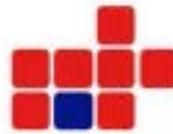




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CANADIAN BEST PRACTICE RECOMMENDATIONS FOR STROKE CARE

Fourth Edition

*Lindsay MP, Gubitz G, Bayley M, Phillips S (Editors),
on Behalf of the Canadian Stroke Best Practices and Standards Working Group*

CHAPTER 5 Stroke Rehabilitation

(UPDATE July 2013)

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Canadian Best Practice Recommendations for Stroke Care
Stroke Rehabilitation Chapter ~ Fourth Edition
(Updated July 10th, 2013)

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Canadian Best Practice Recommendations for Stroke Care

The *Canadian Best Practice Recommendations for Stroke Care* are intended to provide up-to-date evidence-based guidelines for the prevention and management of stroke. The goal of disseminating and implementing these recommendations is to reduce practice variations in the care of stroke patients across Canada, and to reduce the gap between knowledge and practice. Recommendations are updated on a rotating cycle every two years to ensure they continue to reflect contemporary stroke research evidence and leading expert opinion. Each update involves critical review of the current medical literature, which informs decisions regarding modification of the recommendations and the performance measures used to assess their impact. Every attempt is made to coordinate with other Canadian groups who are developing guidelines that relate to stroke, such as hypertension, atrial fibrillation and diabetes. As well, if significant new evidence becomes available in between update cycles, a process is in place to conduct a modified Delphi process to rigorously review the new evidence and gain consensus on the impact of that evidence on current recommendations. Modifications that are required through the consensus process will be made as soon as they are available, which is readily enabled through the web-based format of the Canadian stroke best practices.

This is the fourth edition of the *Canadian Best Practice Recommendations for Stroke Care*, which was first released in 2006. The theme of the 2012 – 2013 update is **TAKING ACTION**, and stresses the critical role and responsibility of healthcare providers at every stage of the continuum of care to ensure that best practice recommendations are implemented and adhered to. **TAKING ACTION** will lead to optimal outcomes for each stroke patient by providing the best care within the most appropriate setting. This includes rapid and efficient access to diagnostic services, stroke expertise and medical and surgical interventions, rehabilitation and support for ongoing recovery and community reintegration.

TAKING ACTION requires a committed team approach and strong coordination of care across regions and networks, with pre-hospital, acute care, rehabilitation and community-based healthcare providers working together to ensure optimal outcomes for patients and their families, regardless of geographic location.

TAKING ACTION also applies to patients who have experienced a stroke, their families and informal caregivers. Stroke patients and their families need to actively participate in their recovery and openly communicate with their healthcare team. Patients and families must participate in setting the goals they want to achieve during recovery from a stroke, and share concerns, as well as physical, mood and cognitive issues with their team, which will lead to the care required for optimal recovery in all aspects of health.

ALL CANADIAN BEST PRACTICE RECOMMENDATIONS FOR STROKE CARE,
AS WELL AS SUPPORTING DOCUMENTS AND IMPLEMENTATION TOOLS CAN BE ACCESSED
THROUGH OUR STROKE BEST PRACTICES WEBSITE AT:

WWW.STROKEBESTPRACTICES.CA

DEVELOPMENT OF THE *CANADIAN BEST PRACTICE RECOMMENDATIONS FOR STROKE CARE*

For detailed methodology on the development and dissemination of the *Canadian Best Practice Recommendations for Stroke Care* please refer to the stroke best practices website at <http://www.strokebestpractices.ca/index.php/methods/>.

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Conflict of Interest:

All participants in the development, writing, and review of these recommendations completed a Conflict of Interest form which was reviewed by the CSN privacy officer for risk assessment. No significant conflicts of interest were noted, that would impact these recommendations. A broad consensus process minimized any potential biases.

Citing the Stroke Rehabilitation Update 2013

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Comments

We invite comments, suggestions, and inquiries on the development and application of the *Canadian Best Practice Recommendations for Stroke Care and ongoing updates*.

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

STROKE REHABILITATION OVERVIEW

Stroke Rehabilitation Definition

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 - a key component of comprehensive stroke care - are provided in acute and post-acute care settings, as well as in rehabilitation units, clinics, centres, programs, early supported discharge services, and outreach 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. In many stroke patients, these services will continue to be needed beyond the first six months, as rehabilitation is an ongoing process that may transition from inpatient care to the community.

TAKING ACTION IN STROKE REHABILITATION AND RECOVERY

TAKING ACTION is an imperative within stroke rehabilitation and recovery, and applies to systems of care, healthcare providers, patients and the broader community. The primary underpinnings of 'rehabilitation' require **TAKING ACTION** to optimize functional, cognitive and emotional recovery. A critical aspect of stroke rehabilitation is that 'rehabilitation' does not refer to a specific place where care is received. Rather, stroke rehabilitation and recovery is a concept, and an approach to patient care post-stroke that starts at the time of the stroke event and continues as long as required for each individual to achieve their maximum potential recovery. Therefore, it crosses all 'settings of care' and a broad range of providers and caregivers are included as active members of the rehabilitation 'team', including patients, their families and informal caregivers.

The actions required in stroke rehabilitation and recovery start with early post stroke rehabilitation assessment and the development of an individualized patient rehabilitation plan that incorporates patient goals, current deficits, and potential for recovery. The plan clearly describes the types of therapies required based on the results of clinical assessments across all domains of rehabilitation. Throughout the rehabilitation and recovery process, the individualized plan is regularly reassessed and revised as needed to reflect patient progress and updated goals. These assessments happen throughout patient-therapist interactions and further discussed at regular meetings of the interprofessional care team.

TAKING ACTION in stroke rehabilitation and recovery involves healthcare providers, policy makers, patients and the public. A critical component of stroke rehabilitation and recovery is access to specialized stroke services, ideally provided by dedicated stroke rehabilitation providers in acute care, inpatient rehabilitation settings and the community.

Recent reports on the quality of stroke rehabilitation and recovery services across Canada and within provinces have shown considerable variation in access to services, availability of specific types of therapies, intensity and duration of therapy, and follow-up care after an inpatient rehabilitation stay. These reports also show limited access to rehabilitation for those with severe stroke. The disparity in access to rehabilitation is occurring in both urban areas where large volumes of patients post-stroke reside, and rural settings where there are fewer people post-stroke, and fewer rehabilitation professionals available who have stroke expertise.

HIGHLIGHTS OF THE STROKE REHABILITATION UPDATE 2013

The 2013 update of the Stroke Rehabilitation Chapter of the *Canadian Best Practice Recommendations for Stroke Care* reinforces the growing and changing body of research evidence available to guide assessment, diagnosis and management in the days, weeks and months following a stroke.

Key messages for 2013 and significant changes to previous recommendations include:

- ✓ **Rehabilitation and recovery after stroke is a dynamic and ongoing process that occurs in all settings and over time (days, weeks, months, years). Rehabilitation is NOT a setting, rather it is a set of activities, and begins soon after the initial stroke event, once the patient is medically stable and can identify goals for rehabilitation and recovery.**
- ✓ The evidence for rehabilitation continues to emerge and is strong and compelling.
- ✓ It is time for both system funders and front-line clinicians to commit to improving the stroke rehabilitation system. Analyses suggest that investing in effective and efficient rehabilitation services could actually reduce costs of taking care of stroke patients.
- ✓ The recommendation sections have been grouped into two parts: the first addressing organization of stroke rehabilitation within a system of care; the second part addressing specific areas of stroke recovery and direct clinical care.
- ✓ The new sections of rehabilitation recommendations provide guidance for rehabilitation providers to ensure a holistic approach to the rehabilitation of the person with stroke by addressing their physical, functional, cognitive and emotional status to help them return to their normal life roles.
- ✓ The recommendations continue to evolve with the evidence to guide clinicians in tailoring their treatment to the individual based on time post stroke, their impairments and their goals.
- ✓ Family members and informal caregivers play a key role in post-stroke rehabilitation and recovery.
- ✓ The section on Dysphagia, included in the Cross Continuum chapter in 2010, has now been included in the rehabilitation chapter so consolidate all post-stroke therapies in one area
- ✓ New sections have been developed for 2013 for visual perceptual deficits, communication issues, central pain, and major life roles (including vocational rehabilitation, return to driving, and sexuality and relationships). These sections further emphasize the need for a holistic approach to stroke rehabilitation.

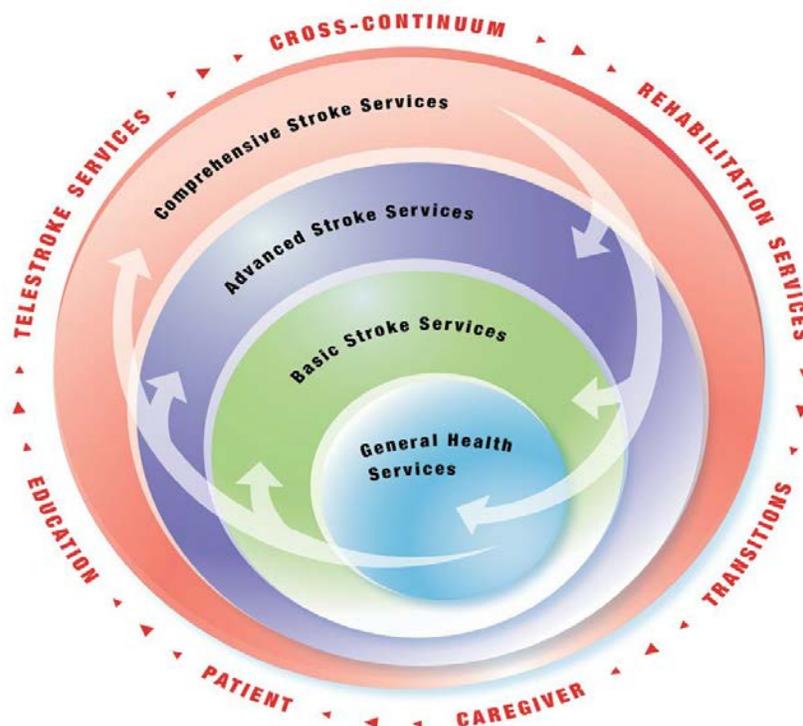
STROKE REHABILITATION UPDATE 2013 RESOURCE PACKAGE INCLUDES:

- i. Stroke Best Practice Recommendations for Stroke Rehabilitation
- ii. Evidence summaries and evidence tables for all topics addressed in the recommendations
- iii. **TAKING ACTION TOWARDS OPTIMAL STROKE CARE** resource kit, with implementation materials and educational slide decks for all Best Practice Recommendations, including stroke rehabilitation
- iv. Stroke Rehabilitation Assessment Tools summary tables
- v. Links to implementation tools for all topic areas

CANADIAN STROKE BEST PRACTICES FRAMEWORK FOR OPTIMAL STROKE SERVICES DELIVERY

There are variations in the levels of stroke care service provided within the Canadian healthcare system. These services can be arranged along a continuum from minimal, non-specialized services provided in facilities that offer general medical and surgical care, to more advanced and comprehensive stroke care centres (See Figure 1). The goal for each organization involved in the delivery of stroke care services is to continue to develop the expertise and processes needed to provide optimal patient care, taking into consideration that 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.

Figure 1: CANADIAN STROKE BEST PRACTICES FRAMEWORK FOR OPTIMAL STROKE SERVICES DELIVERY



FOR ADDITIONAL INFORMATION AND DETAILS ABOUT THE STROKE SERVICES FRAMEWORK, PLEASE REFER TO THE "TAKING ACTION TOWARDS OPTIMAL STROKE CARE" RESOURCE AVAILABLE AT [WWW. STROKEBESTPRACTICES.CA](http://WWW.STROKEBESTPRACTICES.CA)

OPTIMAL STROKE SERVICES DELIVERY IN STROKE REHABILITATION

Stroke rehabilitation addresses all aspects of physical, functional, cognitive and emotional recovery. The guiding principles of the *Canadian Best Practice Recommendations for Stroke Care* related to stroke rehabilitation and recovery include:

- i. Explicit and unambiguous – facilitate clear actions and directions for care
- ii. Flexible – allow tailoring to individuals based on severity and time lapse since stroke (algorithm for care, and development of individualized care plans)
- iii. Accountable – have links to performance measures for monitoring quality of care
- iv. Measurable – paired with evidence based outcome measures or process indicators

The following framework describes the reorganization of evidence-based stroke rehabilitation recommendations for 2013 (specific recommendation sections noted in brackets; these include recommendations within the rehabilitation chapter as well as recommendations located within Chapter 6 Transitions of Care, and Chapter 7 Mood and Cognition).

Part One: Organization of a Stroke Rehabilitation System for Optimal Service Delivery

- i. Early Stroke Rehabilitation Assessment
 - a. Triage for rehabilitation (5.1)
 - b. Criteria for inpatient stroke rehabilitation (new, 5.1)
 - c. Initial stroke rehabilitation assessment (5.1)
- ii. Inpatient Stroke Rehabilitation
 - a. Early initiation of therapy (5.2, 5.3)
 - b. Access to interdisciplinary team (5.2)
 - c. Stroke unit care (5.2)
 - d. Adequate intensity of therapy (5.3)
 - e. Task oriented approach (specificity of tasks) (5.3)
- iii. Community and Ambulatory Rehabilitation
 - a. Early Supported Discharge (5.4)
 - b. Access to outpatient rehabilitation and recovery services (5.4, 6.4)
 - c. Normalizing life/return to community (5.4, 5.11, 6.4)
 - Ongoing adaptive support programs (6.4)
 - d. Access to ongoing rehabilitation therapy beyond 3 to 6 months (5.6, 5.11, 6.4)
 - Wheelchair services, seating assessments, and other assistive device needs (5.5, 6.4)
- iv. Caregiver assessment and training (6.1, 6.2, Transitions of Care Chapter)

Part Two: Providing Stroke Rehabilitation to Address Physical, Functional, Cognitive and Emotional Issues to Maximize Participation in Usual Life Roles

- i. Rehabilitation to improve upper extremity function (5.5)
 - a. Management of activities of daily living/self-care (ADLs) (5.5)
 - b. Management of shoulder pain (5.5.3)
- ii. Rehabilitation to improve mobility and reduce falls (lower limb function)
- iii. Rehabilitation to reduce spasticity (5.6.2, 5.6.2)

- iv. Rehabilitation to improve cardiovascular endurance and fitness (5.6)
- v. Rehabilitation of swallowing and dysphagia (5.7)
- vi. Rehabilitation to improve visual perceptual function (5.8)
- vii. Rehabilitation to address central pain issues (5.9)
- viii. Rehabilitation to improve communication and aphasia (5.810)
- ix. Rehabilitation to improve cognition (Chapter 7, Mood and Cognition)
- x. Rehabilitation to improve psychosocial function (Chapter 7, Mood and Cognition)
- xi. Major life roles (5.11)
 - a. Vocational rehabilitation
 - b. Return to driving
 - c. Relationships and sexuality
- xii. Environmental modifications (to be developed for release in 2014)
- xiii. Special issues in rehabilitation for children with Stroke (to be developed for release in 2014)

The International Classification of Functioning, Disability and Health (ICF):

The International Classification of Functioning, Disability and Health (ICF) is a framework often referenced in organizing rehabilitation care. It clearly emphasizes the importance of function in the context of societal roles (World Health Organization, 2001). Effective stroke rehabilitation must not simply focus on the resolution of body function impairments in isolation, but rather must address them insofar as how they limit activity performance. Furthermore, the activities in question must be those which restrict participation in the individual's previous personal, family, or community roles. Components of the ICF have been incorporated into the Canadian Best Practice Recommendations for Stroke Care Stroke Rehabilitation chapter.

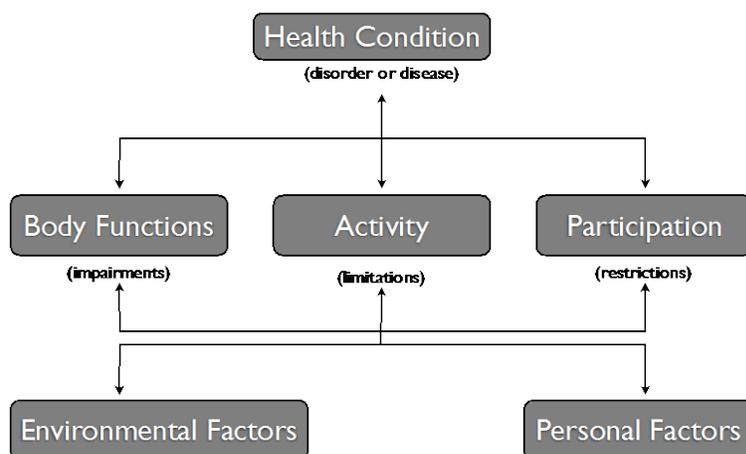


Figure 1. International Classification of Functioning, Disability and Health

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CANADIAN BEST PRACTICE RECOMMENDATIONS FOR STROKE CARE

Part One: Organization of a Stroke Rehabilitation System for Optimal Service Delivery

**Best Practice Recommendation 5.1
Initial Stroke Rehabilitation Assessment**

All patients with acute stroke should be assessed to determine the severity of stroke and early rehabilitation needs.

- i. All patients **admitted to hospital** with acute stroke should have an initial assessment, conducted by rehabilitation professionals, as soon as possible after admission [Evidence Level A].
 - a. The core rehabilitation professional team should include physiatrists, other physicians with expertise/core training in stroke rehabilitation, occupational therapists, physical therapists, speech-language pathologists, nurses, social workers and dietitians [Evidence Level A].
 - b. Additional core team members ideally also include recreation therapists, psychologists, vocational therapists, educational therapists, and rehabilitation therapy assistants [Evidence level C].
 - c. All members of the rehabilitation team should have specialized training in stroke care and recovery [Evidence level C].
 - d. All team members should be trained in supported conversation to be able to interact with patients with communication limitations such as aphasia [Evidence Level C].
 - e. All patients should undergo basic communication screening to ensure optimal vision (glasses or contact lenses), optimal hearing (hearing aids and batteries) and optimal speech (dental prosthesis) when interacting with members of the hospital and rehabilitation team [Evidence Level C].
- ii. Initial assessment should be conducted within 48 hours of admission and include an evaluation of patient function, safety, physical readiness, and ability to learn and participate in rehabilitation therapies [Evidence Level C].
- iii. Issues related to transition planning should be considered during the initial assessment [Evidence Level C].
- iv. Assessments of impairment, functional activity limitations, and role participation restrictions should be conducted using standardized, valid assessment tools; tools should be adapted for use with patients who have communication differences or limitations where required [Evidence Level B]. *Refer to Table 5.1 for a summary of validated and frequently used screening and assessment tools for stroke rehabilitation.*
- v. For patients who do not initially meet criteria for rehabilitation, rehabilitation needs should be reassessed weekly during the first month and at intervals as indicated by their health status thereafter [Evidence Level C].
- vi. All patients who present with acute stroke or TIA who are **not admitted to hospital** should be screened for the need to undergo a comprehensive rehabilitation assessment to determine the scope of deficits from index stroke event and any potential rehabilitation requirements [Evidence level C].
 - a. Priority assessments, including evaluation of safety (cognition, fitness to drive),

swallowing, communication and mobility, should be completed by a clinician with expertise in stroke rehabilitation *before the patients leave the emergency department or primary care setting* [Evidence Level C].

- b. Additional assessment should be conducted within 2 weeks of stroke onset, including evaluation of functional impairment and screening for depression [Evidence Level C].
- vii. Once a stroke patient has undergone assessments, a standardized approach should be used to determine the appropriate setting for rehabilitation (inpatient, outpatient, community, and/or home-based settings) [Evidence Level C].
 - a. Criteria for admission to any rehabilitation setting should be standardized and communicated to all referring centres and services [Evidence Level C]. *Refer to Box 1 for key elements of rehabilitation admission criteria.*

Eligibility and Admission Criteria for Stroke Rehabilitation

DETERMINING IF A PATIENT IS A CANDIDATE FOR REHABILITATION

The following criterion has been developed as part of the Canadian Stroke Best Practice Recommendations to provide guidance and increase consistency on key elements that should be considered in decision-making regarding stroke rehabilitation for individual patients. Criteria for access to rehabilitation services should be agreed upon by all relevant stakeholders in each region, be clearly stated and communicated to all referral sites to improve patient access and admission to stroke rehabilitation programs in an efficient and transparent manner. This applies to all rehabilitation settings, including inpatient rehabilitation, out-patient and community-based rehabilitation, and home-based rehabilitation.

General Inclusion Criteria for Stroke Rehabilitation

- All acute or recent stroke patients (less than one year post-stroke) **or** patient greater than one year post stroke who requires:
 - inpatient or outpatient interdisciplinary rehabilitation to achieve functional goals that will prevent hospital admission and/or improve independence;
 - interdisciplinary rehabilitation assessment, treatment, or review from staff with stroke experience/expertise (including disciplines such as physical therapy, occupational therapy, speech-language pathology, nursing, psychology, and recreation therapy);
 - and whose stroke etiology and mechanisms have been clarified and appropriate prevention interventions started.
- The patient is **medically stable**:
 - A confirmed diagnosis of stroke has been identified, although the mechanism or etiology may not be initially clear, such as in cryptogenic stroke; these situations should not cause delays in access to rehabilitation;
 - all medical issues and/or co-morbidities (e.g. excessive shortness of breath, and congestive heart failure) have been addressed;
 - at the time of discharge from acute care, acute disease processes and/or impairments are not precluding active participation in the rehabilitation program;
 - patient's vital signs are stable;
 - all medical investigations have been completed **or** a follow-up plan is in place at time of referral and follow-up appointments made by time of discharge from acute care.

