurgeons are available on site, or protocols are in place for rapid referral and transfer for stroke patients requiring urgent neurosurgical consult. Stroke patients are cared for by members of an interprofessional team who have received some degree of stroke specialization. Stroke protocols are in

place from the emergency department through to imaging and inpatient care and reflect the Canadian Best Practice Recommendations for Stroke Care.

Hospitals falling within this category should have dedicated stroke beds in a consistent clustered model or designated stroke unit, either for acute or rehabilitation care or an integrated model that provides both acute and rehabilitation care in the same unit. Hospitals with lower volumes, where a designated stroke unit or clustered model is not feasible, should be applying Stroke Best Practices to their stroke inpatients wherever possible, and establish relationships with other centres with stroke unit beds within their region or system to develop and implement effective arrangements for transfer and repatriation. They may be aligned with academic settings and conduct stroke research.

Examples of Centres with Advanced Stroke Services:

- Moderate and large rural and community hospitals
- Small to medium sized urban hospitals
- Primary Stroke Centres
- Stand-alone inpatient rehabilitation hospitals
- Stroke Prevention Clinics affiliated with an inpatient stroke program

Critical Activities: When a patient with suspected hyperacute stroke or TIA arrives at a hospital providing Advanced Stroke Services, the priorities for the hospital staff are to recognize a suspected stroke or TIA, initiate a 'code stroke', including brain CT scan done without delay, stroke team mobilization to the emergency department, mobilize and transfer these patients, as described in Box 3. Hospitals with Advanced Stroke Services serve as a referral site for hospitals with less/non-specialized stroke services available, and have agreements in place to ensure urgent access for patients from these sites. For patients who are cared for as inpatients at a hospital with advanced stroke care, all possible elements of the Canadian Best Practice Recommendations for Stroke Care should be implemented, including stroke unit models of inpatient care. An individualized stroke recovery and prevention management plan should be established with each stroke and TIA patient and their family.

Additional activities and services provided by these specialized stroke sites may include:

- Application of Stroke Best Practice Recommendations
- Specialized stroke care delivering all best practices for at least one specific phase of the stroke care continuum e.g. hyperacute, acute, rehabilitation, or secondary prevention
- IV and IA thrombolysis and endovascular interventions
- Access on-site or through Telestroke to neurosurgical advice and intervention
- Cohorting of stroke inpatients on a consistent hospital ward, such as a designated stroke unit or clustered stroke area with implementation of stroke protocols based on Canadian Best Practice Recommendations for Stroke
- If the centre is an acute care setting it may provide support and consultation to other less

Box 3: Advanced Stroke Care Critical Activities

- **Recognize** a stroke or TIA patient on arrival to hospital
- Rapidly **mobilize** available resources to stabilize the patient
- Perform a brain **CT scan** without delay
- **Decision-making** regarding eligibility for tPA
- **Timely** administration of tPA
- **Specialized** stroke care for non-tPA patients
- **Rapid Access** to neurosurgical consultation
- **Stroke unit/clustered** inpatient stroke care by designated stroke team
- Provide access to **specialized** stroke rehabilitation therapy
- **Optimize** stroke prevention therapy with an individualized management plan

- specialized centres through Telestroke for stroke management
- On-site access to multiple rehabilitation professionals across disciplines and with specialized stroke training
- If the centre is in a rehabilitation setting it may provide Telestroke support to other less specialized centres for transition planning
- Ensure appropriate ambulatory, community and home-based services (such as rehabilitation) and family support services are organized and accessed as required
- Provide a degree of specialized follow-up in vascular secondary prevention or stroke prevention ambulatory care clinic

Implications for Patient Flow:

- Patients who may benefit from highly specialized acute or rehabilitation stroke care not available at sites with Advanced Stroke Services (e.g., neurosurgical care or endovascular interventions) should be transferred to a Comprehensive Stroke Centre as soon as possible;
- Patients may arrive at hospitals with Advanced Stroke Services through direct transport by EMS where smaller and less-specialized sites are bypassed;
- Patients treated at sites with Advanced Stroke Services may be repatriated back to home hospitals for continuing care and palliation;
- Patients may receive ongoing follow-up care after discharge from more specialized stroke services.