- The patient demonstrates at least a minimum level of function, which includes:
 - patient has the stamina to participate in the program demands/schedule;
 - the patient is able to follow at minimum one-step commands, with communication support if required;
 - the patient has sufficient attention, short term memory, and insight to progress through rehabilitation process.
- Patient demonstrates by their post-stroke progress the potential to return to premorbid/baseline functioning or to increase in post-stroke functional level with participation in rehabilitation program.
- Goals for rehabilitation can be established and are specific, measurable, attainable, realistic and timely.
- The patient or substitute decision-maker has consented to treatment in the program and demonstrates willingness and motivation to participate in the rehabilitation program (Exceptions: patients with reduced motivation/initiation secondary to diagnosis e.g. depression).
- Patient **is ready to participate in rehabilitation**:
 - patient meets the criteria of medical stability as defined in guideline above;
 - patient is able to meet the minimum tolerance level of the rehabilitation program as defined by its admission criteria;
 - there are no behavioural issues limiting the patient's ability to participate at the minimum level required by the rehabilitation program.

General Exclusion Criteria for Stroke Rehabilitation

- Severe cognitive impairment preventing patient from learning and participating in therapy;
- Patient already receives treatment elsewhere and needs are being met;
- Behaviour is inappropriate putting self or others at risk (i.e. aggressive, wanders, etc.);
- Terminal illness with expected short survival;
- Not willing to participate in program.

DETERMINING IF A PATIENT IS A SUITABLE CANDIDATE FOR OUTPATIENT REHABILITATION:

- Patient meets the criteria for rehabilitation candidacy, medical stability, and rehabilitation readiness as defined above.
- The patient's current medical, personal care, or rehabilitation needs can be met in the community
- The patient can attend therapy alone or if assistance is required (i.e., for feeding or toileting) a caregiver is available to attend therapy sessions.
- The patient is able to tolerate and organize their own transportation to and from the program. People with communication limitations such as aphasia may require assistance with transport organization.

Characteristics to Consider in Planning Rehabilitation of Stroke Patients

Stroke Characteristics:

- Initial stroke severity
- Location, etiology and type of stroke (ischemic versus hemorrhagic)
- Functional deficits and functional status – using FIM[®] Instrument, Barthel Index, Rankin Score, and/or Alpha FIM[®] Instrument scores
- Types of therapy required based on assessment of deficits (e.g., OT, PT, SLP, and others as required)
- Cognitive status – patient is able to learn and actively participate in rehabilitation
- Time from stroke symptom onset.

Additional Patient Characteristics:

- Medical stability
- Rehabilitation goals can be identified by patient and/or health care team in order to increase independence in all activities of daily living. Some examples of goals may include: transfer unassisted, walk independently with aids, use involved arm, improve communication skills, and provide personal self-care
- Adequate tolerance and endurance to actively participate in stroke rehabilitation therapy
- Age and pre-stroke frailty
- Existing co-morbidities such as dementia, palliative care status for another medical condition/terminal illness
- Caregiver availability for patients with severe impairment is important

System Characteristics:

- Efficient referral process for rehabilitation.
- Rehabilitation professionals knowledgeable about stroke should be responsible for reviewing intake applications.
- Family members and informal caregivers should be included as part of the rehabilitation process, including decisions regarding inpatient and/or outpatient rehabilitation.
- Standards for time from receipt of referral to decision regarding intake (suggest 24-48 hours).
- Available services and resources at different inpatient rehabilitation sites within a geographic region; types and levels of rehabilitation services available at those sites.
- Presence of an early supported discharge (ESD) program and criteria for patient appropriateness for ESD.

Notes about Pediatric Stroke Rehabilitation:

Populations:

There are three populations of Pediatric patients with brain injury due to a cerebrovascular lesion (stroke) to consider for rehabilitation, based on age and presentation:

- children (1 month - 18 years) with acutely diagnosed arterial ischemic stroke or cerebral sinovenous thrombosis hemorrhagic stroke (diagnosed acutely at stroke and hospitalized at acute care hospital);

- neonates (term birth to 1 month age) with acutely diagnosed arterial ischemic stroke or cerebral sinovenous thrombosis hemorrhagic stroke (diagnosed acutely as stroke and hospitalized at acute care hospital);
- presumed pre-perinatal ischemic stroke (PPIS) with diagnosis in later infancy and congenital hemiparesis (usually diagnosed as out-patient rarely admitted to hospital).

Considerations in Planning for Stroke Rehabilitation in Children:

- The full impact of a stroke in a child may not be known for years as the child grows and matures, and there may be ongoing and emerging rehabilitation needs throughout growth and development. Therefore children who have experienced a stroke require long-term monitoring and follow-up throughout maturation.
- Dedicated pediatric stroke rehabilitation programs are scarce in Canada and globally. In areas where stroke rehabilitation programs are not available for children, they often have their rehabilitation needs addressed in Cerebral Palsy Clinics (younger patients) or acquired brain injury rehabilitation programs (older children).
- Rehabilitation goals are similar to adults with stroke; and they also include additional goals such as educational and vocational rehabilitation, re-integration into play roles, growth and development, and developmental psychology.
- The child with stroke may be able to reside at home with their parents/ guardians and attend outpatient rehabilitation.
- Many stroke rehabilitation approaches defined for adults are applicable to children, with adaptations to the younger age and harnessing the increased plasticity.
- Newer evidence-based techniques, such as constraint induced movement therapy and some of the emerging robotic therapies are appropriate for children as well as traditional function-oriented therapy and splinting as needed.
- The focus in rehabilitation of children with stroke is more often 'new' learning rather than relearning.
- Pediatric programs should integrate closely with the child's school for continuity of programs and therapy plans, as well as with other coaches and extracurricular activities (both inpatient and outpatient options).

Rationale

The goal of the first interprofessional assessment a patient receives after admission for stroke is to identify impairments in physical, functional, cognitive, and communication functioning to help identify likely rehabilitation services required, and potential discharge needs. Early consultation with rehabilitation professionals enhances the process of discharge planning, whether patients are going to transition from acute care to specialized rehabilitation units or back to the community.

System Implications

To ensure patients receive timely stroke rehabilitation assessments, the acute care, rehabilitation, and community organizations require:

- An adequate complement of clinicians experienced in stroke and stroke rehabilitation.
- A clear process for patient referral to rehabilitation professionals after acute admission.
- An interprofessional team that is well resourced to provide prescribed levels of rehabilitation therapy.
- A defined geographic area or unit where individuals with stroke are assured access to an

experienced team.

- Standardized expert consensus-based screening assessment tools and training.
- A process for timely referral to specialized stroke inpatient services in all centres (for example, electronic referral system and standardized assessment tools).
- Access to a follow-up clinic to ensure assessment of mild stroke-related difficulties and referral to rehabilitation services and programs when deficits and issues are identified that are amenable to rehabilitation. For children, follow-up in their school environments.
- Development or expansion of stroke rehabilitation expertise in children’s hospitals and children’s treatment centres, as needed.
- Mechanisms to periodically re-evaluate those patients with severe stroke who are admitted to nursing homes or to continuing care to ensure that they have access to rehabilitation as appropriate, if the patient progresses sufficiently and has goals amenable to rehabilitation.
- Coordination and development of strong partnerships in the community, and adequate resources to ensure access to comprehensive stroke rehabilitation. This is especially important in more rural and remote geographic locations where telehealth technologies should be optimized.

Performance Measures

1. **Proportion of stroke patients with a rehabilitation assessment within 48 hours of hospital admission for acute stroke by at least one stroke rehabilitation specialist as appropriate to patient needs (core).**
2. **Median time from hospital admission for stroke to initial rehabilitation assessment for each of the rehabilitation disciplines.**
3. **Proportion of acute stroke patients discharged from acute care to inpatient rehabilitation (core).**
4. Percentage of stroke patients discharged to the community who receive a referral for outpatient rehabilitation before discharge from acute and/or inpatient rehabilitation (either facility-based or community- based programs).
5. Median length of time between referral for outpatient rehabilitation and admission to a facility-based or community rehabilitation program.
6. Median length of time between referral for outpatient rehabilitation to commencement of therapy.
7. Percentage of those patients with severe stroke reassessed for rehabilitation following initial assessment within one month, 3 months and six months of index stroke event.
8. Percentage of patients with severe stroke admitted to inpatient rehabilitation.
9. Percentage of Telehealth/Telestroke coverage to remote communities to support organized stroke care across the continuum and provide rehabilitation assessments for stroke patients.

Measurement Notes

- Referral information may be found through primary audit of inpatient charts (nurses’ notes, discharge summary notes, copies of referral forms) or through databases maintained by organizations that receive and process referrals. These community databases will vary in the amount of information included, and there may be challenges in accessing information contained in these databases.
- Most home care organizations monitor when the first service started but cannot determine easily the onset of rehabilitation therapy.
- For Performance Measure 3, when analyzing these data consider also looking at appropriateness of referral and location of facility.

- Performance Measure 5, the timing being measured if from referral to acceptance into a program, and not specifically the start of therapy (Performance Measure 6 measures time to start of therapy).
- For Performance Measure 7, this reassessment should be done at all transition points and ideally at least monthly thereafter. This includes admission to complex care, long-term care or return to other community setting. The denominator will be a challenge and should be clearly identified and applied consistently by all groups who adopt this measure (e.g., denominator could be all severe stroke patients admitted to a long term care facility).

Implementation Resources and Knowledge Transfer Tools

- **Canadian Stroke Best Practices *Taking Action Towards Optimal Stroke Care Resource Kit***
- Table 5.1, summary of validated and frequently used screening and assessment tools for stroke rehabilitation
- FIM® Instrument, AlphaFIM®
'http://www.va.gov/vdl/documents/Clinical/Func_Indep_Meas/fim_user_manual.pdf
- Modified Rankin Scale http://strokengine.ca/assess/module_mrs_family-en.html
- Evidence-Based Review of Stroke Rehabilitation (Triage Module):
www.ebrsr.com/uploads/Module_4_triage_final.pdf
- The Certificate of Stroke Rehabilitation Program, University of Alberta Department Rehabilitation Medicine
<http://www.rehabilitation.ualberta.ca/ContinuingProfessionalEducation/CertificateinStrokeRehabilitation.aspx>
- Ryerson University Interprofessional Certificate in Advanced Neuroscience-Stroke Care
<http://ce-online.ryerson.ca/ce/default.aspx?id=2873>

Summary of the Evidence

Complete stroke care delivery in the early days and weeks following an acute stroke has been shown to have a significant positive impact on stroke outcomes (Evans et al., 2002). Comprehensive assessments of a patient's cognitive and functional status in the first few days following a stroke are essential to developing individualized plans of care and recovery. The World Health Organization's International Classification of Functioning (ICF) model is commonly used by healthcare professionals to guide assessment and treatment of stroke patients in the acute and post-acute phases of care (World Health Organization, 2010). The ICF considers three perspectives: the body, the individual and societal perspectives. It also includes the two components of *body function and structure* and *activity and participation*, all within the context of one's *environment*. Early rehabilitation assessments for stroke, as well as goal setting and treatment planning, should incorporate aspects of the ICF model during the short and long term recovery of stroke patients (Ustun et al., 2013; Miller et al., 2010).

Definition of functional assessment: Standardized or non-standardized method of evaluating a person's ability to perform basic self-care activities (such as dressing, grooming, personal hygiene, feeding, functional mobility and communication) and instrumental activities of daily living (including meal preparation, home management, communication activities, financial management, shopping and community living skills). Ability to interact socially may also be a component of a functional assessment.

Benefits of early stroke rehabilitation assessment: A screening examination for rehabilitation should be performed by a person experienced in rehabilitation as soon as the patient's medical and

neurological condition permits (Gresham et al., 1995). The screening examination should incorporate medical information, a neurological examination, use of a well-standardized disability instrument (e.g., activities of daily living), and a mental status-screening test. Asberg and Nydevik suggest that the optimal timing for stroke rehabilitation assessment is five to seven days post-stroke onset (Asberg and Nydevik, 1991), although recent trends have been towards decreasing that time, since onset.

Threshold criteria for admission to a comprehensive rehabilitation program should include medical stability, the presence of a functional deficit, the ability to learn, and physical endurance to sit unsupported for at least one hour and to participate actively in rehabilitation (Gresham et al., 1995). Admission to an interprofessional program should be limited to patients who have more than one type of disability and who, therefore, require the services of two or more rehabilitation disciplines. Patients with a single disability can benefit from individual services, but generally, do not require an interprofessional program (Gresham et al., 1995).

Several studies have demonstrated the positive benefit of rehabilitation as soon as possible following stroke. Reviews by Cifu & Stewart (1999) and Ottenbacher & Jannell (1993) reported a positive correlation between early rehabilitation interventions and improved functional outcomes. However, it is not evident whether the relationship is causal. One prospective comparative trial by Paolucci et al. (2000) looked at the outcomes of stroke patients admitted to rehabilitation at differing times following stroke. They found that those stroke patients who received rehabilitation early did better functionally than those whose rehabilitation was delayed.

Interdisciplinary rehabilitation has also been demonstrated to be an integral component for optimal stroke recovery. Specialized nursing care promotes early recognition of complications and management of skin, bowel and bladder problems. Research suggests that physical therapy will promote better recovery through early mobilization of the patient and management of any lung problems caused by immobility. Occupational therapists focus on improving activities that are meaningful to the patient (self-care, productivity and leisure activities) by reducing stroke-related impairments. Assessment of patient's discharge environment addresses suitability for discharge home, need for equipment and/or home modification for function and safety. Speech-language pathologists assess swallowing difficulties and provide swallowing therapy and compensatory techniques. The speech-language pathologist is also able to assess the degree of difficulty with communication, and initiate appropriate therapy. Augmentative or alternative communication devices may be introduced if necessary. Medical specialists in physical medicine and rehabilitation address complications such as pain, spasticity (increased resistance in the muscles), and bowel and bladder incontinence. Neuropsychology, social work and other allied health professionals may help with the cognitive and psychosocial sequelae of stroke (Consensus Panel on the Stroke Rehabilitation System to the Ministry of Health and Long-Term Care, 2007).

Ongoing assessment of patients is an important component of stroke care, and the initial severity of impairment has been consistently demonstrated to have a relationship with one's ability to functionally recover (Ween et al. 1996). Interpretation of early rehabilitation assessments relies on the use of standardized assessment tools. In Canada, the FIM® Instrument is widely used within inpatient rehabilitation settings, with the AlphaFIM® becoming increasingly predominant as an acute assessment tool (Oczkowski & Barreca, 1993). Ween et al. (1996) prospectively analyzed 536 consecutive stroke rehabilitation admissions to try and identify the influence of preselected factors on functional improvement and discharge destination. Nearly all patients with an admission FIM above 80 went home following rehabilitation. It was recommended that patients with early functional independence measure (FIM) scores greater than 80 (the mildly disabled) are best managed at home given appropriate supports are in place. Conversely, patients admitted to

rehabilitation with a FIM score of less than 40 almost always required long-term care in a nursing home facility. It was recommended that those with FIM scores less than 40 (the more severely disabled) may be better suited to a slower paced or less intensive rehab facility, or a discharge decision should be postponed at the time of initial assessment and reassessed weekly. An admission score of 60 or more was associated with a larger FIM improvement, but the absence of a committed caregiver at home increased the risk of nursing home discharge. Therefore, it was recommended that intensive rehabilitation units are most likely to be effective with moderately severe stroke patients with early FIM scores between 40 and 80. These patients are generally able to participate fully, show substantial improvement during rehabilitation and have a high probability of discharge home (Alexander, 1994). A recent study by Lo et. al. (2011) was able to demonstrate the usefulness of the AlphaFIM®, an abbreviation of the FIM, as an acute assessment tool in predicting functional ability to recover.

A number of other factors have been demonstrated to correlate with the ability to make functional improvements following a stroke. Age had been shown have a strong relationship with functional recovery in a number of individual studies and systematic reviews (Ween et al., 1996; Hakkennes et al., 2011; Ones et al., 2009). Other factors such as stroke type and location (Ween et al., 1996; Hakkennes et al., 2011), the presence of comorbidities (Ween et al., 1996), level of cognitive function (Hakkennes et al., 2011; Ones et al., 2009; Toglia et al., 2011), and the presence of aphasia and communication deficits (Gialanella, 2011) have also shown to effect functional recovery. The presence of depressive symptoms (Gillen et al., 2001) and obesity (Kalichman et al., 2007) have also been studied and may negatively impact the recovery process. These factors may all be considered when determining candidacy for both inpatient and outpatient stroke rehabilitation.

[Link to Evidence Table 5.1 and Reference List](#)

For further information and references, please consult the Evidence Based Review of Stroke Rehabilitation at <http://www.ebrsr.com>; and StrokEngine at www.StrokEngine.ca

Best Practice Recommendation 5.2 Stroke Rehabilitation Unit Care

5.2.1 Stroke Rehabilitation Unit Care

- i. All patients who require inpatient rehabilitation following stroke should be treated on a specialized stroke rehabilitation unit [Evidence Level A], characterized by the following elements:
 - a. Rehabilitation care is formally coordinated and organized [Evidence Level A].
 - b. The rehabilitation unit is geographically defined [Evidence Level A].
 - c. The rehabilitation unit is staffed by an interprofessional rehabilitation team consisting of a physician (physiatrist, neurologist, or other physician with expertise/core training in stroke rehabilitation), nurse, physical therapist, occupational therapist, speech-language pathologist, social worker, dietitian, recreation therapist, and psychologist [Evidence Level A], at staffing levels consistent with those identified by the [Stroke Unit Trialists' Collaboration](#) [Evidence Level B].
 - d. The interprofessional rehabilitation team follows evidence-based best practices as defined by current consensus-based clinical practice guidelines [Evidence Level B].
 - e. Transition and discharge planning is initiated on admission to the unit [Evidence Level B]. [Refer to Recommendation 6.4 for additional information.](#)
 - f. Patient, family and caregiver education is provided both formally and informally, with consideration given to individual and group settings as appropriate [Evidence Level A]. [Refer to Recommendation 6.1 and 6.2 for additional information.](#)
 - g. Pediatric acute and rehabilitation stroke care should be provided on a specialized pediatric unit [Evidence Level B], including the same core group of interprofessional team members, with the addition of educators and child-life workers [Evidence Level B].
 - h. All team members should be trained and capable of interacting with people with communication limitations such as aphasia, by using supported conversation techniques [Evidence Level C].
- ii. Patients with moderate or severe stroke, who are ready for rehabilitation and have goals amenable to rehabilitation, should be given an opportunity to participate in inpatient stroke rehabilitation [Evidence Level A].
- iii. Where admission to a stroke rehabilitation unit is not possible, inpatient rehabilitation provided on a general rehabilitation unit (i.e., where interprofessional care is provided to patients disabled by a range of disorders including stroke), where a physiatrist is available on the unit or by consultation, is the next best alternative [Evidence Level B].
 - a. Patients treated on general rehabilitation units should receive the same levels of care and interventions as patients treated on stroke rehabilitation units, as described in section 5.2.1 (i)

5.2.2 Stroke Rehabilitation Team:

Note: Applicable for all stroke rehabilitation settings (acute care hospital, ambulatory clinic, community-based services and programs)

Stroke rehabilitation should be delivered by a full complement of health professionals, experienced in providing post-stroke care, regardless of where services are provided, to ensure consistency and

reduce the risk of complications [Evidence Level C].

- i. The interprofessional rehabilitation team should assess patients within 48 hours of admission and develop a comprehensive individualized rehabilitation plan which reflects the severity of the stroke and the needs and goals of the patient [Evidence Level C].
- ii. Stroke unit teams should conduct at least one formal interprofessional meeting per week to discuss the progress and problems, rehabilitation goals, and discharge arrangements for patients on the unit [Evidence Level B]. Individualized rehabilitation plans should be regularly updated based on review of patient status [Evidence Level C].
- iii. Clinicians should use standardized, valid assessment tools to evaluate the patient's stroke-related impairments, functional activity limitations, and role participation restrictions [Evidence Level C]. Tools should be adapted for use in patients with communication differences or limitations due to aphasia. [Refer to Table 5.1 for a summary of validated and frequently used screening and assessment tools for stroke rehabilitation.](#)

*** For management of bowel and bladder continence, refer to Chapter 4.2 for more information. For post-stroke depression and vascular cognitive impairment, refer to Chapter 7 of the Canadian Best Practice Recommendations for Stroke Care.*

Rationale

There is strong and compelling evidence in favour of admitting patients with moderate and severe stroke to a geographically defined stroke rehabilitation unit staffed by an interprofessional team. Death and disability are reduced when post-acute stroke patients receive coordinated, interprofessional evaluation and intervention on a stroke rehabilitation unit. For every 100 patients receiving organized inpatient interprofessional rehabilitation, an extra five return home in an independent state.

System Implications

To ensure patients receive best practice stroke rehabilitation care, organizations must plan for:

- Timely access to specialized inpatient stroke rehabilitation services.
- An adequate number of geographically defined stroke rehabilitation units with critical mass of trained staff; interprofessional team care during the rehabilitation period following stroke.
- Stroke rehabilitation units adequately staffed with clinicians with expertise in stroke rehabilitation.
- Resources to enable patient access to appropriate type and intensity of rehabilitation professionals throughout their stay (including weekends when required).
- Protocols and strategies to prevent complications and the recurrence of stroke developed and communicated to all staff.
- System and process changes to allow therapists to spend approximately 80% of their time providing direct care to patients.

Performance Measures

1. Number of stroke patients treated in a geographically defined stroke rehabilitation unit at any time during their inpatient rehabilitation phase following an acute stroke event (core).
2. Final discharge disposition for stroke patients following inpatient rehabilitation: percentage discharged to their original place of residence; percentage discharged to a long-term care facility or nursing home; percentage requiring readmission to an acute care hospital for stroke-related causes; percentage of patients discharged back to the community who were residing in a community setting prior to their stroke (core).
3. Number of stroke patients assessed by a physical therapist, occupational therapist, speech-

- language pathologist, dietitian, and social workers during inpatient rehabilitation.
4. Proportion of total time during inpatient rehabilitation following an acute stroke event that is spent on a stroke rehabilitation unit.
 5. Frequency, duration and intensity of therapies received from rehabilitation professionals while in an inpatient rehabilitation setting following stroke.
 6. Change in functional status measured with a standardized measurement tool, from time of admission to an inpatient rehabilitation unit for stroke patients to the time of discharge.

Measurement Notes

- Performance measure 1: The denominator should be the total number of stroke patients admitted to inpatient rehabilitation.
- Performance measure 2: Data should be correlated with stroke severity scores during analysis.
- Duration and intensity of services by rehabilitation professionals requires a chart review or consistent use of reliable workload measurement tools that are implemented locally or regionally.

Implementation Resources and Knowledge Transfer Tools

- **Canadian Stroke Best Practices Taking Action Towards Optimal Stroke Care Resource Kit**
- FIM® Instrument, AlphaFIM®
'http://www.va.gov/vdl/documents/Clinical/Func_Indep_Meas/fim_user_manual.pdf
- Modified Rankin Scale http://strokengine.ca/assess/module_mrs_family-en.html
- Evidence-Based Review of Stroke Rehabilitation (Triage Module):
www.ebsr.com/uploads/Module_4_triage_final.pdf
- The Certificate of Stroke Rehabilitation Program, University of Alberta Department Rehabilitation Medicine
<http://www.rehabilitation.ualberta.ca/ContinuingProfessionalEducation/CertificateinStrokeRehabilitation.aspx>
- Ryerson University Interprofessional Certificate in Advanced Neuroscience-Stroke Care
<http://ce-online.ryerson.ca/ce/default.aspx?id=2873>
- Table 5.1, summary of validated and frequently used screening and assessment tools for stroke rehabilitation

Summary of the Evidence

The benefits of stroke unit care are substantial. As compared to general rehabilitation units, coordinated and organized rehabilitation care in a stroke unit has been shown to reduce mortality and hospital length of stay and to increase functional independence and quality of life (Stroke Unit Trialists' Collaboration, 2009; Foley et al., 2007; Ottawa Panel, 2006). Within a stroke unit, care is provided by an experienced interprofessional stroke team (including physicians, nurses, physiotherapists, occupational therapists, speech therapists, etc.) dedicated to the management of stroke patients, often within a geographically defined space (Langhorne & Pollock, 2002). Stroke units also typically include staff members who have a specialist interest in stroke, participate in routine team meetings and continuing education/training, and involve caregivers in the rehabilitation process (Langhorne & Pollock, 2002).

The Stroke Unit Trialists' Collaboration identified 31 randomized and quasi-randomized trials (n=6,936) comparing stroke unit care with an alternative, less organized form of care (e.g., general medical ward)(Stroke Unit Trialists' Collaboration, 2009). At a median one-year follow-up, stroke unit

care was associated with a significant reduction in death (OR=0.82, 95% CI 0.73 to 0.92, $p=0.001$), death or institutionalization (OR=0.81, 95% CI 0.74 to 0.90, $p<0.001$), and death or dependency (OR=0.79, 95% CI 0.71 to 0.88, $p<0.001$), as compared to an alternative form of care. Moreover, stroke unit care was found to be beneficial regardless of sex, age, or stroke severity, with benefits maintained in follow-up studies 5-10 years post-stroke (Stroke Unit Trialists' Collaboration, 2009).

Seenan and colleagues identified 25 ($n=42,236$) observational studies to explore the benefits of stroke unit care in clinical practice (Seenan et al., 2007). As in pooled analyses of clinical trials, stroke unit care provided in clinical practice was found to be associated with a significant reduction in the odds of death (odds ratio=0.79, 95% CI=0.73 to 0.86; $p<0.001$) and of death or poor outcome (odds ratio=0.87, 95% CI=0.80 to 0.95; $p=0.002$; $I^2=45.5\%$) within one-year of stroke. Similar findings were reported for a secondary analysis limited to multi-centered trials (OR=0.82, 95% CI 0.77 to 0.87, $p<0.001$; $I^2=0\%$) (Seenan et al., 2007).

In another systematic review and meta-analysis, Foley and colleagues identified 14 trials comparing stroke unit care to conventional care (Foley et al., 1997). Included studies were categorized on the basis of the model of care provided (i.e., acute care, combined acute/rehabilitation, or rehabilitation). Based on the pooled results of 5 studies, post-acute rehabilitation stroke units were found to be associated with reduced odds of death (OR=0.60, 95% CI 0.44 to 0.81, $p<0.05$) and death or dependency (OR=0.63, 95% CI 0.48 to 0.83, $p<0.05$). Similar findings were reported with respect to combined acute/rehabilitation stroke units (death: OR=0.71, 95% CI 0.54 to 0.94; death/dependency: OR=0.50, 95% CI 0.39 to 0.65). Although Foley et al. reported that stroke rehabilitation units do not have a significant impact on length of stay (weighted mean difference=-13.2, 95% CI -48.3 to 21.9, $p>0.05$), there is evidence that patients with moderately severe strokes treated in stroke rehabilitation units are more likely to be discharged home (75% v. 52%, $p<0.01$) and are less likely to require institutionalization (22% vs. 44%, $p<0.001$) (Kalra et al. 1993).

[Link to Evidence Table 5.2 and Reference List](#)

For further information and references, please consult the Evidence Based Review of Stroke Rehabilitation at <http://www.ebrsr.com> and StrokEngine at www.StrokEngine.ca

Best Practice Recommendation 5.3 Delivery of Inpatient Stroke Rehabilitation

- i. All patients with stroke should receive rehabilitation therapy within an active and complex stimulating environment [Evidence Level C] as early as possible once they are determined to be rehabilitation ready and they are medically able to participate in active rehabilitation [Evidence Level A].
- ii. Patients should receive rehabilitation therapies of appropriate intensity and duration, individually designed to meet their needs for optimal recovery and tolerance levels [Evidence Level A].
- iii. Patients should receive a **minimum** of three hours of direct task-specific therapy, five days a week, delivered by the interprofessional stroke team [Evidence Level C].
- iv. The team should promote the practice and transfer of skills gained in therapy into the patient's daily routine [Evidence Level A].
- v. Patients should receive opportunities to repeat rehabilitation techniques learned in therapy and implement them while supervised by stroke rehabilitation nurses [Evidence Level C].
- vi. Therapy should include repetitive and intense use of novel tasks that challenge the patient to acquire the necessary skills needed to perform functional tasks and activities [Evidence Level A].
- vii. Stroke rehabilitation unit teams should conduct at least one formal interprofessional meeting per week, during which rehabilitation goals are set, problems are identified, progress is monitored, and support after discharge is planned [Evidence Level B].
- viii. The care plan should include a pre-discharge needs assessment to ensure a smooth transition from rehabilitation back to the community. Elements of discharge planning may include:
 - a. A home visit by a healthcare professional, ideally conducted before discharge, for patients where the stroke rehabilitation team and/or family have concerns regarding changes in functional and/or cognitive abilities that may affect patient safety [Evidence Level C].
 - b. Assessment of the safety of the patient's home environment and the need for equipment and home modification [Evidence Level C].
 - c. Caregiver education and training to assist the patient with activities of daily living and increasing the patient's level of independence [Evidence Level B].
 - d. Patients and families should be introduced to resources which will enable self-management and the ability to navigate through the health care system [Evidence Level B].

Rationale

In order to obtain maximum benefit from inpatient stroke rehabilitation, a number of essential elements are required. These elements include adequate intensity of therapy, task-oriented training, excellent team coordination and early discharge planning. Both animal and human research suggests that the earlier rehabilitation starts, the better the outcome. In fact, people who start rehabilitation later may never recover to the same extent as those who start early. Early, intensive rehabilitation care for patients in both the acute and subacute stage of stroke helps to improve arm and leg motor recovery, language and communication function, which in turn

improves mobility, independence in self-care and participation in leisure activities. It is important that the rehabilitation therapies be tailored to the tasks that need to be retrained and developed, as well as to the activities of patient's choice and to their social roles. The need for a highly-coordinated, specialized team, who meet regularly to discuss the rehabilitation goals and progress, is also vital. Early discharge planning, including a home assessment and caregiver training, support and education, is required to identify and remove potential barriers to discharge and facilitate efficient transition back to the community.

System Implications

- Timely access to specialized, interprofessional stroke rehabilitation services, regardless of geographic location of patients' home community.
- A critical mass of trained healthcare providers functioning as a coordinated interprofessional team during the rehabilitation period following stroke.
- Adequate clinician resources to provide the recommended intensity of individualized therapies for stroke patients. Current estimates suggest the ratio of patients to therapists should be no more than 6:1 in order to achieve these targets.
- Establishment of protocols and partnerships between inpatient rehabilitation and community care providers to ensure safe and efficient transitions between hospital and community. Particular considerations should be made for patients residing in more rural or remote locations.
- Particular considerations should be made for transmitting all information concerning the patient, including assessments, rehabilitation goals and results.
- All stroke rehabilitation services should be accessible for patients who have communication limitations such as aphasia.
- Optimization of strategies to prevent the recurrence of stroke through health promotion and education.
- Stroke rehabilitation support initiatives for caregivers.
- Process for patients and caregivers to re-access the rehabilitation system as required.
- All rehabilitation hospital services should have mechanisms established to contribute to the CIHI National Rehabilitation Reporting System

Performance Measures

1. Median length of time from stroke admission to an acute care hospital to assessment of rehabilitation potential by a rehabilitation healthcare professional.
2. Median length of time from stroke onset to stroke rehabilitation referral, and referral to and admission to stroke inpatient rehabilitation.
3. Number or percentage of patients admitted to a stroke unit — either a combined acute care and rehabilitation unit or a rehabilitation stroke unit in an inpatient rehabilitation facility — at any time during their hospital stay (acute and/or rehabilitation) (core).
4. Final discharge disposition for stroke patients following inpatient rehabilitation: percentage discharged to their original place of residence, percentage discharged to a long-term care facility or nursing home, percentage discharged to supportive housing or assisted living (core).
5. Percentage of patients requiring readmission to an acute care hospital for stroke-related causes (core).
6. Median length of time spent on a stroke rehabilitation unit during inpatient rehabilitation.
7. Average number of days sent in active rehabilitation (i.e., length of stay less days unable to

participate due to service interruptions, such as illness or short-term readmission to acute care).

8. Median number of days spent waiting for transfer to an inpatient rehabilitation setting (i.e. from the time a patient is ready for rehabilitation to the time of admission to inpatient rehabilitation).
9. Change (improvement) in functional status scores using a standardized assessment tool from admission to an inpatient rehabilitation program to discharge (e.g., FIM® Instrument, AlphaFIM®, Modified Rankin Scale).
10. Total number of days spent in inpatient rehabilitation, by stroke type.
11. Number of patients screened for cognitive impairment using valid screening tool during inpatient rehabilitation.
12. Number of patients screened for depression using valid screening tool during inpatient rehabilitation.
13. Time from stroke onset to mobilization: sitting, standing upright, and walking with or without assistance.
14. Time from stroke onset to independence in feeding, dressing, grooming, toileting and bathing and other self-care.
15. Median number of days spent in alternate level of care or inpatient rehabilitation while waiting for return to home or placement in a residential or long-term care setting.

Measurement notes

- ♦ Some acute care hospitals provide combined acute and rehabilitation stroke units, where patients progress to “rehabilitation ready” and may not actually move or change locations. This information could be found in patient records through primary chart audit.
- ♦ Many performance measures require primary chart audit of inpatient rehabilitation records. Quality of documentation (good or poor) by rehabilitation staff will impact validity of these measures.
- ♦ The Canadian Institute for Health Information has a database known as the National Rehabilitation Reporting System. This database includes data on inpatient rehabilitation encounters to designated rehabilitation beds. It is mandated in some provinces to submit data to the National Rehabilitation Reporting System; in other provinces, it is optional. The National Rehabilitation Reporting System (NRS) has information on an estimated 80% of all inpatient rehabilitation encounters in Canada and can distinguish stroke cases from other rehabilitation patients by diagnosis.
- ♦ Duration or intensity of services by rehabilitation professionals requires a chart review or consistent use of reliable workload measurement tools implemented locally or regionally.
- ♦ For performance measure 2, efforts should be made to collect information on reasons for delay, if any, in admission to inpatient rehabilitation from acute care. These may include such issues as bed availability, patient health status and other aspects of the referral and transfer process. This information may provide direction on areas to target quality improvement initiatives.
- ♦ Workload measurement systems (such as GRASP) are a key source of data and information on intensity and frequency of services, but these are not consistently or widely implemented in Canada. Use of such systems should be encouraged in addition to the NRS.
- ♦ Performance measures 8 and 9 can be combined to calculate a FIM efficiency value: Change in FIM® score from admission to discharge/total days in stroke rehabilitation.

Implementation Resources and Knowledge Transfer Tools

- **Canadian Stroke Best Practices *Taking Action Towards Optimal Stroke Care Resource Kit***
- FIM® Instrument, AlphaFIM®
http://www.va.gov/vdl/documents/Clinical/Func_Indep_Meas/fim_user_manual.pdf
- Modified Rankin Scale http://strokengine.ca/assess/module_mrs_family-en.html
- Evidence-Based Review of Stroke Rehabilitation (Triage Module):
www.ebrsr.com/uploads/Module_4_triage_final.pdf
- The Certificate of Stroke Rehabilitation Program, University of Alberta Department Rehabilitation Medicine
<http://www.rehabilitation.ualberta.ca/ContinuingProfessionalEducation/CertificateinStrokeRehabilitation.aspx>
- Ryerson University Interprofessional Certificate in Advanced Neuroscience-Stroke Care
<http://ce-online.ryerson.ca/ce/default.aspx?id=2873>
- Table 5.1, summary of validated and frequently used screening and assessment tools for stroke rehabilitation

Summary of the Evidence:

The timeliness and intensity of inpatient rehabilitation interventions as well as the environment in which they are provided have been found to be significant predictors of patient outcomes post stroke. In particular, the establishment of stroke units as the optimal organization of care for patients in the acute and rehabilitation phases post stroke has garnered evidence for the importance of these factors in delivery of inpatient rehabilitation. A Cochrane review published in 2009 with 31 included trials and 6936 participants found decreased odds of death at 1 year, 5 year and 10 year follow-up for patients receiving care from an organized stroke unit compared to care received on a conventional ward (Stroke Unit Trialists' Collaboration, 2009). The specifics of a stroke unit vary between sites, but are typified by a multidisciplinary team of stroke specialists that offer comprehensive and intensive services to patients, often with the involvement of the caregiver. Organized and comprehensive inpatient stroke rehabilitation services were also found to be beneficial in an observational study by Woo and colleagues (Woo et al., 2008), who compared the functional outcomes at discharge for patients receiving care from one of three inpatient rehabilitation facilities. The authors found that the patients who received care from the facility that offered multidisciplinary services (including weekly team meetings between care providers) and discharge planning/support had greater functional improvements per day over the course of their care compared to patients receiving care from the other two facilities ($P < 0.0001$) (Woo et al., 2008).

Time from stroke onset to commencement of therapeutic interventions has also been found to influence patient outcomes. The AVERT (A Very Early Rehabilitation Trial) trial (Bernhardt, Dewey, Thrift, Collier, & Donnan, 2008), for example, assesses the impact of an early mobilization intervention (within 24 hours) for patients following stroke. This trial, along with the VERITAS (Very Early Rehabilitation or Intensive Telemetry After Stroke) trial, were included in a meta-analysis by Craig and colleagues (Craig et al., 2010). Both studies followed similar trial protocols in terms of the nature of the intervention, but varied in the length of the intervention; the AVERT trial lasted 14 days while the VERITAS trial lasted 7 days. The meta-analysis found that early mobilization, consisting of patients walking within 24 hours after stroke, resulted in greater odds of being independent at three months (OR 3.11; 95% CI: 1.03-9.33). In addition to the evidence in support of early mobilization, timely admission to inpatient rehabilitation was also found to be a significant predictor of functional outcomes for patients post stroke (Wang et al., 2011). Patients with both moderate and severe stroke severity were found to benefit from early admission to inpatient rehabilitation with respect to total Functional Independence Measure (FIM) gain and motor FIM gain ($P < 0.0001$). Patients with severe strokes, but not moderately severe, experienced improvements in cognition FIM scores ($P < 0.0001$) (Wang et al., 2011). Similar results were found by Horn and colleagues who assessed the association between time from stroke onset to inpatient rehabilitation admission and changes in FIM score (Horn et al., 2005). Patients who were admitted to inpatient rehabilitation earlier experienced significant increases in total discharge FIM score ($P < 0.0001$) and discharge motor FIM score

($P=0.002$) (Horn et al., 2005).

Adequate intensity is another important element of successful inpatient rehabilitation interventions. An early review of the effects of intensive rehabilitation interventions on patient outcomes was completed by Kwakkel and colleagues in 1997 (Kwakkel et al., 1997). This review found positive effects, albeit small effects, of increased rehabilitation frequency on patient outcomes. Several studies since then have found a similar positive relationship between therapy intensity and patient outcomes (Wang et al., 2013; Horn et al., 2005; Foley et al., 2012); two retrospective cohort studies (Wang et al., 2013; Foley et al., 2012) and one prospective cohort study (Horn et al., 2005). Wang and colleagues assessed a cohort of 360 patients with stroke who were discharged from an inpatient rehabilitation facility and found that more than 3 hours of total combined therapy time from a physiotherapist (PT), occupational therapist (OT) and speech language pathologist (SLP) was associated with improved functional outcomes when compared to patients receiving less than 3 hours of therapy (Wang et al., 2013). When therapy time was assessed separately for each type of specialist, there was variability in the type of FIM gain (i.e. activities of daily living (ADL), motor, cognitive or total) (Wang et al., 2013). Foley et al (2012) found that total ($P<0.0001$) and average daily PT ($P=0.005$) and OT ($P<0.0001$) therapy time was significantly correlated with total FIM gain (Foley et al., 2012). However, in the multivariate model, only total OT time and total FIM at admission were significant predictors of total FIM gain (Foley et al., 2012). The prospective study, a larger cohort consisting of 830 patients, found that more intensive therapy (based on number of minutes) and more intensive therapy in the early stages (first therapy session) was associated with greater discharge FIM scores. These findings applied to patients with both moderate and severe strokes (Horn et al., 2005).

A narrative review by Cifu and Stewart (1999) summarizes the importance of timing, organization and intensity of rehabilitation interventions after stroke, as well the importance of type of rehabilitation provided (Cifu & Stewart, 1999). Their review of 8 studies related to type of rehabilitation suggested that there is some evidence, although weak, for task specific therapy compared to general therapy in improving functional outcomes post stroke. A more recent systematic review by Legg and colleagues (2007) compiled literature assessing the effect of personal activities of daily living focused interventions for improvement in patient functioning (Legg et al., 2007). Findings from this study indicated that task focused therapy was effective in increasing patient independence (SMD 0.18; 95% CI 0.04 to 0.32; $P=0.01$); studies assessing task specific interventions in the inpatient setting ($n=4$) were excluded from this review (Legg et al., 2007). Evidence for task specific interventions in the inpatient rehabilitation setting are more limited, however, a pre-post study was conducted for a group based dressing retraining program in this setting by Christie and colleagues (Christie et al., 2011). From a sample of 119 patients admitted to an inpatient rehabilitation facility there were significant increases in upper and lower body dressing FIM scores from admission to discharge ($P=0.0001$). Although not based in an inpatient setting, the Locomotor Experience Applied Post Stroke (LEAPS) trial is another study assessing the impact of task specific therapy on patient outcomes (Nadeau et al., 2013). Task specific and impairment based walking interventions were compared to usual care provided by a physiotherapist. Compared to the usual care group, patients in the two intervention groups experienced gains in walking speed, walking frequency, stroke impact scale (SIS) participation, SIS mobility, SIS ADLs/Instrumental ADLs, Fugl-Meyer score and confidence in balance (Nadeau et al., 2013).