Level 4: Comprehensive Stroke Services (Regional Stroke Centre)

Description: Comprehensive stroke care is provided within integrated stroke systems which encompass a geographic area of a city, a sub-provincial zone, or an identified regional stroke system. Comprehensive stroke centres should ideally form part of each stroke system and serve as a consultation and referral site for hospitals with less/non-specialized stroke services available (see Figure 2.4), and have agreements in place to ensure urgent access for patients from these sites. They also play a role in coordination of stroke services across the continuum within their region, to enable patients to move across the region to receive optimal stroke care based on their individual needs. Comprehensive stroke centres provide leadership, professional education and support to smaller and less-specialized centres, as well as working closely with EMS providers, and community-based service providers. They are also closely aligned with academic settings and conduct stroke research.

These systems have advanced diagnostic imaging available on site, dedicated stroke teams with a range of expertise, and provide acute thrombolysis on-site as well acting as a hub for specialized consultation across the continuum to other Advanced or General Stroke Services (including Telestroke). Many comprehensive centres also use advanced technology for acute management and rehabilitation. Care in these hospitals or centres is provided by neurologists, neurosurgeons, interventional neuroradiologists, internists, physiatrists or other stroke specialized physicians; and for nurses and allied health staff with stroke specialization. Systems falling within this category will have dedicated stroke unit beds for both acute or rehabilitation care, alongside stroke specialized ambulatory care.

Critical Activities: When a patient with suspected hyperacute stroke or TIA arrives at a hospital providing Comprehensive Stroke Services, the priorities for the hospital staff are to recognize a suspected stroke or TIA, initiate a 'code stroke', including brain CT scan done without delay, stroke team mobilization to the emergency department, mobilize and transfer these patients, as described in Box 4. Hospitals with Comprehensive Stroke Services serve as a referral site for hospitals with less/non-specialized stroke services available, and have agreements in place to ensure urgent access for patients from these sites.

For patients who are cared for as inpatients at a hospital with comprehensive stroke care, all possible elements of the Canadian Best Practice Recommendations for Stroke Care should be implemented, including stroke unit models of inpatient care. An individualized stroke recovery and prevention management plan should be established with each stroke and TIA patient and family.

Additional activities and services provided by these specialized stroke sites may include:

- Specialized stroke care delivering all best practices for most or all of the specific phases of the stroke care continuum e.g. hyperacute, acute, rehabilitation, or secondary prevention
- IV and IA thrombolysis and endovascular interventions
- Access on-site to neurosurgical consult and intervention, and provide neurosurgical consultation to sites with Advanced or Basic Stroke Services
- Cohorting of stroke inpatients on a consistent hospital ward, such as a designated stroke unit or clustered stroke area with implementation of stroke protocols based on Canadian Best Practice Recommendations for Stroke
- If the centre is an acute care setting it may provide support and consultation to other less-specialized centres through Telestroke for stroke management
- Access to multiple rehabilitation professionals across disciplines and with specialized stroke training, and additional stroke team members such as pharmacists with stroke expertise, neuropsychologists and community liaisons
- If the centre is in a rehabilitation setting it may provide Telestroke support to other less-specialized centres for transition planning
- Ensure appropriate ambulatory, community and home-based services (such as rehabilitation) and family support services are organized and accessed as required
- Provide specialized follow up in vascular secondary prevention or stroke prevention ambulatory care clinic

Implications for Patient Flow:

- Patients who may benefit from highly specialized acute or rehabilitation stroke care not available at sites with Advanced Stroke Services (e.g., neurosurgical care or endovascular interventions) should be transferred to a comprehensive stroke centre as soon as possible;
- Patients who require neurosurgical interventions or advanced endovascular interventions should be transferred to this level of care as soon as possible;
- Patients may arrive at comprehensive stroke centres through direct transport by EMS where smaller and less-specialized sites are bypassed;
- Patients treated at sites with Advanced Stroke Services may be repatriated back to home hospitals for continuing care and palliation.