Patients and caregivers often struggle and feel overwhelmed with the transition home after inpatient rehabilitation (Gustafsson & Bootle, 2012). A recent Cochrane review including 24 studies aimed to assess the impact of discharge planning interventions on the use of acute care services, patient and carer outcomes, and health care costs during transition in recovery (Shepperd et al., 2013). Due to the heterogeneity between studies, not all studies were included in individual meta-analyses for each outcome. A reduced length of stay in hospital (MD -0.91; 95% CI -1.55 to -0.27), and a decreased risk of readmission to hospital (RR 0.82; 95% CI 0.73 to 0.92) was found for patients in the discharge planning group compared to control group in a subset of 10 and 12 trials respectively (Shepperd et al., 2013). A detailed review of the challenges that exist at the transition point between hospital and community offers further research on this topic, highlighting the importance of continuity of care, patient self-management, communication between care provider and patient, and ensuring appropriate up to date communication of a patient's medication regimen (Kripalani, Jackson, Schnipper, & Coleman, 2007). Recommended approaches to addressing these challenges include a pre-discharge planning meeting with the care team, patient and caregiver, the coordination of home visits, and implementing strategies to ensure patient educational resources and support are in place (Kripalani et al., 2007).

[Link to Evidence Table 5.3 and Reference List](#)

For further information and references, please consult the Evidence Based Review of Stroke Rehabilitation at <http://www.ebrsr.com>; and StrokEngine at www.StrokEngine.ca

Best Practice Recommendation 5.4 Outpatient and Community-Based Stroke Rehabilitation (including Early Supported Discharge)

5.4.1 Outpatient & Community-Based Rehabilitation

- i. Stroke survivors with ongoing rehabilitation goals should continue to have access to specialized stroke services after leaving hospital [Evidence Level A]. This should include a blend of in-home community-based rehabilitation services (like “Early Supported Discharge” teams) and facility-based outpatient services.
- ii. Outpatient and/or community based rehabilitation services should be available and provided by a specialized interprofessional team, when needed by patients, within 48 hours of discharge from an acute hospital or within 72 hours of discharge from inpatient rehabilitation [Evidence Level C].
 - a. All team members should be trained and capable of interacting with people with communication limitations such as aphasia, by using supported conversation techniques [Evidence Level C].
- iii. Outpatient and/or community-based services should be delivered in the most suitable setting based on patient functional rehabilitation needs and participation-related goals, which may include in the home or other community settings [Evidence Level C].
- iv. Outpatient and/or community- based rehabilitation services should include the same elements as coordinated inpatient rehabilitation services:
 - a. An interprofessional stroke rehabilitation team [Evidence Level B].
 - b. A case coordination approach including regular team communication to discuss assessment of new clients, review client management, goals, and plans for discharge or transition [Evidence Level B].
 - c. Therapy should be provided for a minimum of 45 minutes per day up to 3 hours per day, 3 to 5 days per week 3 hours per day 3 to 5 days per week, based on individual patient needs and goals [Evidence Level B].
 - d. Patients and families should be involved in their management, goal setting, and transition planning [Evidence Level A].
- v. At any point in their recovery, stroke survivors who have experienced a change in functional status and who would benefit from additional rehabilitation services should be offered a further trial of outpatient rehabilitation [Evidence Level B].

5.4.2 Early Supported Discharge (ESD)

- i. Early supported discharge services are an acceptable form of rehabilitation for a select group of patients when available and provided by a well-resourced, coordinated specialized interprofessional team [Evidence Level A].
- ii. ESD services must be provided within 48 hours of discharge from an acute hospital or within 72 hours of discharge from inpatient rehabilitation [Evidence Level C].
- iii. Criteria for ESD candidacy include:
 - a. Mild to moderate disability
 - b. Ability to participate in rehabilitation from the point of discharge
 - c. Medically stable, availability of appropriate nursing care, necessary resources and support services (e.g., family, carers, and home care services)

- iv. Services should be provided five days per week at the same level of intensity as they would have received in the inpatient setting to meet patient needs [Evidence Level B].

Rationale

Some patients with mild impairments can be safely transferred back to their homes to **complete** their rehabilitation and achieve outcomes that are as good as or better than those that would have been attained had they remained in hospital. This form of service provision, known as early-supported discharge (ESD) may be desirable where resources exist and may have the added benefit of being less costly.

Many patients who have completed a course of inpatient rehabilitation will still require ongoing therapy provided in the community to achieve their desired goals once discharged from hospital. Community-based rehabilitation may be defined as care received once the patient has passed the acute stage and has transitioned back to their home and community environment. In smaller communities and rural and remote settings, access to outpatient and/or community rehabilitation presents a significant challenge.

The evidence suggests that community reintegration takes up to one year post-stroke and individuals make the most gains within the first 6 months post-stroke.

System Implications

There is a marked lack of outpatient and community-based rehabilitation resources available. Therefore, the health system should aim to provide the following:

- **Timely access to stroke rehabilitation services in the community following discharge.**
- Organized and accessible stroke care in communities.
- Increased number of skilled clinicians who have experience practicing in outpatient and community rehabilitation.
- Optimization of strategies to prevent the recurrence of stroke, including regular screening for stroke risk factors and use of standardized screening tools.
- Stroke rehabilitation support for caregivers.
- Long-term rehabilitation services widely available in nursing and continuing care facilities, and in outpatient and community programs, including in-home visits.
- Increased use of telemedicine technologies to broaden access to outpatient rehabilitation services.
- Mechanisms should be in place for prospective data collection for evaluation and monitoring. All programs should have these in place or be developing them.

Performance Measures

1. **Percentage of stroke patients discharged to the community who receive a referral for ongoing rehabilitation before discharge from hospital (acute and/or inpatient rehabilitation) (core).**
2. Median length of time between referral for outpatient rehabilitation to admission to a community rehabilitation program.
3. Frequency and duration of services provided by rehabilitation professionals in the community.
4. Magnitude of change in functional status scores, using a standardized measurement tool, for stroke survivors engaged in community rehabilitation programs.
5. Length of time between referral for ongoing outpatient/community rehabilitation to commencement of therapy.

6. Percentage of persons with a diagnosis of stroke who receive outpatient or community-based therapy following completion of a hospital admission to hospital for an acute stroke event.
7. Percentage of persons receiving ambulatory rehabilitation assessment, follow-up and treatment in all districts/sections/communities served by the stroke rehabilitation service/program. (This would include telehealth, clinic, in-home).
8. Number of stroke patients assessed by physiotherapy, occupational therapy, speech-language pathologists and social workers in the community.
9. Use of health services related to stroke care provided in the community for stroke rehabilitation, including timing and dose of services.

Measurement notes

- Many performance measures require targeted data collection through audits of rehabilitation records and community program records. Documentation quality may create concerns about data availability and data quality.
- For performance measure 3, information regarding frequency and duration of services by rehabilitation professionals requires a chart review or consistent use of reliable workload measurement tools that are implemented locally or regionally. This data should include the total number of visits or therapy sessions by discipline that the patient receives over a defined time frame (such as first 6 weeks post stroke) and the median length of each session.
- Data availability regarding community programs varies considerably across programs, regions and provinces. Efforts should be made to introduce standard audit tools for collection of these data.
- FIM® Instrument data is available in the National Rehabilitation Reporting System (NRS) database at the Canadian Institute of Health Information (CIHI) for participating organizations.

Implementation Resources and Knowledge Transfer Tools

- **Canadian Stroke Best Practices *Taking Action Towards Optimal Stroke Care Resource Kit***
- www.ebrsr.com/uploads/Module_7_outpatients.pdf
- Table 5.1, summary of validated and frequently used screening and assessment tools for stroke rehabilitation
- FIM® Instrument, AlphaFIM®
<http://www.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx?ID=889>
- Chedoke-McMaster Stroke Assessment Scale
http://strokengine.ca/assess/module_cmmsa_intro-en.html
- Reintegration to Normal Living Index http://strokengine.ca/assess/module_rnli_family-en.html
- Leisure section of the Assessment of Life Habits (LIFE-H)
http://strokengine.ca/assess/module_lifeh_family-en.html
- Stroke Impact Scale http://strokengine.ca/assess/module_sis_family-en.html
- Post-Stroke Checklist <http://www.strokebestpractices.ca/wp-content/uploads/2013/03/PSC-Canadian-Version-English-WSO-Livery-03-19-13.pdf>
- Table 7.1, Screening and Assessment Tools for Post-Stroke Depression
- Falls Risk Assessment Tools
[http://www.google.ca/url?sa=t&rct=j&q=tools%20to%20assess%20patient%20falls%20risk&source=web&cd=5&ved=0CFgQFjAE&url=http%3A%2F%2Fwww.albertahealthservices.ca%](http://www.google.ca/url?sa=t&rct=j&q=tools%20to%20assess%20patient%20falls%20risk&source=web&cd=5&ved=0CFgQFjAE&url=http%3A%2F%2Fwww.albertahealthservices.ca%2F)

[2Fps-1051701-fpp-schmid-risk-ass-tool.pdf&ei=xnzNUZvODYbtygGPhICQBA&usg=AFQjCNEyPbrfsN3hWMP0RAZSfa_OYfBeTg&bvm=bv.48572450,d.aWc](http://www.google.ca/url?sa=t&rct=j&q=tools%20to%20assess%20patient%20falls%20risk&source=web&cd=1&ved=0CEYQFjAA&url=http%3A%2F%2Fwww.health.vic.gov.au%2Fagedcare%2Fmaintaining%2Ffalls_dev%2Fdownloads%2Fb2b_1a_frat.pdf&ei=xnzNUZvODYbtygGPhICQBA&usg=AFQjCNG551Ki6hRPEcDEIKNRJpJz2I_DrA&bvm=bv.48572450,d.aWc)

http://www.google.ca/url?sa=t&rct=j&q=tools%20to%20assess%20patient%20falls%20risk&source=web&cd=1&ved=0CEYQFjAA&url=http%3A%2F%2Fwww.health.vic.gov.au%2Fagedcare%2Fmaintaining%2Ffalls_dev%2Fdownloads%2Fb2b_1a_frat.pdf&ei=xnzNUZvODYbtygGPhICQBA&usg=AFQjCNG551Ki6hRPEcDEIKNRJpJz2I_DrA&bvm=bv.48572450,d.aWc

Summary of the Evidence

Outpatient therapy is often prescribed following discharge from acute in-patient care, in-patient stroke rehabilitation units and/or may be required several months or years later for survivors with ongoing rehabilitation goals. Continuing therapy may include hospital-based “day” hospital programs, community-based programs, or home-based rehabilitation, depending on resource availability and patient considerations.

The Outpatient Service Trialists (2002) identified 14 studies that randomized stroke patients who were living at home prior to stroke and who were within 1 year of stroke onset, to receive specialized outpatient therapy-based interventions or usual care (often no additional treatment). Service interventions examined included those that were outpatient based (home-based n=2, day hospital or outpatient clinic n=12). In these trials, provision of services included physiotherapy, occupational therapy services or interprofessional staff working with patients primarily to improve task-oriented behaviour and hence increase activity and participation. Outpatient therapy was associated with a reduced odds of a poor outcome (OR= 0.72 95% CI 0.57–0.92; p = 0.009) and increased personal activity of daily living scores (SMD=0.14, 95% CI 0.02–0.25; p = 0.02). For every 100 stroke patients resident in the community receiving therapy-based rehabilitation services, 7 (95% CI 2–11) patients would be spared a poor outcome, assuming 37.5% would have had a poor outcome with no treatment. The authors concluded that therapy-based rehabilitation services targeted toward stroke patients living at home appear to improve independence in personal activities of daily living.

In studies that provided additional occupational therapy (OT) as a sole therapy to patients within 6 months of stroke who were living at home, the results from studies are mixed. Sackley et al. (2006) randomized 118 patients with moderate to severe stroke (Barthel Index [BI] scores of 4-15) who had been admitted to 12 nursing homes to receive a 3 month occupational therapy (OT) program that was client-centred and targeted towards independence in ADL or to receive no OT. At 6 months, although there were no significant differences between groups in terms of improvement in BI or Rivermead Mobility Index scores, significantly fewer patients in the OT group had a poor global outcome, (51% vs. 76%, p=0.03) defined as deterioration of BI scores or death. In a trial that randomized 138 patients who planned to return home following discharge from hospital, to receive either 6 weeks of domiciliary OT or to receive routine post-stroke follow-up care, there were significantly improved outcomes for approximately half of the outcomes assessed. There were no significant differences at 6 months between groups for Nottingham EADL scores (primary outcome), BI or London Handicap scores. There were significant differences favouring the OT group for selected components of Canadian Occupational Performance Measure (COPM) and Dartmouth COOP Charts (Gilbertson et al. 2000, Gilbertson & Langhorne 2000). When 185 patients who had sustained a stroke within the previous 6 months and had not have been admitted to hospital received outpatient OT for up to five months, there were significantly greater improvements in Nottingham EADL scores at 6 months and one year, compared with patients in the control group who received usual care.

There is some evidence that patients who receive outpatient rehabilitation in their homes may have better short-term outcomes compared with those who received services in a day hospital or clinic setting. A systematic review and meta-analysis (Hillier & Inglis-Jassiem 2010) included the results from 11 RCTs that included patients who were discharged from inpatient rehabilitation to home following a stroke and who had been living in the community prior to the event. Home-based therapy was associated with a 1-point mean difference in BI gain at 6 -8 weeks following the intervention and a 4-point difference at 3-6 months. By 6 months following treatment, there were no longer significant differences between groups. The majority of the trials that have examined the comparison between home or community-based and hospital-based

rehabilitation programs have failed to identify the superiority of one service provision model over the other. The interventions most commonly assessed were physiotherapy and/or occupational therapy and the outcomes usually included scales of ADL or extended ADL performance, gait speed and/or quality of life (Young & Forester, 1992, Gladman et al. 2003, 2004, Lincoln et al. 2004, Bjorkdahl et al. 2006). In a trial evaluating the benefit of hospital vs. community-based physiotherapy for patients whose rehabilitation goals included independent ambulation, while patients in both groups had improved after a 7-week program, there were no differences between groups in gait speed or performance on the 6MWT (Lord et al. 2009).

Early Supported Discharge

Early-supported discharge (ESD) is a form of rehabilitation designed to accelerate the transition from hospital to home through the provision of rehabilitation therapies delivered by an interprofessional team, in the community. It is intended as an alternative to a complete course of inpatient rehabilitation and is most suitable for patients recovering from mild to moderate stroke. An argument in favour of ESD programs is that, since the goal of rehabilitation is to establish skills that are appropriate to the home setting, the home provides the optimal rehabilitation environment. Key components of ESD that have been reported as contributing to favorable outcomes include: in-hospital and discharge planning; a case manager or 'key worker' based in the stroke unit who constituted the link between the stroke unit and the outpatient care, guaranteeing continuity in both time and personnel, and enabling the smooth transition from the hospital to the home.

Patients who are recovering from mild strokes and are recipients of ESD programs have been shown to achieve similar outcomes compared with patients who receive a course of inpatient rehabilitation. The effectiveness of early supported discharge (ESD) programs following acute stroke has been evaluated most comprehensively by the Early Supported Discharge Trialists. In the most updated version of the review (Fearon et al. 2012), the results from 14 RCTs were included. The majority of the trials evaluated ESD using a multidisciplinary team which, coordinated discharge from hospital, and provided rehabilitation and patient care at home. ESD was associated with a reduction in the odds of death or the need for institutional care (OR=0.78, 95% CI 0.61 to 1.00, p=0.049), death or dependency, (OR=0.82, 95% CI 0.67 to 0.97, p=0.021) improvement in performance of extended ADL (SMD=0.14, 95% CI 0.02 to 0.26, p=0.024) and satisfaction with services (OR=1.6, 95% CI 1.08 to 2.38, p=0.019). The ESD groups showed significant reductions ($P < 0.0001$) in the length of hospital stay equivalent to approximately eight days. There were no significant differences between groups on the outcomes associated with patients' carers (subjective health status, mood or satisfaction with services).

Langhorne et al. (2005) reported additional patient level analysis from their original Cochrane review, which examined the effects of patient characteristics and differing levels of service provision (more coordinated v. less organized) on the outcome of death and dependency. The levels of service provision evaluated were: (1) early supported discharge team with coordination and delivery, whereby an interprofessional team coordinated discharge from hospital and post discharge care and provided rehabilitation therapies in the home; (2) early supported discharge team coordination, whereby discharge and immediate post-discharge plans were coordinated by an interprofessional care team, but rehabilitation therapies were provided by community-based agencies; and (3) no early supported discharge team coordination, whereby therapies were provided by uncoordinated community services or by healthcare volunteers. There was a reduction in the odds of a poor outcome for patients with a moderate initial stroke severity (BI 10-20), (OR= 0.73; 0.57-0.93), but not among patients with severe disability (BI< 9) and also among patients who received care from a coordinated multidisciplinary ESD team (0.70; 0.56- 0.88) compared to those without an ESD team. Based on the results of this study, it would appear that a select group of patients, with mild to moderately disabling stroke, receiving more coordinated ESD could achieve better outcomes compared to organized inpatient care on a stroke unit.

[Link to Evidence Table 5.4 and Reference List](#)

For further information and references, please consult the Evidence Based Review of Stroke Rehabilitation at <http://www.ebrsr.com>; and StrokEngine at www.StrokEngine.ca

CANADIAN BEST PRACTICE RECOMMENDATIONS FOR STROKE CARE

Part Two: Providing Stroke Rehabilitation to Address Physical, Functional, Cognitive and Emotional Issues to Maximize Participation in Usual Life Roles

Best Practice Recommendation 5.5.1

Management of the Arm and Hand following Stroke

Definition: For the purposes of these recommendations 'early' has been defined as patients who are less than 6 months post stroke, and 'late' is defined as more than 6 months from index stroke event.

General Principles

- i. Patients should engage in training that is meaningful, engaging, progressively adapted, task-specific and goal-oriented in an effort to enhance motor control and restore sensorimotor function [Evidence Level: Early-Level A; Late-Level A].
- ii. Training should encourage the use of patients' involved affected limb during functional tasks and be designed to simulate partial or whole skills required in activities of daily living (e.g. folding, buttoning, pouring, and lifting) [Evidence Level: Early-Level A; Late-Level A].

Specific Therapies

- i. Therapists should provide supplementary training programs aimed at increasing the active movement and functional use of the affected arm between therapy sessions, e.g. Graded Repetitive Arm Supplementary Program (GRASP) suitable for use during hospitalization and at home [Early - Evidence Level A; Late - Evidence level C].
- ii. The Grasp Program should include:
 - a. strengthening exercises for the arm and hand (using small wrist weight, putty, hand gripper), range of motion exercises (stretching, active exercises), and exercises that improve gross and fine motor skills (e.g., blocks, Lego™, pegs) [Early - Evidence Level A; Late - Evidence level C];
 - b. the GRASP protocol suggests that the program be delivered for one hour per day, six days per week [Evidence Level: Early-Level A; Late-Level C];
 - c. appropriate patients, based on the GRASP protocol, may include those with some arm function (i.e., Chedoke-McMaster; or the Fugl-Meyer Upper Limb Motor Impairment Scale score between 10 and 57) and with active scapular elevation (shoulder shrug) and palpable wrist extension [Early - Evidence Level A; Late - Evidence level C].
- iii. Following assessment to determine if a patient is a suitable candidate, patients should be encouraged to engage in mental imagery to enhance upper-limb, sensorimotor recovery [Evidence Level: Early-Level A; Late-Level B].
- iv. Functional Electrical Stimulation (FES) targeted at the wrist and forearm muscles should be used to reduce motor impairment and improve function [Evidence Level: Early-Level A; Late-Level A].
- v. Traditional or modified constraint-induced movement therapy (CIMT) should be used for a select group of patients who demonstrate at least 20 degrees of active wrist extension and

10 degrees of active finger extension, with minimal sensory or cognitive deficits.

- a. Traditional CIMT refers to a two-week training regimen consisting of six hours of intensive upper-extremity training coupled with restraint of the unaffected arm for at least 90 percent of waking hours [Evidence Level: Between 3 and 6 months-Level A; Late-Level A].
 - b. Traditional CIMT, where therapy is provided for more than 2 hours/day, should not be used within the first month following stroke [Evidence Level A].
 - c. Modified CIMT most often refers to a less intense program which varies in terms of time of constraint, intensity of associated therapy, and duration of intervention (weeks). M-CIMT may be initiated in the first month following stroke in appropriate patients [Evidence Level: Early-Level A; Late-Level A].
- vi. Mirror therapy may be appropriate for select patients to improve ADLs, reduce pain, and improve visual spatial neglect [Evidence Level A].
 - vii. Sensory stimulation (e.g., TENS, acupuncture, muscle stimulation, biofeedback) for the upper extremity may be offered to select patients to improve sensory motor function [Evidence Level A].
 - viii. For patients with a flaccid arm (i.e., Chedoke-McMaster Stroke Assessment <3) electrical stimulation should be considered [Evidence Levels: Early- Level B; Late- Level B].
 - ix. Where available, virtual reality techniques, using both immersive techniques (such as virtual reality) and non-immersive techniques (such as video games), can be used as an adjunct to other rehabilitation therapies as a means to provide additional opportunities for repetition, intensity and task-oriented training [Evidence Level B].
 - x. Range of movement exercises should be provided that includes placement of the upper limb in a variety of appropriate and safe positions within the patient's visual field [Evidence Level: Early-Level C; Late-Level C]. *Refer to Recommendation 5.5.3 for additional information.*

Adaptive Devices

- i. Adaptive devices (cutting boards, utensils) designed to improve safety and function should be used if other methods of performing specific functional tasks are not available or tasks cannot be learned [Evidence Level C].
- ii. The need for special equipment (e.g., wheelchairs, safety devices) should be evaluated on an individual basis. Once provided, patients should be reassessed, as appropriate, to determine if changes are required or equipment can be discontinued with the aim of achieving normal unassisted function [Evidence Level C].
- iii. Functional dynamic orthoses are an emerging therapy tool that may be offered to patients to facilitate repetitive task-specific training [Evidence Level C].

Rationale:

Arm and hand function is frequently reduced following stroke, limiting stroke survivors' ability to perform activities of daily living. Unfortunately, a large number of stroke survivors with initial arm weakness do not regain normal function; however, many therapeutic techniques have been developed for those individuals who have minimal arm movement.

System Implications

- To achieve timely and appropriate assessment and management of arm and hand function the organization requires:
- Initial standardized arm and hand function assessment performed by clinicians experienced in the field of stroke.
- Timely access to specialized, interprofessional stroke rehabilitation services where therapies of appropriate type and intensity are provided.
- Access to appropriate equipment.
- Long-term rehabilitation services widely available in nursing and continuing care facilities, and in outpatient and community programs.
- Robotics are an emerging and developing area and stroke rehabilitation programs should begin to build capacity to integrate robotic technology into stroke rehabilitation therapy to appropriate patients as the research evidence suggests, and in the future incorporate this therapy as part of comprehensive therapy where available.

Performance Measures

1. **Extent of change (improvement) in functional status scores using a standardized assessment tool (e.g., ARAT or WMFT) from admission to an inpatient or community-based rehabilitation program to discharge.**
2. **Extent of change in arm and hand functional status scores using a standardized assessment tool from admission to an inpatient or community-based rehabilitation program to discharge.**
3. Median length of time from stroke admission in an acute care hospital to assessment of rehabilitation potential by a rehabilitation healthcare professional.
4. Median length of time spent on a stroke unit during inpatient rehabilitation
5. Average hours per day of direct task-specific therapy provided by the interprofessional stroke team (target is minimum of three hours).
6. Average days per week of direct task specific therapy provided by the interprofessional stroke team (target is a minimum of five days).

Measurement Notes

- A data entry process will need to be established to capture the information from the outcome tools such as the Chedoke-McMaster Stroke Assessment
- FIM® Instrument data is available in the National Rehabilitation Reporting System (NRS) database at the Canadian Institute of Health Information (CIHI) for participating organizations.
- For Performance Measure 5, the direct therapy time is considered 1:1 time between therapist and patient and does not include group sessions or time spent on documentation.

Implementation Resources and Knowledge Transfer Tools

- Table 5.1, summary of validated and frequently used screening and assessment tools for stroke rehabilitation
- FIM® Instrument <http://www.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx?ID=889>
- Chedoke-McMaster Stroke Assessment http://strokengine.ca/assess/module_cmmsa_intro-en.html
- Chedoke-McMaster Arm and Hand Activity Inventory http://strokengine.ca/assess/module_cahai_intro-en.html
- Chedoke-McMaster Spasticity sub-scale <http://www.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx?ID=918&Source=http%3A%2F%2Fw>

www.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx?ID=908&Source=http%3A%2F%2Fwww.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx%3FView%3D%257b0C859D90%252d7478%252d4C9B%252d9575%252d784C4A9A2D85%257d%26PageView%3DShared

- o Modified Ashworth Scale http://strokengine.ca/assess/module_mashs_intro-en.html
- o Box and Block Test http://strokengine.ca/assess/module_bbt_intro-en.html
- o Nine Hole Peg Test http://strokengine.ca/assess/module_nhpt_intro-en.html
- o Fugl-Myer Assessment of Sensory-Motor Recovery
<http://www.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx?ID=908&Source=http%3A%2F%2Fwww.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx%3FView%3D%257b0C859D90%252d7478%252d4C9B%252d9575%252d784C4A9A2D85%257d%26PageView%3DShared>
- o Evidence-based review of modified CIMT (Page et al. 2013)
<http://www.ncbi.nlm.nih.gov/pubmed/23396369>
- o Action Research Arm Test, http://www.aratest.eu/Index_english.htm
- o Wolf Motor Function Test , http://strokengine.ca/assess/module_wmft_family-en.html

Summary of the Evidence

Update June 2013

There are many therapeutic approaches and treatment modalities that can be used to improve hand and upper-limb function following stroke.

Task-oriented training involves practicing real-life tasks (such as answering a telephone), with the intention of acquiring or reacquiring a skill (defined by consistency, flexibility and efficiency). The tasks should be challenging and progressively adapted and should involve active participation. This approach differs from repetitive training, whereby a task is usually divided into component parts and then reassembled into an overall task once each component is learned. Repetitive training is usually considered a bottom-up approach, and is missing the end-goal of acquiring a skill. In a systematic review of motor recovery following stroke, Langhorne et al. (2009) identified 8 randomized controlled trials (RCTs) of repetitive task training, specific to the upper-limb, from a Cochrane review including trials of both upper and lower-limb therapy (French et al. 2007). In these trials, treatment duration varied widely from a total of 20 to 63 hours provided over a 2 week to 11 week period. Therapy was not associated with significant improvements in arm function (SMD=0.19, 95% CI -0.01 to 0.38) or hand function (SMD= 0.05, 95% CI -0.18 to 0.29). Perhaps the inclusion of trials that evaluated repetitive task training in addition to task-oriented training was, in part, responsible for the null result.

Traditional constraint-induced movement therapy (CIMT) involves restraint of the unaffected arm for at least 90 percent of waking hours, and at least six hours a day of intense upper extremity (UE) training of the affected arm every day for two weeks. This form of therapy may be effective for a select group of patients who demonstrate some degree of active wrist and arm movement and have minimal sensory or cognitive deficits. Evidence from the VECTORS trial (Dromerick et al. 2009) suggests that traditional (intensive) CIMT should not be used for individuals in the first month post stroke. In this RCT, patients who were randomized to receive 3 hours of intensive therapy in addition to wearing a constraint for 6 hours/day had lower Action Research Arm Test (ARAT) scores at 3 months compared with patients who had received conventional occupational therapy or standard CIMT for 2 hours each day. In one large RCT (Wolf et al. 2009), which included 222 patients 3-9 months post stroke, patients in the CIMT group had significantly higher Wolf Motor Function Tests (WMFT) scores and Motor Activity Log (MAL) (Amount of Use and Quality of Movement subscores) at 3 months, compared with patients in the control group who received usual care, which could range from no therapy to a formal structured therapy program.

Modified constraint-induced movement therapy (mCIMT) is a more feasible therapy option when resources are limited. In the most common variation of traditional CIMT, the unaffected arm is restrained with a padded mitt or arm sling for five hours a day, and with half-hour blocks of 1:1 therapy provided for up to 10 weeks (Page et al. 2013). The results from several good-quality RCTs suggest that patients who received mCIMT in the subacute or chronic phase of stroke experienced greater functional recovery compared with patients who received traditional occupational therapy. A Cochrane review (Sirtori et al. 2009) including the results from 19 trials reported a moderate improvement in arm function and a significant reduction in disability at the end of the treatment period, although treatment effects were not maintained at 3-6 months post treatment. The results from this review are difficult to interpret since trials of all forms of CIMT were included as were patients in all stages of stroke recovery.

Evidence from a single trial evaluating the Graded Repetitive Arm Supplementary Program (GRASP) program suggests that this type of therapy can increase the number of hours of therapeutic upper limb use received by a patient (Harris et al. 2009). In this RCT, 103 patients recruited an average of 21 days following stroke with upper-extremity Fugl Meyer scores between 10 and 57, were randomized to participate in a 4 week (one hour/day x 6 days/week) home-based, self-administered program designed to improve ADL skills through strengthening, ROM and gross and fine motor exercises or to a non-therapeutic education control program. At the end of the treatment period, subjects in the GRASP group had significantly higher Chedoke Arm & Hand Activity Inventory, ARAT and MAL scores compared with the control group. The improvement was maintained at 3 months.

Similarly, the use of mental practice has been shown to improve arm function compared with traditional therapy alone. It may also be a valuable adjunct to other upper limb interventions and used as a precursor to mCIMT. A large treatment effect (SMD=1.37, 95% CI 0.60 to 2.15, $p<0.0001$) was reported in a Cochrane review, (Barclay-Goddard et al. 2011) which included the results from 6 RCTs. Length of treatment ranged from 3 to 10 weeks. Subgroup analysis based on stroke chronicity and dosage was not possible due to small numbers of trials.

Results from two systematic reviews suggest that patients with mild to moderate upper-limb impairment may benefit from treatment using commercially available non-immersive virtual reality devices. A Cochrane review (Laver et al. 2011) included the results from 19 RCTs and reported that arm function, assessed using the Fugl Meyer Assessment, was significantly improved following treatment (mean difference=4.43, 95% CI 1.98 to 6.88, $p<0.0001$). Improvements in hand function approached statistical significance (MD=3.55 95% CI -0.20 to 7.3, $p=0.063$). In sub group analysis, based on time since stroke onset, treatment provided in both the acute and chronic phase of stroke was effective. Saposnik et al. (2011) reported similar findings in their review, which included the results from 12 studies. There was significant improvement in motor impairment, assessed using the Fugl Meyer Assessment, but no improvement in performance on the Box & Block test or the Wolf Motor Function test (manual function).

Meilink et al. (2008) examined the effectiveness of EMG-triggered neuromuscular electrical stimulation (NMES) applied to the extensor muscles of the forearm to improve hand function following stroke. This systematic review included the results of 8 studies (157 patients, > 6 months post stroke). Compared with usual care, there was a non-statistically significant treatment effect for all outcomes assessed (Fugl Meyer Assessment: SMD=0.10, 95% CI -0.43 to 0.64, $p=0.35$; Box & Block test: SMD=0.37, 95% CI -0.27 to 1.01, $p=0.13$; Action Research Arm Test: SMD=0.0, 95% CI -0.56 to 0.57, $p=0.5$; and reaction time: SMD=0.41, 95% CI -0.20 to 1.03). The results of a small RCT authored by Page et al. (2012) suggest that 2 hours of daily therapy for 8 weeks using the commercially-available Bioness device reduced impairment from baseline levels for patients in the chronic stage

of stroke; however, when compared with the results of patients in the control group who participated in a 30-minute per weekday home-exercise program, there was no difference in mean Fugl Meyer Assessment scores between groups.

In a systematic review, including 13 RCTs, (Harris & Eng 2010) therapy programs including a strength training or resistance training component were associated with significant improvements in grip strength (SMD=0.95, 95% CI 0.05 to 1.85, $p=0.04$), but not performance of ADLs (SMD=0.26, 95% CI -0.10 to 0.63, $p=0.16$). There is currently no evidence that strength training increases spasticity or reduces range of movement.

There is evidence that EMG-biofeedback is associated with modest improvements in arm function. In a review which included the results 4 small RCTs that compared a 3-12 week program of EMG-biofeedback treatment + physiotherapy with physiotherapy alone in the upper limb, there was a significant improvement in arm function (SMD=0.41, 95% CI 0.05 to 0.77, $p<0.05$) (Langhorne et al. 2009). Nevertheless, its use in routine clinical practice is the subject of ongoing debate.

While clinicians often place an emphasis on the use of bilateral upper limb activity, evidence from a Cochrane Review (Coupar et al. 2010) and a recent systematic review (Van Delden et al. 2012) suggests that bilateral upper limb training is no more effective than unilateral training for improving arm function. There were no significant differences between treatment and control groups on any of the impairment of activity outcomes assessed in either study.

Mirror therapy is a technique that uses visual feedback about motor performance as a means to enhance upper-limb function following stroke and to reduce pain. Evidence from a Cochrane review (Thieme et al. 2012), which included the results from 14 RCT, suggests a modest benefit associated with treatment. There were significant improvements in motor function, the primary outcome, both immediately following treatment (SMD=0.61; 95% CI 0.22 to 1.0, $p= 0.002$) and at 6 months (SMD=1.09; 95% CI 1.09 to 1.87, $p= 0.0068$). There were also improvements in performance of ADLs (SMD=0.33, 95% CI 0.05 to 0.60, $p=0.02$) and pain (SMD= -1.1, 95% CI -2.10 to -0.09, $p=0.03$).

[Link to Evidence Table 5.5.1 and References](#)

For additional information and more extensive reviews of the literature, please refer to: Evidence Based Review of Stroke Rehabilitation www.ebrsr.ca, and StrokEngine:www.strokengine.ca/

Best Practice Recommendation 5.5.2

Range of Motion and Spasticity in the Shoulder, Arm and Hand

- i. Spasticity and contractures can be prevented or treated by antispastic pattern positioning, range-of-motion exercises, and/or stretching [Evidence Levels: Early- Level C; Late-Level C]. Routine use of splints is not recommended [Evidence Levels: Early- Level A; Late-Level B].
- ii. Chemodenervation using botulinum toxin can be used to increase range of motion and decrease pain for patients with focal and/or symptomatically distressing spasticity [Evidence Levels: Early-Level C; Late-Level A].
- iii. Oral medications can be prescribed for the treatment of disabling spasticity:
 - a. Tizanidine can be used to treat more generalized, disabling spasticity. [Evidence Levels: Early-Level C; Late-Level B].
 - b. Baclofen can be used as a lower cost alternative but has not been studied in this population [Evidence Levels: Early-Level C; Late-Level C].
 - c. Benzodiazepines should be avoided due to sedating side effects, which may impair recovery [Evidence Level: Early-Level C; Late-Level C].
- iv. The presence of spasticity should not limit the use of strength training in the arm [Evidence Level: Early-Level C; Late-Level C].

Rationale:

Spasticity, defined as a velocity dependent increase of tonic stretch reflexes (muscle tone) with exaggerated tendon jerks can be painful, interfere with functional recovery and hinder rehabilitation efforts. If not managed appropriately, stroke survivors may experience a loss of range of motion at involved joints of the arms, which can result in contracture.

System Implications

To achieve timely and appropriate assessment and management of shoulder, arm and hand range and spasticity the organization requires:

- Organized stroke care available, including stroke rehabilitation units with critical mass of trained interprofessional staff during the rehabilitation period following stroke.
- Timely access to specialized, interprofessional stroke rehabilitation services, where assessments and therapies of appropriate type and intensity are provided.
- Expertise should be developed within the interdisciplinary stroke team to prevent and/or ameliorate post stroke spasticity and remediate its complications and functionally related limitations.
- Optimization of strategies to prevent or manage spasticity both initially post stroke and at follow-up assessment.
- Funding for chemodenervation and associated post injection rehabilitation services where necessary.
- Long-term rehabilitation services widely available in nursing and continuing care facilities, and in outpatient and community programs.

Performance Measures

1. Change (improvement) in functional status scores using a standardized assessment tool from admission to an inpatient rehabilitation program to discharge.
2. Change in shoulder, arm and hand functional status scores using a standardized

assessment tool (such as the Chedoke-McMaster Stroke Assessment pain scale or the Ashworth Scale) from admission to an inpatient rehabilitation program to discharge.

3. Median length of time from stroke admission in an acute care hospital to assessment of rehabilitation potential by a rehabilitation healthcare professional.
4. Median length of time spent on a stroke rehabilitation unit during inpatient rehabilitation

Measurement Notes

- A data entry process will need to be established to capture the information from the outcome tools such as the Disability Assessment Scale
- FIM® Instrument data is available in the National Rehabilitation Reporting System (NRS) database at the Canadian Institute of Health Information (CIHI) for participating organizations.

Implementation Resources and Knowledge Transfer Tools

- o **Canadian Stroke Best Practices *Taking Action Towards Optimal Stroke Care Resource Kit***
- o Table 5.1, summary of validated and frequently used screening and assessment tools for stroke rehabilitation
- o FIM® Instrument <http://www.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx?ID=889>
- o Modified Ashworth Scale http://strokengine.ca/assess/module_mashs_intro-en.html
- o Visual analog 10-point Likert pain scale <http://www.painedu.org/Downloads/NIPC/Pain%20Assessment%20Scales.pdf>

Summary of the Evidence

Update 2013

Spasticity, defined as a velocity dependent increase of tonic stretch reflexes (muscle tone) with exaggerated tendon jerks can be painful, interfere with functional recovery and hinder rehabilitation efforts. If not managed appropriately, stroke survivors may experience a loss of range of motion at involved joints of the arms, which can result in contracture. Although it is a common in clinical practice to use range-of-motion or stretching exercises and splints to prevent or treat spasticity or contracture following stroke, there is a lack of evidence supporting their benefit.

Turton & Britton (2005) randomized 13 subjects with no hand function, admitted to a stroke rehabilitation unit, within 4 weeks of stroke to a program of twice daily stretches for wrist and finger flexors and shoulder adductors and internal rotators, for up to 12 weeks post stroke. By the end of follow-up, patients in both groups had lost an average of 30 degrees of wrist extension and shoulder external rotation ROM of the affected side, but the difference between groups was not significant. Compliance with treatment was poor. Horsley et al. (2007) recruited 40 patients admitted to a rehabilitation service (19 with stroke). All patients received routine upper-limb retraining five days a week. In addition, the experimental group (n=20) received 30 minutes daily stretch of the wrist and finger flexors five days a week for four weeks. There was no difference in the development of contracture, the primary outcome, five weeks after treatment. There were also no differences in pain at rest measured on a 10-cm visual analogue scale, or upper-limb activity measured using the Motor Assessment Scale.

Splints have been widely-used in clinical practice with the aim of the prevention of contractures and reducing spasticity; however, evidence of their effectiveness is lacking. The results from 3 small RCTs suggest that splinting is not effective (Harvey et al. 2006, Lanin et al. 2007, and Basaran et al. 2012). Most recently, Basaran et al. (2012) randomized 39 subjects to participate in a 5

week, home-based exercise program in which patients were advised to stretch wrist and finger flexors for 10 repetitions and to try reaching and grasping an object for 10 repetitions 3x/day, in addition to conventional therapy. Patients in the 2 experimental groups wore either a volar or dorsal splint for up to 10 hours overnight throughout the study period, while patients in the control group wore no splint. At the end of the study period, there were no significant differences among groups in terms of reductions in spasticity or wrist passive range of motion.

While it is well-established that treatment with Botulinum toxin–type A (BTX-A) reduces focal spasticity in the finger, wrist and elbow, it remains uncertain whether there is also improvement in upper-limb function. In 2 recent, large placebo-controlled RCTs, one which recruited subjects within the first month (Shaw et al. 2012) and the other an average of 6 years following stroke (McCrary et al. 2009), significant reductions in spasticity, assessed using the Modified Ashworth Scale scores were reported in both studies. Shaw et al. (2012) reported there was no significant difference in the percentage of patients who had achieved a successful outcome (defined by 3 different levels of improvement on the Action Research Arm Test, depending on baseline arm function) at one month following treatment: 25% of patients in the treatment group compared with 19.5% of patients in the control group ($p=0.232$). However, significant differences in favor of the intervention group were seen in muscle tone at 1 month; upper limb strength at 3 months; basic arm functional tasks (hand hygiene, facilitation of dressing) at 1, 3, and 12 months, and pain at 12 months. McCrary et al. (2009) reported there were no significant between group differences in Assessment of Quality of Life scale change scores, pain, mood, disability or carer burden at 20 weeks.

In cases where spasticity is generalized, and it would be impractical, or contrary to patients' wishes to inject multiple muscle groups with BTX-A, the use of oral agents may be considered as an alternative treatment. Traditional pharmacotherapies for spasticity include centrally acting depressants (baclofen and tizanidine) and muscle relaxants; (dantrolene) however; these treatments are only partially effective in treating spasticity and have the negative side effects of weakness and sedation. Treatment with oral baclofen has not been studied in the stroke population and is used more frequently in patients recovering from spinal cord injury. Tizanidine has been well-studied in other conditions including multiple sclerosis and acquired brain injury, and has a better side effect profile than other oral agents. There is only a single open-label trial of the use of tizandine post stroke (Gelber et al. 2001). Following 16 weeks of treatment in which 47 patients received a maximum daily dose of 36 mg (mean 20 mg), there was a decrease in mean combined total modified Ashworth Scale scores (9.3 vs. 6.5, $p=0.038$). There were also significant improvements in pain, quality of life, and physician assessment of disability.

[Link to Evidence Table 5.5.2 and References](#)

For further information and references, please consult the Evidence Based Review of Stroke Rehabilitation at http://www.ebrsr.com/uploads/Module_10_upper_extremity_formatted.pdf

Best Practice Recommendation 5.5.3 Management of Shoulder Pain following Stroke

Note: Causes of shoulder pain may be due to the hemiplegia itself, injury or acquired orthopedic conditions due to compromised joint and soft tissue integrity.