Box 4: Comprehensive Stroke Care Critical Activities

- **Recognize** a stroke or TIA patient on arrival to hospital
- Rapidly **mobilize** available resources to stabilize the patient
- Perform a brain **CT scan** without delay
- **Decision-making and consultation** regarding eligibility for tPA
- **Timely** administration of tPA
- **Specialized** stroke care for non-tPA patients
- **Rapid Access** to neurosurgical consultation
- **Stroke unit/clustered** inpatient stroke care by designated stroke team
- Enroll stroke patients in clinical **research** trials
- Provide access to **specialized** stroke rehabilitation therapy
- **Optimize** stroke prevention therapy with an individualized management plan
- **Provide leadership** to regional coordination and reorganization of the stroke care system

Table 2.2: Summary of Stroke Service Elements by Healthcare Facility Level:

Stroke Service Elements	Acute Care Centre, Hospital or Outpost Station	Acute Care Hospital or Inpatient Rehabilitation Facility		
	General Healthcare Facility*	Basic Stroke Service Facilities	Advanced Stroke Service Facilities	Comprehensive Stroke Service Facilities
Stroke System of Care (Access and Movement)				
Individual site providing non-specialized stroke assessment and laboratory services	✓	N/A	N/A	N/A
Individual site providing non-specialized stroke assessment and diagnostic services (neuroimaging)	N/A	✓	N/A	N/A
Individual site providing specialized stroke assessment, diagnostic and treatment services	N/A	N/A	✓	N/A
Individual site providing comprehensive tertiary/quaternary stroke services; regional leadership and expertise in stroke care across the continuum of stroke care	N/A	N/A	N/A	✓
Establishment of a stroke network or system that is regional and includes all levels of non-specialized and specialized stroke services working together to ensure timely access to the optimal level of specialized stroke care for all patients	✓	✓	✓	✓
Access to stroke specialists through telemedicine (Telestroke) across the continuum of care	✓	✓	✓	✓
Regional coordination with protocols and agreements in place for EMS bypass to more specialized stroke services for hyperacute care and tPA consideration (includes both accepting bypassed patients or agreement to be a bypassed hospital; also, EMS pre-notification to the receiving stroke centre).	✓	✓	✓	✓
Regional coordination with protocols and agreements in place to transfer non-tPA patients for acute stroke care to a more appropriate level of care	✓	✓	✓	✓
Agreements for repatriation of stroke patients to and from their home community	✓	✓	✓	✓

Stroke Service Elements	Acute Care Centre, Hospital or Outpost Station	Acute Care Hospital or Inpatient Rehabilitation Facility		
	General Healthcare Facility*	Basic Stroke Service Facilities	Advanced Stroke Service Facilities	Comprehensive Stroke Service Facilities
Shared decision-making and goal setting involving the interprofessional team, patients, and caregivers	✓	✓	✓	✓
Participation through patient enrollment in research studies and clinical trials	N/A	N/A	✓	✓
Leadership and/or coordination of research studies and clinical trials	N/A	N/A	N/A	✓
Initial Patient Presentation and Assessment				
Clinical protocols in place to recognize a stroke or TIA patient based on presenting signs and symptoms and neurological history	✓	✓	✓	✓
Ability to conduct basic neurological clinical assessment and provide basic acute and preventive stroke care	✓	✓	✓	✓
Access to Stroke Diagnostic Services				
Protocols in place to access urgent neuroimaging when no CT scan on site - transfer stroke patients to next closest appropriate facility that provides CT scan 24/7	✓	N/A	N/A	N/A
Neuroimaging on site (CT scan), including CT angiography (access available to patients who arrive at general healthcare hospitals and require transfer for neuroimaging)	N/A	✓	✓	✓
Basic neurovascular investigations – carotid Doppler	N/A	✓	✓	✓
Advanced neurovascular imaging (including CT, CTA, CT perfusion, MRI, MRA).	N/A	N/A	✓	✓
Neurovascular interventional radiology for acute stroke intervention 24/7	N/A	N/A	N/A	✓
Laboratory tests based on Canadian Best Practice Recommendations for Stroke Care	✓	✓	✓	✓
Basic cardiac investigations - ECG and monitoring (telemetry)	✓	✓	✓	✓
Advanced cardiac investigations – Holter monitor, echocardiogram, transesophageal echocardiogram	N/A	N/A	✓	✓