A. Prevention of Hemiplegic Shoulder Pain

- i. Joint protection strategies should be used during the early or flaccid stage of recovery to prevent or minimize shoulder pain. These include:
 - a. Positioning and supporting the arm during rest [Evidence Level B].
 - b. Protecting and supporting the arm during functional mobility [Evidence Level C].
 - c. Protecting and supporting the arm during wheelchair use by using a hemi-tray or arm trough [Evidence Level C].
 - d. During the flaccid stage slings can be used to prevent injury; however, beyond the flaccid stage the use of slings remains controversial [Evidence Level C].
- ii. Overhead pulleys should not be used [Evidence Level A].
- iii. The arm should not be moved beyond 90 degrees of shoulder flexion or abduction, unless the scapula is upwardly rotated and the humerus is laterally rotated [Evidence Level A].
- iv. Patients and staff should be educated to correctly handle the involved arm [Evidence Level A]. For example, excessive traction should be avoided during assisted movements such as transfers [Evidence level C].

B. Assessment of Hemiplegic Shoulder Pain

- i. The assessment of the painful hemiplegic shoulder should include evaluation of tone, strength, changes in length of soft tissues, alignment of joints of the shoulder girdle and orthopedic changes in the shoulder [Evidence Level C].

C. Management of Hemiplegic Shoulder Pain

- i. Treatment of hemiplegic shoulder pain related to limitations in range of motion includes **gentle** stretching and mobilization techniques, and typically involves increasing external rotation and abduction. [Evidence Level B].
 - a. Active range of motion should be increased gradually in conjunction with restoring alignment and strengthening weak muscles in the shoulder girdle [Evidence Level B].
- ii. If there are no contraindications, analgesics (such as acetaminophen or ibuprofen) can be used for pain relief [Evidence Level C].
- iii. Injections of botulinum toxin into the subscapularis and pectoralis muscles can be used to treat hemiplegic shoulder pain thought to be related to spasticity [Evidence Level B].
- iv. Subacromial corticosteroid injections can be used in patients when pain is thought to be related to injury or inflammation of the subacromial region (rotator cuff or bursa) in the hemiplegic shoulder [Evidence level A].
- v. In a subset of patients who experience pain related to both injury or inflammation and spasticity, dual therapy (botulinum toxin plus steroid injections) should be used [Evidence Level C].

D. Complex Regional Pain Syndrome (CRPS)

(Also known as Shoulder-Hand Syndrome, Reflex Sympathetic Dystrophy, Sudecks Atrophy)

- i. **Prevention:** Active, active-assisted, or passive range of motion exercises should be used to prevent CRPS [Evidence Level C].
- ii. **Diagnosis** should be based on clinical findings including pain and tenderness of metacarpophalangeal and proximal interphalangeal joints, associated with edema over the dorsum of the fingers, trophic skin changes, hyperaesthesia, and limited range of motion [Evidence Level C].
- iii. A triple phase bone scan (which demonstrates increased periarticular uptake in distal upper extremity joints)) can be used to assist in diagnosis. [Evidence Level C].
- iv. **Management of Complex Regional Pain Syndrome (CRPS):** An early course of oral corticosteroids in tapering doses can be used to reduce swelling and pain [Evidence Level B].
- v. Hand edema may be reduced by:
 - a. Active, active-assisted, or passive range of motion exercises in conjunction with arm elevation [Evidence Level C].
 - b. Retrograde massage [Evidence Level C].
 - c. Gentle grade 1-2 mobilizations for accessory movements of the hand and fingers [Evidence Level C].

Rationale:

The incidence of shoulder pain following a stroke is high. As many as 72 percent of adult stroke patients report at least one episode of shoulder pain within the first year after stroke. Shoulder pain may inhibit patient participation in rehabilitation activities, contribute to poor functional recovery and can also mask improvement of movement and function. Hemiplegic shoulder pain may contribute to depression and sleeplessness and reduce quality of life.

System Implications

To achieve timely and appropriate assessment and management of shoulder pain the organization requires:

- Organized stroke care, including stroke rehabilitation units with a critical mass of trained interprofessional staff during the rehabilitation period following stroke.
- Equipment for proper positioning of limb (pillows, troughs).

To achieve timely and appropriate assessment and management of shoulder pain the organization should provide:

- Initial assessment of active or passive upper extremity range of motion of shoulder, based on Chedoke-McMaster Stroke Assessment score and assessment of external rotation performed by clinicians experienced in stroke rehabilitation.
- Timely access to specialized, interprofessional stroke rehabilitation services for the management of shoulder pain.
- Timely access to appropriate rehabilitation therapy intensity/ treatment modalities for management or reduction of shoulder pain in stroke survivors.
- Long-term rehabilitation services in nursing and continuing care facilities, and in outpatient and community programs.
- Physicians trained in stroke care and, where needed, intra-articular shoulder injections and botulinum toxin injections.

| Performance Measures | |
|---|-------------|
| <ol style="list-style-type: none"> 1. Proportion of stroke patients who experience shoulder pain in acute care hospital, inpatient rehabilitation and following discharge into the community (NRS tool has a self-report question about pain on admission/discharge). 2. Length of stay during acute care hospitalization and inpatient rehabilitation for patients experiencing shoulder pain (versus patients not experiencing shoulder pain). 3. Proportion of stroke patients who report shoulder pain at three-month and six-month follow-up. 4. Pain intensity rating change, from baseline to defined measurement periods. 5. Motor score change, from baseline to defined measurement periods. 6. Range of shoulder external rotation before and after treatment for shoulder pain. 7. Proportion of patients with restricted range of motion related to shoulder pain. | |
| <p>Measurement notes</p> <ul style="list-style-type: none"> • Performance measure 4: Standardized rating scales should be used for assessment of pain levels and motor scores. • Some data will require survey or chart audit. The quality of documentation related to shoulder pain by healthcare professionals will affect the quality and ability to report some of these performance measures. • Audit tools at a local level may be helpful in collecting shoulder pain data on patients who experience shoulder pain. | |
| Implementation Resources and Knowledge Transfer Tools | |
| <ul style="list-style-type: none"> ○ Canadian Stroke Best Practices <i>Taking Action Towards Optimal Stroke Care Resource Kit</i> ○ Table 5.1, summary of validated and frequently used screening and assessment tools for stroke rehabilitation ○ Visual analog pain scale http://www.painedu.org/Downloads/NIPC/Pain_Assessment_Scales.pdf ○ Wong-Baker Visual Analog Communicatively Accessible Pain Scale http://www.painedu.org/Downloads/NIPC/Pain_Assessment_Scales.pdf ○ Chedoke-McMaster Shoulder Pain Subscale http://www.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx?ID=918&Source=http%3A%2F%2Fwww%2Erehabmeasures%2Eorg%2Frehabweb%2Fallmeasures%2Easpx%3FView%3D%257b0C859D90%252d7478%252d4C9B%252d9575%252d784C4A9A2D85%257d%26PageView%3DShared | |
| Summary of the Evidence | Update 2013 |
| <p>The use of supportive slings and supports has been shown to reduce the amount of subluxation (evident upon radiographic examination) and may also help to reduce hemiplegic shoulder pain. A Cochrane review authored by Ada et al. (2005) included the results from 4 RCTs evaluating the use of strapping (n=3) and hemisling (n=1). All patients were in the acute phase of stroke (less than 4 weeks) with a flaccid arm with no history of shoulder pain. The number of pain-free days associated with treatment was significantly greater; (mean difference: 13.6 days, 95% CI 9.7 to 17.8, p<0.0001); however, the results from only two studies were included in the pooled result. Of two RCTs that examined the use of strapping, specifically to prevent the development of shoulder pain, the results were conflicting (Hanger et al. 2000, Griffin & Bernhardt 2006). A recent meta-analysis, including the results from five RCTs reported that shoulder positioning programs were not effective in preventing or reducing the loss of shoulder external rotation range of motion (Borisova & Bohannon 2009).</p> <p>Ada & Foongchomcheay (2002) conducted a meta-analysis to examine the effect of electrical stimulation on shoulder subluxation following stroke. Subjects with subluxation or shoulder muscle paralysis in both the acute</p> | |

and chronic stages of stroke, from 7 RCTs were included. The results suggested that early treatment in addition to conventional therapy helps to prevent the development of hemiplegic shoulder while later treatment helps to reduce pain. Church et al. (2006) randomized 176 patients to receive active or sham surface FES treatments in addition to conventional therapy, for four weeks following acute stroke. Patients in both groups improved in terms of function (assessed using the Action Research Arm Test, Frenchay Arm test and Motricity Index) but there were no significant between-group differences at either four weeks or three months from baseline. Koyuncu et al. (2010) also reported no differences in shoulder pain of all patients during resting, passive range of motion or active range of motion following 20 sessions of surface functional electrical stimulation who were receiving inpatient rehabilitation, compared with patients who did not receive electrical stimulation treatments.

There is evidence that treatment with botulinum toxin type a (BTX-A) may help to improve hemiplegic shoulder pain, but the results from systematic reviews and RCTs are not consistent. A Cochrane review (Singh & Fitzgerald 2010) examined the efficacy of the use of BTX-A toxin in the treatment of shoulder pain. Six RCTs were included, 5 of which included patients with post-stroke shoulder pain. Treatment with BTX-A was associated with reductions in pain at three and 6 months, but not at one month following injection. De Boer et al (2008) randomized 22 patients, an average of 6 months following stroke with significant shoulder pain to receive a single injection of 100 U Botox or placebo to the subscapularis muscle. In addition, all patients received some form of physical therapy. While pain scores improved in both groups over time, there was no significant difference at 12 weeks following treatment, nor was there significant improvement between groups in degree of humeral external rotation.

Intra-articular corticosteroids injections may also help to improve symptoms of shoulder pain. Rah et al. (2012) randomized 58 patients with chronic shoulder pain (at least 3/10 on a Visual Analog Scale (VAS) to receive a single subacromial injection of 40 mg triamcinolone acetonide or lidocaine (control condition). All patients participated in a standardized exercise program. There was significant reduction in the average shoulder pain level at day and night, measured on a 10 cm VAS at 8 weeks associated with steroid injection. In contrast, Snels et al. (2000) reported that in 37 patients with hemiplegic shoulder pain (≥ 4 on a 0 to 10 VAS) randomized to receive three injections (1-2 weeks apart) of 40 mg triamcinolone acetonide or placebo, active treatment was not associated with improvements in pain scores three weeks later.

There is no definitive therapeutic intervention for complex regional pain syndrome (CRPS). Although a wide variety of preventative measures and treatments have been used including exercise, heat, contrast baths, hand desensitization programs, splints, medications, and surgical options, there is little evidence that many of the commonly-used treatments are effective. Although physiotherapy is regarded as the cornerstone of integrated treatment, no controlled trials have been conducted to evaluate its effect in preventing the development of CRPS. There is some evidence that a two-week, tapering dose of 32 or 40 mg of oral corticosteroids is more effective than either NSAIDs or placebo in improving symptoms of CRPS (Bruas et al. 1994, Kalita et al. 2006).

[Link to Evidence Table 5.5.3 and References](#)

For further information and references, please consult the Evidence Based Review of Stroke Rehabilitation http://www.ebrsr.com/uploads/Module_11_hemiplegic_shoulders_formatted.pdf

Best Practice Recommendation 5.6.1 Lower Limb Mobility and Transfer Skills

Definition: For the purposes of these recommendations 'early' has been defined as patients who are less than 6 months post stroke, and 'late' is defined as greater than 6 months from index stroke event.

A. General Considerations

- i. Patients should engage in training that is meaningful, engaging, progressively adaptive, task-specific and goal-oriented in an effort to improve transfer skills and mobility [Evidence Level: Early-Level A; Late-Level A].

B. Specific Interventions

- i. Ankle-foot orthoses can be used on selected patients with foot drop following proper assessment and with follow-up to verify its effectiveness [Evidence Level: Early-Level A; Late-Level A].
- ii. Lower-extremity orthotic devices can be used when ankle stabilization is required to help the patient walk. Prefabricated bracing can be used initially, while customized bracing should be reserved for patients with anticipated long-term need [Evidence Level: Early-Level C; Late-Level C].
- iii. Functional electrical stimulation (FES) can be used to improve muscle force, strength and function (gait) in selected patients, but the effects should not be assumed to be sustained [Evidence Level: Early-Level A; Late-Level A].
- iv. The need for gait aids, assistive devices, wheelchairs, and other special equipment should be evaluated on an individual basis [Evidence Level: Early-Level C; Late-Level C].
 - a. Prescription or purchase of a long-term device should be based on anticipation of a long-term need [Evidence Level: Early-Level C; Late-Level C].
 - b. Once provided, patients should be reassessed, as appropriate, to determine if changes are required or equipment can be discontinued [Evidence Level: Early-Level C; Late-Level C].

Rationale:

Stroke frequently affects balance and the use of the legs. Along with the goal of increasing a patient's safety and ability to walk, basic abilities to stand and transfer safely must also be addressed. To ambulate safely, patients may require assistive devices such as a cane or walker. Unfortunately, some individuals may not achieve independence in walking and may require a wheelchair.

System Implications

To achieve timely and appropriate assessment and management of basic mobility, postural control and transfer skills the organization requires:

- Organized stroke care, including stroke units with a critical mass of trained staff and an interprofessional team during the rehabilitation period following stroke.
- Initial assessment performed by clinicians trained and experienced in stroke rehabilitation.
- Timely access to specialized, interprofessional stroke rehabilitation services.
- Timely access to appropriate intensity of rehabilitation for stroke survivors, including sit to stand training.
- Access to required supportive devices and equipment to promote safety and

independence. This equipment should be affordable. Processes should be in place to ensure proper assessment of patients to meet equipment needs (e.g., seating assessments).

Performance Measures

1. **Extent of change (improvement) in functional status scores (e.g., FIM® Instrument sub scores transfers and locomotion) from admission to an inpatient rehabilitation program to discharge.**
2. **Extent of change (improvement) in functional status score (e.g., Timed Up and Go, Berg Balance Scale) from admission to an inpatient rehabilitation program to discharge (average and median).**
3. Average hours per day of direct task-specific therapy provided by the interprofessional stroke team (target is minimum of three hours total therapy time).
4. Average days per week of direct task specific therapy provided by the interprofessional stroke team (target is minimum of five days).
5. Number/percentage of organizations using sit-to-stand as a standard treatment modality for post-stroke functional gain.

Measurement Notes

- Therapy time may be extracted from rehabilitation professional workload measurement systems where available

Implementation Resources and Knowledge Transfer Tools

- o **Canadian Stroke Best Practices *Taking Action Towards Optimal Stroke Care Resource Kit***
- o Table 5.1, summary of validated and frequently used screening and assessment tools for stroke rehabilitation
- o FIM® Instrument (Functional Independence Measure)
<http://www.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx?ID=889>
- o Chedoke-McMaster Stroke Assessment: Impairment stages of leg, foot and postural control scales http://strokengine.ca/assess/module_cmmsa_intro-en.html
- o Timed Up and Go Test, http://strokengine.ca/assess/module_tug_family-en.html
- o 6-Minute Walk Test, http://strokengine.ca/assess/module_6mwt_family-en.html
- o Berg Balance Scale, <http://www.strokecenter.org/professionals/stroke-diagnosis/stroke-assessment-scales/>

Summary of the Evidence

Update 2013

For patients with limited mobility following stroke orthoses and electrical stimulation may be used to enhance recovery. A more extensive list of therapy approaches and interventions are summarized in 5.6.3.

Functional electrical stimulation (FES) can be used to improve gait quality in selected patients who are highly motivated and able to walk independently or with minimal assistance. FES has been studied extensively with RCTs; however, the results of a Cochrane review (Pomeroy et al. 2006) including the results from 24 RCTs, of which 12 included interventions and outcomes associated with mobility, suggest that treatment is not associated with significant increases in gait speed (SMD= -0.02, 95% CI -0.30 to 0.26) or stride length (SMD=0.36, 95% CI -0.93 to 1.63). Ambrosini et al. (2011) did report significant improvement in Motricity Index scores (leg subscale) and the Trunk Control Test in 35 lower-functioning patients randomized to receive FES-induced cycling training using a motorized cycle-ergometer.

The use of ankle-foot orthoses (AFO) is widespread, although there are few controlled trials examining its benefit. When patients who had been wearing an AFO regularly for the previous 6 months were assessed with and without the orthosis, measures of gait speed were significantly better when the AFO was worn (de Wit et al. 2004). Similarly, when 58 patients who had never worn the device previously were assessed with,

and without an AFO two hours apart, measures of balance and gait speed were significantly better when the AFO was worn (Wang et al. 2007). In 32 chronic stroke survivors who were randomized to wear or not wear an AFO for a period of three months, gait speed was significantly increased as was and Physiological Cost Index (beats/min) in patients who had worn the device. Tyson & Kent (2013) recently conducted a systematic review, including the results from 13 crossover RCTs. During a single testing session, subjects performed significantly better on measures on balance (weight distribution: SMD=0.32, 95% CI -0.52 to -0.11, p=0.003) and mobility (gait speed: MD=0.06 m/s, 95% CI, 0.03 to 0.08, p< .0001 and stride length: SMD= 0.28, 95% CI 0.05 to 0.51, p=0.02) while wearing an AFO compared with control condition where an AFO was not worn. There were no significant treatment effects associated with the outcomes of postural sway and timed mobility tests.

[Link to Evidence Table 5.6.1 and Reference List](#)

For further information and references, please consult the Evidence Based Review of Stroke Rehabilitation at <http://www.ebrsr.com>; and StrokEngine at www.StrokEngine.ca

Best Practice Recommendation 5.6.2 Lower Limb Spasticity Following Stroke

- i. Spasticity and contractures should be treated or prevented by antispastic pattern positioning, range-of-motion exercises and/o stretching [Evidence Level: Early-Level C; Late-Level C]. Current evidence does not support the use of splints.
- ii. Chemodenervation using botulinum toxin can be used to increase range of motion, improve gait, and decrease pain for patients with focal and/or symptomatically distressing spasticity [Evidence Level: Early-Level C; Late-Level A].
- iii. Oral medications can be prescribed for the treatment of disabling spasticity:
 - a. Tizanidine can be used to treat more generalized, disabling spasticity. [Evidence Levels: Early-Level C; Late-Level B].
 - b. Baclofen can be used as a lower cost alternative but has not been studied in this population [Evidence Levels: Early-Level C; Late-Level C].
 - c. Benzodiazepines should be avoided due to sedating side effects, which may impair recovery [Evidence Level: Early-Level C; Late-Level C].
- iv. The presence of spasticity should not limit the use of strength training in the leg [Evidence Level: Early-Level C; Late-Level C].

Rationale:

Spasticity, defined as a velocity dependent increase of tonic stretch reflexes (muscle tone) with exaggerated tendon jerks can be painful, interfere with functional recovery and hinder rehabilitation efforts. If not managed appropriately, stroke survivors may experience a loss of range of motion at involved joints of the ankle and foot, which can cause difficulties with ambulation.

System Implications

To achieve timely and appropriate assessment and management of lower limb spasticity the organization requires:

- Organized stroke care, including stroke rehabilitation units with a critical mass of trained staff and an interprofessional team during the rehabilitation period following stroke.
- Initial and ongoing assessments performed by clinicians experienced in stroke rehabilitation both in hospital and in the community.
- Assessment for an orthotic/splint/brace should be considered to ensure safety.
- Timely access to specialized, interprofessional stroke rehabilitation services.
- Timely access to appropriate intensity of rehabilitation for stroke survivors.
- Funding for chemodenervation and associated post injection rehabilitation services where necessary.

Performance Measures:

1. Extent of change in functional status scores using a standardized assessment tool (e.g., FIM® Instrument) from admission to an inpatient rehabilitation program to discharge (average and median).
2. Extent of change in lower limb functional status using a standardized assessment tool (e.g., Chedoke-McMaster Stroke Assessment sub scale) from admission to an inpatient rehabilitation program to discharge.
3. Extent of change in lower limb spasticity scores using a standardized assessment tool (e.g.,

Modified Ashworth Scale) from admission to an inpatient rehabilitation program to discharge.

4. Median length of time from stroke admission in an acute care hospital to assessment of rehabilitation potential by a rehabilitation healthcare professional.
5. Median length of time spent in active rehabilitation on a stroke rehabilitation unit during inpatient rehabilitation.
6. Median total length of time spent on a stroke rehabilitation unit during inpatient rehabilitation.

Measurement Notes:

- Ensure consistency in start time for measures 4 and 5

Implementation Resources and Knowledge Transfer Tools

- o **Canadian Stroke Best Practices Taking Action Towards Optimal Stroke Care Resource Kit**
- o Table 5.1, summary of validated and frequently used screening and assessment tools for stroke rehabilitation
- o Functional Independence Measure (FIM ® Instrument)
<http://www.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx?ID=889>
- o Chedoke-McMaster Stroke Assessment http://strokengine.ca/assess/module_cmmsa_intro-en.html
- o Modified Ashworth Scale http://strokengine.ca/assess/module_mashes_intro-en.html

Summary of the Evidence

Update 2013

Few studies have been published examining the prevention or treatment of spasticity or contracture using antispastic pattern positioning, range of motion exercises, stretching and/or splinting in the lower extremity. Kluding et al. (2008) reported that eight sessions of functional task practice combined with ankle joint mobilizations, provided over four weeks, resulted in increased ankle range of motion, compared with a group that received therapy only, in the chronic stage of stroke. The subjects in the intervention group gained 5.7 degrees in passive ankle range of motion compared with 0.2 degree degrees in the control group (p<0.01).