Stroke Service Elements	Acute Care Centre, Hospital or Outpost Station	Acute Care Hospital or Inpatient Rehabilitation Facility		
	General Healthcare Facility*	Basic Stroke Service Facilities	Advanced Stroke Service Facilities	Comprehensive Stroke Service Facilities
Hyperacute Stroke Management in the Emergency Department				
Basic stroke protocols based on Canadian Best Practice Recommendations for Stroke Care	✓	✓	✓	✓
Collaborative, evidence-based written protocols, order sets and care pathways/algorithms in place to guide hyperacute stroke care teams, including rehabilitation assessments and cross-continuum stroke care management	N/A	N/A	✓	✓
Provide access to tPA on-site for all eligible patients, including patients transferred from general healthcare or basic stroke service hospitals	N/A	N/A	✓	✓
Support of Telestroke referring sites (i.e., centres provide Telestroke consulting services)	N/A	N/A	✓	✓
Stroke Team available on site - a dedicated interprofessional team with advanced training in stroke management. Stroke team members in-house or on-call 24/7	N/A	N/A	✓	✓
Access to urgent neurosurgery consult with neurosurgery team and available 24/7 on-site, through telestroke, or by receiving patients from non-specialized sites.	N/A	N/A	✓	✓
Access to urgent interventional neuroradiology consult with interventional neuroradiology team available 24/7 on-site or through transfer of patient	N/A	N/A	N/A	✓
Inpatient Acute Stroke Management				
Clustered stroke care model - patients cared for on a geographically defined stroke/neurovascular unit with organized clustered bed model, with a dedicated, specialized interprofessional stroke team	N/A	N/A	✓	✓
Ongoing specialized stroke-specific professional development for all members of the interprofessional team	N/A	N/A	✓	✓
Interprofessional team rounds daily, case review meetings regularly	N/A	N/A	✓	✓

Stroke Service Elements	Acute Care Centre, Hospital or Outpost Station	Acute Care Hospital or Inpatient Rehabilitation Facility		
	General Healthcare Facility*	Basic Stroke Service Facilities	Advanced Stroke Service Facilities	Comprehensive Stroke Service Facilities
Access to general, non-specialized rehabilitation assessment and development of individualized management plan	N/A	✓	N/A	N/A
Access to specialized early rehabilitation assessment and development of individualized management plan	N/A	N/A	✓	✓
Access to palliative care	✓	✓	✓	✓
Stroke Rehabilitation and Ambulatory Care				
Access to stroke specific community and home-based stroke rehabilitation through early supported discharge services	N/A	N/A	✓	✓
Timely access to specialized inpatient stroke rehabilitation services	N/A	N/A	✓	✓
Timely access to specialized community-based stroke rehabilitation services	N/A	N/A	✓	✓
Access to timely hospital-based or community-based stroke or vascular prevention services for individualized management	✓	✓	✓	✓
Patient and Family Support and Engagement				
Protocols and materials available to provide stroke education and self-management training to patients, family and caregivers	✓	✓	✓	✓
Expertise available to screen patients for mood and cognition status during inpatient stay or through ambulatory care	✓	✓	✓	✓
Access to home care services for patients on return to the community post-discharge	✓	✓	✓	✓
Shared decision making approach that reflects patient and family preferences, needs and advanced directives	✓	✓	✓	✓

* N/A indicates that the stroke service element is not applicable to a particular level of facility – either the element requires more advanced levels of specialization and coordination of stroke care, or the element is intended for facilities without specialized stroke services.

SECTION THREE: IMPLEMENTATION OF OPTIMAL INPATIENT STROKE CARE

3.0 TAKING ACTION TOWARDS OPTIMAL STROKE CARE

The development of a regional plan for comprehensive stroke services across a region is a critical first step in achieving optimal stroke care. It involves the participation of key individuals and champions, leaders and front-line staff from all levels of stroke services. There are several steps to take when planning for and implementing comprehensive stroke care, including the establishment of stroke unit beds, and/or ensuring ongoing quality of improvement or redesign of existing inpatient stroke unit capacity. This section of the guide describes some of the most important of these steps, as well as providing access to a number of tools to support the knowledge translation (KT) activities relevant to each of these phases.

3.1 Stroke Unit Care

There are several types of stroke unit, usually determined by either the phase of care, the type of patients on the unit, or both. The three most common types described in the literature are: an acute stroke unit (see earlier definition of acute care); a rehabilitation stroke unit (see earlier definition of rehabilitative care); and an integrated or comprehensive stroke unit (providing care both the acute and rehabilitative phase). Other types of unit are less common but may include a neurovascular unit, or a hyperacute/critical care stroke unit (providing neurological and/or neurosurgical care [see earlier definition of hyperacute care]).