The use of Botulinum toxin–type A (BTX-A) has not been as well studied in the lower extremity compared with the upper. A meta-analysis (Foley et al. 2010), which included the results from 8 studies reported a moderate increase in gait speed associated with BTX-A (SMD= 0.193±0.081, 95% CI 0.033 to 0.353, p<0.018). Dunne et al. (2012) randomized 85 stroke patients (≥ 6 weeks post stroke) to receive a single injection of 200 U (n=28), 300 U Botox ® (n=28) or saline. When the results from the two Botox ® groups were combined, there was significantly greater improvement in Ashworth Scale scores, pain, spasm frequency, and the number of patients who experienced at least a 15% increase in ankle dorsiflexion, at 12 weeks. Kaji et al. (2010) randomized 120 patients with lower limb spasticity following stroke greater than six months to receive a single treatment of 300 U Botox® or placebo. There was a significantly greater mean reduction in modified Ashworth Scale scores at weeks four, 6 and 8 in the treatment group compared with the control group; however, there were no significant differences between groups at week 10 or 12. Pittock et al. (2003) compared escalating doses of BTX-A with placebo and found that the highest dose (1,500 U Dysport ®) was associated with the greatest relief of calf spasticity compared with placebo at four, eight and 12 weeks following treatment. Lower doses (500 and 1,000 U) resulted in significant reductions in spasticity at week four only. Burbaud et al. (1996) randomized 23 adult hemiparetic stroke patients with ankle plantar flexor and foot invertor spasticity to receive a single injection of BTX-A and one of placebo in random order, at day 0 and day 90). Following active treatment, there was a significant reduction in spasticity associated with the ankle movement (extensors and invertors).

[Link to Evidence Table 5.6.2 and Reference List](#)

For further information and references, please consult the Evidence Based Review of Stroke Rehabilitation
http://www.ebrsr.com/uploads/Module_9_mobility.pdf

Best Practice Recommendation 5.6.3 Lower-Limb Gait Training following Stroke

- i. Task and goal-oriented training that is progressively adapted, meaningful, salient, and involves active participation should be used to improve performance of selected lower-extremity tasks [Evidence Level: Early-Level B; Late-Level B].
- ii. Treadmill-based gait training (without body support) can be used to enhance walking speed, endurance, and distance walked when over-ground training is not available or appropriate. When used, it is suggested that therapy should be provided for 30 minutes a day, five days a week, for two weeks [Evidence Level: Early-Level C; Late-Level B].
- iii. Body weight supported treadmill training, (BWSTT) is one method can be used for patients with low ambulatory function when other strategies for walking practice are unsuccessful or unsafe [Evidence Level: Early-Level A; Late-Level A].
- iv. Following medical clearance, patients should participate regularly in an aerobic exercise program that accommodates the patient's co-morbidities and functional limitations to improve gait speed, endurance, stroke risk factor profile, mood, and cognition [Evidence Level: Early-Level A; Late-Level A].

Rationale:

Stroke frequently affects balance and the use of the legs. Walking is a valued function by patients to facilitate every day interaction. The ability to walk also requires sufficient balance to avoid falls. For walking to be a feasible alternative to wheelchair mobility, critical elements would include having a reasonable walk speed and endurance.

System Implications

- To achieve timely and appropriate assessment and management of lower limb function and gait the organization requires:
- Organized stroke care, including stroke rehabilitation units with a critical mass of trained staff and an interprofessional team during the rehabilitation period following stroke.
 - Initial and ongoing standardized assessment performed by clinicians experienced in stroke rehabilitation.
 - Timely access to specialized, interprofessional stroke rehabilitation services.
 - Timely access to appropriate intensity of rehabilitation for stroke survivors.
 - Access to appropriate equipment.
 - Access to ECG monitored exercise stress testing and experienced physician to develop appropriate intensity of aerobic exercise.

Performance Measures:

1. **Extent of change (improvement) in functional status on the 6-Minute Walk Test from admission to an inpatient rehabilitation program to discharge. Change (improvement) in functional status scores (e.g., FIM® Instrument sub score locomotion) from admission to an inpatient rehabilitation program to discharge.**
2. **Extent of change (improvement) in functional status score (e.g., CMSA lower limb sub scale) from admission to an inpatient rehabilitation program to discharge.**
3. Average hours per day (minimum of three) of direct task-specific therapy provided by the interprofessional stroke team.
4. Average days per week (minimum of five) of direct task specific therapy provided by the interprofessional stroke team.

Measurement Notes:

- Therapy time may be extracted from rehabilitation professional workload measurement systems where available.

Implementation Resources and Knowledge Transfer Tools

- o **Canadian Stroke Best Practices Taking Action Towards Optimal Stroke Care Resource Kit**
- o Table 5.1, summary of validated and frequently used screening and assessment tools for stroke rehabilitation
- o FIM® Instrument (Functional Independence Measure)
<http://www.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx?ID=889>
- o Chedoke-McMaster Stroke Assessment
http://strokengine.ca/assess/module_cmmsa_intro-en.html
- o 6 minute walk test http://strokengine.ca/assess/module_6mwt_intro-en.html
- o Fugl-Meyer Assessment http://strokengine.ca/assess/module_fma_intro-en.html
- o Functional Ambulation Categories http://strokengine.ca/assess/module_fac_intro-en.html

Summary of the Evidence

Update 2013

Task oriented training (also called task-specific training) involves practicing real-life tasks, with the intention of acquiring or reacquiring a skill. The tasks should be challenging and progressively adapted and should involve active participation. Evidence suggests that this type of therapy helps to improve gait speed and endurance. A Cochrane review (English & Hillier 2010) included the results from 6 RCTs that examined repetitive practice of functional tasks arranged in a circuit with the aim of improving mobility. Compared with the control condition, there were significant improvements in performance on the 6-Metre Walk test (6MWT) (MD=76.6 m, 95% CI 38.4 to 114.7, p<0.0001) and gait speed (MD=0.12, 95% CI 0.0 to 0.24, p=0.043), but not on measures of balance or on the Timed Up and Go (TUG test) associated with treatment. Van de Port et al. (2012) recruited 250 patients who had completed their inpatient rehabilitation following stroke, who were able to walk 10 m without physical assistance and were to be discharged home, with the intention of participating in an outpatient rehabilitation program. Patients were randomized to receive a graded task specific circuit training program or usual outpatient physiotherapy. At the end of follow-up (24 weeks), patients in the task-specific therapy group had significantly higher scores on the mobility sub scale of the Stroke Impact Scale and increased distance walked on the 6MWT, compared with patients in the control group. Salbach et al. (2004, 2005) randomized 91 community-dwelling subjects with a residual walking deficit within one year of stroke to an intervention group which comprised 10 functional tasks designed to strengthen the lower extremities and enhance walking balance, speed and distance or to a control intervention focusing on upper extremity activities. Patients in the active intervention group walked a further distance on the 6MWT and increased their comfortable and maximal walking speed to a greater degree compared with patients in the control group.

In terms of superiority of any one particular therapy approach, A Cochrane review authored by Pollock et al. (2007) examined the efficacy of various treatment approaches for lower limb rehabilitation. The results from 21 RCTs were included; eight trials compared a neurophysiological approach with another approach, eight compared a motor learning approach with another approach, and eight compared a mixed approach with another approach. A mixed approach was significantly more effective than no treatment or placebo control for improving functional independence (standardized mean difference= 0.94, 95% CI 0.08 – 1.80). Nevertheless, the authors concluded that there was insufficient evidence that any single approach had a better outcome than any other single approach or no treatment control.

A number of treatment interventions are effective in enhancing lower limb function and gait post-stroke. A Cochrane review (Mehrholtz et al. 2007) examined the effectiveness of electromechanical and robot-assisted gait training s for improving walking after stroke. Seventeen RCTs were included that examined

subjects who were ambulators, non-ambulators, or both ambulators and non-ambulators. The treatment contrasts included comparison of electromechanical and robot-assisted gait training devices (with or without electrical stimulation), designed to assist stepping cycles by supporting body weight and automating the walking therapy process with the addition of physiotherapy compared with physiotherapy or routine care only. Treatment was not associated with increases in gait speed or endurance; however, the odds of becoming an independent ambulators were significantly increased for patients who had experienced their stroke < 3 months previously (OR=2.56, 95% CI 1.67 to 3.94, $p < 0.0001$). Morone et al. (2011, 2012) included 48 participants, an average of 20 days post stroke, stratified by motor impairment (high vs. low). All patients underwent standardized rehabilitation for 3 months. After one week of therapy, subjects in the robotic group underwent additional robotic-assisted gait training instead of a second therapy session (20 sessions in total). Subjects in the control group participated in a second therapy session. At the end of treatment subjects in the low impairment robot group had improved significantly more than subjects in the low impairment control group on the Functional Ambulation Category (FAC) ($p < .001$), the Rivermead Mobility Index ($p = .001$) and the 6-Minute Walk test ($p = .029$). Although subjects in the high impairment groups also improved over time, there were no significant between-group differences on any of the outcomes. At 2 year follow-up, patients in the low impairment robot group continued to demonstrate significantly improved scores, while there were no significant differences between groups for highly-impairment patients. Treadmill training can also be used to increase walking speed, endurance and distance late post stroke. Macko et al. (2005) reported that 61 chronic stroke patients with hemiparetic gait patients who received 6 months of progressive treadmill aerobic exercise program had significantly greater improvement in ambulatory performance and mobility function compared with patients in a control group who received a program of stretching plus low-intensity walking. Langhammer & Stanghelle (2010) reported that patients in the treadmill group had better walking speed, endurance, and walking distance following an intervention consisting of 2.5 weeks/5 days week for 30 min of treadmill training versus a control intervention consisting of outdoor walking.

Treadmill training with body weight support (BWS) may also be effective for patients with initial poor ambulatory status, although the evidence is less clear. Duncan et al. (2011) randomized 408 community-dwelling patients with stroke onset of 2 months, who were able to walk 3 meters with maximum of one person assist, to receive a 3-4 month course of early or delayed treadmill training with partial body-weight support or to a home-based exercise program. At one-year, 52% of all patients had improved functional walking ability. There was no difference in the proportion of improvement found among the 3 groups. In the MOBILISE trial, (Ada et al. 2010, Dean et al. 2010) 126 patients within 28 days of stroke were randomized to an experimental or a control group and received treatment until they achieved independent walking or for as long as they remained in hospital. Subjects in both groups received 30 minutes of walking practice 5 days/week. Additional lower-limb therapy was provided for an additional 30 minutes/day. Subjects in the experimental group undertook up to 30 minutes per day of treadmill walking with sufficient body weight support such that initially, the knee was within 15 degrees of extension in mid stance. Subjects the control group received up to 30 minutes of overground walking training, with the use of aides, if required. Although there were no differences in the proportion of independent ambulators between groups at one, two or 6 months, subjects in the experimental group achieved independence in ambulation a median of 14 days sooner.

Aerobic exercise can be used to improve measures of gait performance. A Cochrane review (Brazzelli et al. 2011), included the results from 32 trials of patients in both the acute and chronic stages of stroke. Interventions were classified as 1) Cardiorespiratory training vs. usual care, 2) Resistance training vs. usual care and 3) Mixed training interventions, which included combinations of cardiorespiratory and resistance training methods. At the end of follow-up, cardiorespiratory training was not associated with reductions in disability (measured by FIM), but maximal and preferred walking speed and walking capacity were significantly improved. Increased gait speed and improved walking capacity were also associated with mixed training interventions. Pang et al. (2006) also conducted a systematic review of aerobic exercise following stroke, which included the results from 7 RCTs, evaluating patients in all stages of stroke recovery. Exercise intensity in the included studies ranged from 50% to 80% of heart rate reserve, while duration varied from 20-40 min for 3-5 days a week for 3-19 weeks. Regardless of the stage of stroke recovery, there was a significant benefit of therapy. Improvements were noted in the parameters of peak VO_2 , peak workload, walking speed and endurance. Jin et al (2012) and Globas et al (2012) reported significant improvements in measures of cardiovascular fitness, walking ability and performance in patients >6 months post stroke

who had received a progressive graded, high-intensity aerobic treadmill exercise or aerobic cycling exercise, with lower extremity weights. MacKay-Lyons et al. (2013) reported that a 12-week aerobic conditioning program using body-weight supported treadmill training was associated with improvements in cardiovascular fitness and walking ability that were sustained for one year.

[Link to Evidence Table 5.6.3 and Reference List](#)

For further information and references, please consult the Evidence Based Review of Stroke Rehabilitation at <http://www.ebrsr.com>; and StrokEngine at www.StrokEngine.ca

Best Practice Recommendation 5.6.4 Falls Prevention and Management

- i. Following stroke, all patients should be screened for fall risk by an experienced clinician at admission, at all transition points, and/or whenever there is a change in health status [Evidence Level C].
- ii. Screening should include identification of medical, functional, cognitive, and environmental factors associated with risk of falling and fall injuries (e.g., osteoporosis and low vitamin D levels) [Evidence Level B].
- iii. Those identified as being at risk for falls should undergo a comprehensive interprofessional assessment that includes medical and functional history and evaluation of mobility, vision, perception, cognition, and cardiovascular status [Evidence Level C].
- iv. Based on risk assessment findings, an individualized falls prevention plan should be implemented for each patient [Evidence Level B].
- v. Patients should be made aware of their increased risk for falls and given a list of precautions to reduce their risk of falling [Evidence Level B].
- vi. Families and caregivers should receive skills training to enable them to safely transfer and mobilize the patient [Evidence Level B].
- vii. The patient, family, and caregiver should receive education regarding suitable gait aides, footwear, transfers, and wheelchair use (e.g., direction of transfer, transfer belt use, seatbelt use, arm support devices, foot rests, and brakes) [Evidence Level B].
- viii. If a patient experiences a fall, an assessment of the circumstances surrounding the fall should be conducted to identify precipitating factors. Pre-existing falls prevention plans should be modified to reduce the risk of further falls [Evidence Level C].

Rationale

Patients with stroke are at higher risk for falls than many other hospitalized patients. The reported incidence ranges from 14 to 65 percent. Falls occur often within the first week following stroke during the acute phase, and then again as patient mobility increases. The interprofessional care team must be cognizant of the risk for falls and ensure appropriate assessments and interventions take place.

System Implications

- Organizations should provide a falls prevention and management strategy that includes:
- regular and ongoing education for staff in all hospital settings about risk assessment and prevention strategies related to falls, including transfer and mobilization training;
 - use of a falls screening tool in all organizations for early recognition of fall risk;
 - patient transferring and mobilization instructions provided to all staff by physical therapists and occupational therapists, and provided to patients and families by trained staff members;
 - All therapies should be delivered by trained professionals capable of interacting with people with communication limitations such as aphasia, by using supported conversation techniques;
 - standardized falls risk assessment process that addresses timing, components, and the need for documentation;

- universal falls precautions in all environments where stroke patients receive care.

Performance Measures

1. **Fall incidence rate for stroke patients admitted to hospital (acute care or rehabilitation).**
2. Percentage of patients with falls who experience injuries during the fall.
3. Percentage of patients with falls who experience a prolonged length of stay as a result of the fall.

Measurement Notes

- Falls assessments are included as separate documentation in some organizations, and included in interprofessional clinical notes in others.
- The absence of documentation may not reflect whether or not assessments were done.

Implementation Resources and Knowledge Transfer Tools

- o **Canadian Stroke Best Practices *Taking Action Towards Optimal Stroke Care Resource Kit***
- o Table 5.1, summary of validated and frequently used screening and assessment tools for stroke rehabilitation
- o RNAO Prevention of Falls and Fall Injuries in the Older Adult Best Practice Guideline: www.rnao.org
- o Berg Balance Scale http://strokengine.ca/assess/module_bbs_intro-en.html
- o Function in Sitting Test
<http://www.rehabmeasures.org/Lists/RehabMeasures/DispForm.aspx?ID=1062&Source=http%3A%2F%2Fwww%2Erehabmeasures%2Eorg%2Frehabweb%2Fallmeasures%2Easpx%3FView%3D%257b0C859D90%252d7478%252d4C9B%252d9575%252d784C4A9A2D85%257d%26PageView%3DShared>
- o Falls Risk Assessment Tool
http://www.google.ca/url?sa=t&rct=j&q=tools%20to%20assess%20patient%20falls%20risk&source=web&cd=1&ved=0CEYQFjAA&url=http%3A%2F%2Fwww.health.vic.gov.au%2Fagedcare%2Fmaintaining%2Ffalls_dev%2Fdownloads%2Fb2b_1a_frat.pdf&ei=xnzNUZvODYbtygGPhlCOBA&usq=AFOjCNG551Ki6hrPEcDEikNRJPjZl_DrA&bvm=bv.48572450.d.aWc
- o Schmid Fall Risk Assessment Tool – Acute Care
http://www.google.ca/url?sa=t&rct=j&q=tools%20to%20assess%20patient%20falls%20risk&source=web&cd=5&ved=0CFgQFjAE&url=http%3A%2F%2Fwww.albertahealthservices.ca%2Fps-1051701-fpp-schmid-risk-ass-tool.pdf&ei=xnzNUZvODYbtygGPhlCOBA&usq=AFOjCNEyPbrfsN3hWMP0RAZSfa_OYfBeTg&bvm=bv.48572450.d.aWc

Summary of the Evidence

Update 2013

The risk of falling is increased following stroke due to leg weakness, impaired balance, visual disturbances, cognitive impairment and sensory loss. During inpatient rehabilitation the reported incidence of falls has been reported to range from 25%-39%. Upon return to the community, the risk increases further. Forster & Young (1995) reported that up to 73% of persons had fallen within 6 months of discharge from hospital following stroke, although serious injuries were not reported frequently.

Teasell et al. (2002) reported that one third of patients on a stroke rehabilitation unit sustaining at least one fall during their stay. Of 238 patients, 88 (37%) experienced at least 1 fall, and almost half of these (45 patients [19%]) experienced at least 2 falls, over the 5-year study period. Injuries were reported in 22% of the falls. There were no differences in stroke type ($P=0.393$), stroke location ($P=0.926$), or gender ($P=0.741$) between fallers and nonfallers; however, there were differences in the scores of all functional measurement scores between the groups. The arm, leg, and foot components of the admission Cedoke McMaster scores were significantly lower for fallers compared with nonfallers ($P < 0.05$). Admission Berg Balance Scale scores were significantly

lower in fallers when compared with nonfallers (19.0 ± 13.9 vs. 30.7 ± 16.6 , $P < .0001$). FIM scores of nonfallers were higher than fallers ($P < .0001$) and there was an inverse relationship between admission FIM scores and the number of falls. The average admission FIM score for one-time fallers was 72.4 ± 19.1 but declined to 43.6 ± 22.9 for those who had experienced four or more falls ($P < .0001$). When functional deficits between the two groups were compared fallers were more likely to be apraxic ($P = 0.014$) and have cognitive deficits ($P = 0.010$).

Czernuszenko & Czlonkowska (2009) assessed the incidence and circumstances of falls in patients during inpatient stroke rehabilitation, the frequency of fall-related fractures and identified the risk factors for single and repeated falls. Two hundred fifty-two falls were reported in 189 (16.3%) patients during the observation period. The incidence rate for any fall was 7.6 per 1000 patient-days (95% CI 6.6–8.5). Almost two-thirds (65%; $n=163$) of falls occurred in the first two weeks after admission. Most falls ($n=207$; 82%) occurred during the day between the hours of 6 am and 8 pm with a peak incidence between 11 am–1 pm. Patients fell during activities that included transfers (34%; $n=85$), while sitting (21%; $n=54$) and during position changes such as going from a sitting to standing or standing to sitting position (13%; $n=32$). Falls from bed accounted for 10 percent ($n=24$) of the events. In 24 cases, falls resulted from inadequate or insufficient staff assistance (5 falls from bed, 19 falls from a wheelchair or toilet bowl). In three cases, patients slid on a wet floor, and falls occurred in three cases due to inadequate assistance by visitors. Seventy-two per cent ($n=182$) of falls resulted in no injury; 27 percent ($n=67$) resulted in bruises grazes or lacerations; and 1.2 percent ($n=3$) resulted in fractures (proximal femur, humeral bone and pelvis).

There have been very few RCTs conducted evaluating therapies to specifically reduce the occurrence of falls following stroke. Batchelor et al. (2010) conducted a systematic review and meta-analysis to examine the effectiveness of interventions that reduce falls following stroke. The results from 13 RCTs were included. The intervention types examined were classified as: physical therapy, modifying the environment or increasing knowledge, models of stroke care and medications designed to improve bone density. It should be noted that the incidence of falls was often a secondary outcome in the majority of these trials (i.e., they were not designed specifically to reduce falls). Pooling of results was limited to two treatment contrasts (exercise vs. usual care and bisphosphonate use vs. placebo) in three studies. There was no significant effect of exercise on fall rate (rate ratio=1.22; 95% CI, 0.76 –1.98) or proportion of fallers (Relative Risk= 0.77; 95% CI, 0.24- 2.43). Bisphosphonate usage was also associated with a non-significant reduction in the proportion of fallers (Relative risk=0.95; 95% CI, 0.73–1.22).