Regardless of the type of unit, key evidence-based characteristics apply to all models. The Stroke Unit Trialists' Group (Cochrane Collaborative 2009) identified the following main elements which were considered minimum criteria for a stroke unit:¹

- dedicated geographically defined units;
- interprofessional staffing – team that consists of physicians, nursing and therapy staff (usually including physiotherapy, occupational therapy, speech therapy, social work);
- coordinated multidisciplinary rehabilitation services;
- staff with a specialized interest in stroke or rehabilitation;
- team meetings held at least once per week;
- routine involvement of carers in the rehabilitation process;
- regular programs of staff education and training.

Additional stroke unit characteristics identified within the 2012 Best Practice Recommendations include:

- procedures for diagnostic evaluation;
- acute monitoring of neurological function and vital signs;
- acute treatment;
- early physical mobilization (including sitting, standing, and early ambulation);
- a strong focus on rehabilitation and recovery.

Creating a stroke unit does not have to involve creating new beds. In most cases, in fact, the case for opening a stroke unit emphasizes the reassignment or reorganization of existing beds capacity. This therefore represents consolidating these beds in a single geographic location rather than stroke patients being cared for in beds on other wards (e.g. neuroscience, neurology, cardiology, and medical or surgical units). The evidence for the benefits of stroke unit care emphasizes not only the improved outcomes for stroke survivors, but also positive system impact such as reduced length of

¹ Stroke Unit Trialists' Collaboration. Organized inpatient (stroke unit) care for stroke. *Cochrane Database of Systematic Reviews* 2007, Issue 4. Art. No.: CD000197. DOI: 10.1002/14651858.CD000197.pub2.

inpatient stay. In this way, the reassignment of beds to create a consolidated stroke unit is considered to confer significant benefit on patient flow as compared with having stroke patients spread across non-specialized units.

Clustering of stroke patients on non-stroke units where volumes of stroke patients are low (e.g. an average facility census of less than four stroke patients) is preferable to having patients spread across beds in different geographic areas. The evidence of improved individual and system impact is stronger, however, for dedicated stroke unit beds.

It is also recognized that the creation of a stroke unit does not necessarily in itself translate into improved patient outcomes. The ability to apply best practices in a timely and reliable manner to patients within a stroke unit will determine the overall extent of positive impact, and the steps towards implementing optimal inpatient stroke unit care in the next section provide practical guidance on how to make this happen.

Table 3.1: Steps for Taking Action Towards Optimal Stroke Unit Care

Step	What's involved in this phase?
1. Prepare an implementation plan	Preparation of a business case outlining the need, resource implications, likely benefits and main steps towards implementation of a stroke unit. This will include the appraisal of the type of unit, and which stakeholders are required to be involved and how.
2. Establish space for the unit	Identification and securing the space and beds required for the stroke unit. This will include identifying the likely impact upon patient flow and implications for services upstream (e.g. EMS and/or Emergency Department) and downstream (e.g. rehabilitation or community) of the unit.
3. Identify the make-up of the stroke team	Based upon an assessment of the key care requirements for the number and type of patients on the stroke unit, identification of the type, number, and rotation/deployment of staff to include physicians, nursing staff, allied health professionals and support staff.
4. Implement stroke best practices	Assessment of current ability to deliver best practices, prioritizing opportunities for improvement, and supporting systematic implementation of best practices within the unit.
5. Establish team communication processes	Identification and development of clinical and team-development communication processes for the stroke unit team. Clinical communication processes will include bedside rounds, sit-down rounds, and hand-over communications. Team-development communication processes will include team (business) meetings, interaction with other key stakeholders across the continuum of care, and with the broader community.
6. Establish patient engagement, transition and education processes	The development of processes to support effective engagement of patients and families at transition points. The development and implementation of effective patient education and support processes. The development of practical and effective ways for patients and families to provide input into quality improvement and planning processes.

Step	What's involved in this phase?
7. Establish the quality management arrangements	Implementing the key components of the quality management arrangements for the unit, including the measurement of performance; critical supporting activities, e.g. provider education; and the approaches taken to ensure ongoing quality improvement.

Note:

This is a living document that continues to grow and evolve.

Detailed information and tools to implement the seven steps, plus information on quality improvement will be available on the stroke best practices website by May 31st, 2013

Stay Tuned!!!!