More recently, the results from two RCTs, designed specifically as therapy to reduce the incidence of falls suggest that falls prevention programs are not effective. Dean et al. (2012) randomized 151 community-based stroke patients to an intervention group that received exercise and task related training or control group that performed an upper-extremity strength training program and cognitive tasks. At 12 month follow up, although patients in the experimental group showed significantly improvement in gait speed, there was no significant difference between groups in the number of patients who fell ($n=129$, experimental group vs. $n=133$, control group). Batchelor et al. (2012) randomized 156 patients at high risk of falls into a tailored multifactorial falls prevention group or the control group which consisted of usual care. The falls prevention program consisted of an individualized home-based exercise program, falls risk strategies, education, and injury risk minimization strategies. Patients in the control group received usual care. There was no difference in the falls rate between groups. The intervention group had 1.89 falls/person-year, and the control group had 1.76 falls/person-year, incidence rate ratio=1.10, $P=0.74$). The proportion of fallers did not differ significantly between groups (risk ratio=0.83, 95% CI, 0.6-1.14), nor was the injurious fall rate (intervention group 0.74 vs. control group 0.49 injurious falls/person-year, incidence rate ratio=1.57, $P=0.25$).

[Link to Evidence Table 5.6.4 and Reference List](#)

For further information and references, please consult the Evidence Based Review of Stroke Rehabilitation at <http://www.ebrsr.com>; and StrokEngine at www.StrokEngine.ca.

Best Practice Recommendation 5.7

Assessment and Management of Dysphagia and Malnutrition Following Stroke

5.7.1 Dysphagia

- i. Interprofessional team members should be trained to complete initial swallowing screening for all stroke patients to ensure patients are screened in a timely manner [Evidence Level C].
- ii. Patients should be screened for swallowing deficits within the first 24 hours of admission using a valid screening tool [Evidence Level B]. Patients who are not initially alert should be closely monitored and screened when clinically appropriate [Evidence Level C].
Refer to Table 4.2: Canadian Stroke Best Practices Swallow Screening and Assessment Tools for more information (Also see Appendix 5.1 at the end of the Stroke Rehabilitation Chapter)
- iii. Abnormal results from the initial or ongoing swallowing screens should prompt a referral to a speech-language pathologist, occupational therapist, dietitian or other trained dysphagia clinician for more detailed assessment and management of swallowing, nutritional and hydration status [Evidence Level C]. An individualized management plan should be developed to address therapy for dysphagia, dietary needs, and specialized nutrition plans [Evidence Level C].
- iv. Videofluoroscopic modified barium swallow (MBS), which allows actual visualization of swallowing, should be performed on all patients considered at high risk for aspiration, based on results from a bedside swallowing assessment, stroke location (e.g. brain stem stroke, pseudobulbar palsy), or other clinical features (e.g., multiple strokes) [Evidence Level B].
 - a. Modified barium swallow may also be used to guide management decisions for patients with dysphagia [Evidence Level C].
- v. Management of dysphagia includes the use restorative swallowing therapy (e.g., lingual exercises) and/or compensatory techniques, with reassessment as required [Evidence Level C].
 - a. Compensatory techniques may include upright positioning; double swallow technique, coughing after swallowing, small sips of fluids only, texture-modified solids and altered consistency fluids, and/or restorative swallowing therapy [Evidence Level C].
- vi. To reduce the risk of pneumonia, patients should be permitted and encouraged to feed themselves whenever possible [Evidence Level C].
- vii. Patients should be given meticulous mouth and dental care, and educated in the need for good oral hygiene to further reduce the risk of pneumonia [Evidence Level B].

5.7.2 Nutrition

- i. Patients should be screened for premorbid malnutrition within 48 hours of admission using a valid screening tool.
 - a. Patients should be rescreened for changes in nutritional status throughout inpatient admission and prior to discharge, as well as periodically in outpatient and community settings [Evidence Level C].
 - b. Screening of a patient's nutritional status should include an assessment of their

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| <p>ability to eat independently, weight changes, and a periodic record of their food consumption and nutritional intake [Evidence Level C].</p> <p>c. Results from the screening process should be used to guide appropriate referral to a dietitian for further assessment and ongoing management of nutritional and hydration status [Evidence Level C].</p> <p>ii. Stroke patients with suspected nutritional concerns, hydration deficits, dysphagia, or other comorbidities that may affect nutrition (such as diabetes) should be referred to a dietitian for recommendations:</p> <p>a. To meet nutrient and fluid needs orally while supporting alterations in food texture and fluid consistency recommended by a speech-language pathologist or other trained professional [Evidence Level B];</p> <p>b. For enteral nutrition support (nasogastric tube feeding) in patients who cannot safely swallow or meet their nutrient and fluid needs orally.</p> <p>c. The decision to proceed with tube feeding should be made as early as possible after admission, usually within the first three days of admission in collaboration with the patient, family (or substitute decision maker), and interprofessional team [Evidence Level B].</p> |
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| <p>Rationale</p> <p>The published estimates of the incidence of stroke-related dysphagia vary widely from 19% to 65% in the acute stage of stroke, depending on the lesion location, timing and selection of assessment methods. The presence of dysphagia is important clinically because it has been associated with increased mortality and medical complications, including pneumonia. The risk of pneumonia has been shown to be 3 times higher when patients are dysphagic. Stroke-related pneumonia is fairly common with estimates that range from 5% to 26%, depending on diagnostic criteria.</p> |
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| <p>System Implications</p> <p>In order to manage dysphagia and malnutrition post stroke organizations should:</p> <ul style="list-style-type: none"> • develop and deliver educational programs to train appropriate staff to perform an initial swallowing screen for stroke patients. This may include staff across the continuum, such as in emergency departments, acute inpatient units, rehabilitation facilities, and community and long-term care settings; • ensure access to appropriately trained healthcare professionals such as speech-language pathologists, occupational therapists, and/or dietitians who can conduct in-depth assessments. |
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| <p>Performance Measures</p> <ol style="list-style-type: none"> 1. Proportion of stroke patients with documentation that an initial dysphagia screening assessment was performed in the emergency department or during hospital admission (core). 2. Proportion of stroke patients who fail an initial dysphagia screening who then receive a comprehensive assessment by a speech-language pathologist, occupational therapist, dietitian, or other appropriately trained healthcare professional. 3. Median time in minutes from patient arrival in the emergency department to initial swallowing screening by a trained clinician. 4. Incidence of malnutrition among patients admitted to inpatient care for stroke. |
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Measurement Notes:

- In chart audits, dysphagia screening has been poorly documented. Clinical providers should be educated and made aware of the importance of documenting dysphagia screening for valid and reliable measurement and monitoring.
- Measure 1 is a mandatory reporting indicator for the Accreditation Canada Stroke Distinction Program

Implementation Resources and Knowledge Transfer Tools

- **Canadian Stroke Best Practices *Taking Action Towards Optimal Stroke Care Resource Kit***
- **Table 4.2**, Canadian Stroke Best Practices Summary of Swallowing Screening and Assessment Tools
- **Table 5.1**, summary of validated and frequently used screening and assessment tools for stroke rehabilitation
- Mini Nutritional Assessment http://www.nestle-nutrition.com/clinical_resources/Mini_Nutritional_Assessment.aspx
- Malnutrition Universal Screening Tool (MUST) <http://www.bapen.org.uk/screening-for-malnutrition/must/introducing-must>

Summary of the Evidence

Updated 2013

Evidence suggests a standardized program for screening, diagnosis and treatment of dysphagia following acute stroke results in reductions in the incidence of pneumonia, feeding tube dependency and length of hospital stay. (Hinchey et al. 2005, Lakshminarayan et al. 2010). Bedside screening may include components related to a patient's level of consciousness, an evaluation of the patient's oral motor function and oral sensation, as well as the presence of a cough. It may also include trials of fluid. Coughing during and up to one minute following test completion and/or "wet" or hoarse voice are suggestive of an abnormal swallow. Silent aspiration may occur in patients who do not cough or complain of any problems with swallowing or have no wet-sounding voice. If there is silent aspiration, the patient may not display any signs or symptoms on the trial swallows. It is possible for them to not demonstrate obvious problems during the initial screen and still be aspirating. Therefore all stroke patients, regardless of their screening result, should be informally monitored during their hospital stay for symptoms of swallowing problems.

The effectiveness of a variety of treatments for dysphagia management was recently the subject of a Cochrane review (Geeganage et al. 2012). The results from 33 RCTs examining acupuncture, behavioral interventions, drug therapy, neuromuscular electrical stimulation, pharyngeal electrical stimulation, physical stimulation, (thermal, tactile) transcranial direct current stimulation and transcranial magnetic stimulation, were included. Pooling of results was not possible for many of the outcomes due to small numbers of studies available evaluating similar interventions/outcomes. Death or dependency at end of trial was the primary outcome, although only two RCTs were included in the pooled result. The results were not significant (OR=1.05, 95% CI 0.63 to 1.75, p=0.86). Acupuncture and behavioural modifications were associated with reduction in the presence of dysphagia at the end of treatment. No significant treatment effect was associated with subgroup analysis by therapy type (behavioral interventions, drug therapy, and electrical stimulation) for the outcome of chest infections.

Dietary modifications, including altered textured solids and fluids and the use of restorative swallowing therapy, and compensatory techniques, are the most commonly used treatments for the management of dysphagia in patients who are still safe to continue oral intake. Unfortunately, there is little direct evidence of their benefit. The effectiveness of behavioural modifications and dysphagia therapy has been examined in two RCTs. Carnaby et al. (2006) randomized 306 patients with dysphagia admitted to hospital within 7 days of acute stroke, to receive usual care, standard low-intensity intervention (composed of environmental modifications, safe swallowing advice and appropriate dietary modifications), or standard high-intensity

intervention and dietary prescription (daily direct swallowing exercises, dietary modification), for up to one month. When the results from the high-intensity and low-intensity groups were combined and compared with the usual care group, patients in the active therapy group regained functional swallow sooner and had a lower risk of chest infections at 6 months. There were no differences between groups for the risk of death, death or dependency, death or institutionalization, or return to normal diet within 6 months. De Pippo et al. (1994) did not report a reduction in the incidence of pneumonia, dehydration, recurrent upper-airway obstruction or death associated with daily sessions with a Speech-Language therapist during hospitalization on a stroke rehabilitation unit.

Enteral feeding is used when patients' swallowing impairment precludes safe oral feeding. In the early days following stroke, treatment decisions usually centre on the type of feeding type to use (i.e., nasogastric or enteric feeding tubes). The evidence relating to the superiority of one type is lacking. In one arm of the FOOD trial (2005), patients were randomized to receive either a percutaneous endoscopic gastrostomy (PEG) or nasogastric (NG) feeding tube within 3 days of enrolment into the study. PEG feeding was associated with an absolute increase in risk of death of 1.0% (-10.0 to 11.9, $p=0.9$) and an increased risk of death or poor outcome of 7.8% (0.0 to 15.5, $p=0.05$).

Treatment with neuromuscular electrical stimulation may be effective in the rehabilitation of dysphagia, although it is a treatment option not commonly used in clinical practice in Canada. Carnaby-Mann & Crary et al. (2007) conducted a systematic review and meta-analysis, which included the results from 7 studies of patients with oropharyngeal dysphagia secondary to stroke, cancer or other disease. A moderate treatment effect was reported for the outcome of change in swallowing score assessed using the Mann Assessment of Swallowing Ability score or the Functional Oral Intake Scale (SMD=0.66, 95% CI 0.47 to 0.85, $p<0.001$). Evidence of improvement in swallowing ability associated with NMES treatment has also been reported in RCTs which included only patients recovering from stroke (Kim et al. 2009, Xia et al. 2011).

Oral supplementation can be used for patients who are not able to consume sufficient energy and protein to maintain body weight, or for those with premorbid malnutrition. The FOOD trial (2005) aimed to establish whether routine oral nutritional supplementation in patients who could safely swallow and were prescribed a regular hospital diet, was associated with improved outcome after stroke. 4,023 patients were randomized to receive or not receive an oral nutritional supplement (540 Kcals) in addition to a regular hospital diet, provided for the duration of their entire hospital stay. At 6 month follow-up, there were no significant differences between groups on the primary outcome of death or poor outcome (OR=1.03, 95% CI 0.91 to 1.17, $p>0.05$). The absolute risk of death or poor outcome was 0.7%, 95% CI -2.3 to 3.8. Only 314 (8%) patients were judged to be undernourished at baseline. The anticipated 4% absolute benefit for death or poor outcome from routine oral nutritional supplements was not evident. The FOOD trial results would be compatible with a 1% to 2% absolute benefit or harm from oral supplements. Results from RCTs examining nutrition-related outcomes suggest that oral supplements can increase the amount of energy and protein patients consume, and prevent unintentional weight loss (Gariballa et al. 1998, Ha et al. 2010).

[Link to Evidence Table 5.7 and Reference List](#)

For further information and references, please consult the Evidence Based Review of Stroke Rehabilitation at <http://www.ebrsr.com>; and StrokEngine at www.StrokEngine.ca

Best Practice Recommendation 5.8 Rehabilitation of Visual Perceptual Deficits

- i. All patients with stroke should be screened for visual perceptual deficits as a routine part of the broader rehabilitation assessment process [Evidence Level C].
- ii. Patients with suspected perceptual impairments (visual neglect, non-lateralized visuo-spatial impairment, agnosias, prosopagnosia, body schema disorders and apraxias) should be assessed using validated tools [Evidence Level C]. Tools should be adapted for use with patients who have communication limitations such as aphasia.
- iii. Treatment of neglect can include visual scanning techniques, phasic alerting, cuing, imagery, virtual reality, hemispheric (limb) activation and trunk rotation [Evidence Level B].
- iv. Remedial based techniques could include prisms, eye patching, transcranial magnetic stimulation, and neck muscle vibration [Evidence Level A].
- v. Patients with suspected limb apraxia should be treated using errorless learning, gesture training and graded strategy training [Evidence Level B].

Rationale

Visual perceptual disorders are a common clinical consequence of stroke. They include unilateral neglect, which has a major impact on rehabilitation outcome. Visual perceptual disorders result in processing changes in the integration of visual information with other systems. These changes decrease a patient's ability to adapt to the basic requirements of daily life. The incidence of unilateral spatial neglect is estimated to be approximately 23%. The presence of neglect has been associated with both severity of stroke and age of the individual.

Limb apraxias are more common in those with left hemisphere involvement (28 – 57%) but can also be seen in right hemisphere damage (0 – 34%) (Donkervoort et al., 2000). While apraxia improves with early recovery, up to 20 percent of those initially identified will continue to demonstrate persistent problems. Severity of apraxia is associated with changes in functional performance.

System Implications

To achieve timely and appropriate assessment and management of perceptual deficits, the organization should provide:

- Initial standardized assessment of visual perceptual deficits (including inattention and apraxia) performed by clinicians experienced in the field of stroke.
- Timely access to specialized, interprofessional stroke rehabilitation services where therapies of appropriate type and intensity are provided.
- Access to appropriate equipment.
- Long-term rehabilitation services widely available in nursing and continuing care facilities, and in outpatient and community programs.

Performance Measures

1. Proportion of stroke patients with documentation that an initial screening for visual perceptual deficits was performed as part of a comprehensive rehabilitation assessment.
2. Proportion of stroke patients with poor results on initial screening who then receive a comprehensive assessment by appropriately trained healthcare professionals.

Implementation Resources and Knowledge Transfer Tools (pulled from StrokEngine)

- o Canadian Stroke Best Practices *Taking Action Towards Optimal Stroke Care Resource Kit*
- o **Table 5.1**, summary of validated and frequently used screening and assessment tools for stroke rehabilitation
- o Comb and Razor Test http://strokengine.ca/assess/module_crt_intro-en.html
- o Behavioral Inattention Test http://strokengine.ca/assess/module_bit_intro-en.html
- o Line Bisection Test http://strokengine.ca/assess/module_lbt_intro-en.html
- o Rivermead Perceptual Assessment Battery <http://www.gla-assessment.co.uk/products/rivermead-perceptual-assessment-battery>
- o Ontario Society of Occupational Therapy Perceptual Evaluation http://strokengine.ca/assess/module_osot_intro-en.html
- o Motor-Free Visual Perceptual Test http://strokengine.ca/assess/module_mvpt_intro-en.html
- o Apraxia Assessment Tools:
 - Test of Oral and Limb Apraxia (Helm-Estabrooks, 1992) (Commercial) <http://buros.unl.edu/buros/jsp/reviews.jsp?item=05002705>
 - Florida Apraxia Screening Tool (FAST-R) (Rothi et al., 1997) & Florida Apraxia Battery-Extended and Revised Sydney (FABERS) (Emma et al., 2008) <http://books.google.com/books?id=BA4HbvzqcVcC&pg=PA62&lpg=PA62&dq=Florida+Apraxia+Screening+Tool&source=bl&ots=w1B9cCYSg9&sig=cK1uo9I1POOav3-1YLANLCqvgWA&hl=en&sa=X&ei=HU2-UbysDIX6yQGO0YHABQ&ved=0CEQQ6AEwAQ#v=onepage&q=Florida%20Apraxia%20Screening%20Tool&f=false>
 - Apraxia Screen of TULIA (AST) (Vanbellingen et al., 2011) <http://tulia.ch/wordpress/wp-content/uploads/2011/02/AST1.pdf>

Summary of the Evidence

Perceptual deficits or disorders may affect any of the sensory modalities, resulting in disorders that may include visual, tactile, location, auditory, spatial, object (object agnosia), prosopagnosia, and colour processing, among others (Bowen et al., 2011). The prevalence of post-stroke perceptual deficits has been estimated to be as high as 69% one-month post-stroke and 74% two-years post-stroke (Edmans et al., 2000).

Of the perceptual deficits that affect individuals post-stroke, visual perceptual disorders, including unilateral spatial neglect (USN), may be the most frequently selected for investigation. In the Copenhagen Stroke Study, the incidence rate of post-stroke USN was found to be 23%, with USN being more common among individuals with a right-sided, as compared to a left-sided lesion (42% vs. 8%) (Pedersen et al., 1997). Presence of neglect has been reported to have a negative impact on functional recovery, length of rehabilitation stay, and independence following discharge (Katz et al., 1999; Paolucci et al., 2001; Gillen et al., 2005; Wee & Hopman, 2008).

In a recent Cochrane review, Bowen and colleagues identified 5 studies (n=308) investigating non-pharmacological interventions for the treatment of post-stroke perceptual disorders, each of which examined some form of sensory stimulation (Bowen et al. 2011). Based on the results of three trials providing sufficient data for pooling, no significant between group differences were found in perceptual impairment at the end of treatment (SMD=0.07, 95% CI -0.29 to 0.43). In another Cochrane review, 12 trials (n=306) were identified examining cognitive rehabilitation for the treatment of spatial neglect (Bowen and Lincoln, 2007). Although cognitive rehabilitation was

associated with significant improvement in standardized neglect outcomes, treatment was not found to have a significant effect on functional disability (end of treatment: SMD=0.26 95% CI -0.2 to 0.7; follow-up: SMD=0.61, 95% CI -0.4 to 1.6). In both of these reviews, the authors concluded that there is insufficient evidence to support or refute the effectiveness of the interventions examined (Bowen et al., 2011; Bowen and Lincoln, 2007).

In a third Cochrane review examining interventions for visual field defects, Pollock and colleagues identified 13 studies (n=344, 83% post-stroke) exploring vision restorative therapy, visual scanning, and prism therapy (Pollock et al. 2011). Of the three treatments, only prism therapy was associated with significant improvement in visual field outcomes (MD=8.40, 95% CI 4.0 to 12.8). While both prism therapy and visual scanning were associated with improvement in scanning outcomes, neither treatment was found to have a significant treatment effect on functional ADLs (Pollock et al. 2011). More recent trials examining visual scanning and prism therapy have not provided further support for the use of these therapies (Ferreira et al. 2011; Mancuso et al. 2012).

[Link to Evidence Table 5.8 and Reference List](#)

For further information and references, please consult the Evidence Based Review of Stroke Rehabilitation at <http://www.ebrsr.com>; and StrokEngine at www.StrokEngine.ca

Best Practice Recommendation 5.9 Rehabilitation to Improve Central Pain

- i. Patients with persistent Central Post Stroke Pain (CPSP) should receive a trial of low-dose, centrally acting analgesics, as recommended by the Canadian Pain Society [Evidence Level C]:
 - a. Patients should receive an anticonvulsant (such as gabapentin or pregabalin) as a first-line treatment [Evidence Level C].
 - b. Patients should receive a tricyclic antidepressant (e.g., amitriptyline) or an SNRI (particularly duloxetine) as second-line treatment [Evidence Level C].
 - c. Treatment for patients resistant to first and second line treatment can include opioids or tramadol [Evidence Level C]. Caution is advised for the use of Opioids as there is a significant risk of physical dependency.
- ii. An individualized patient-centred approach for management of central pain syndromes should be implemented by an interdisciplinary team that includes healthcare professionals with mental health expertise as well as expertise in central pain management [Evidence Level C].

Rationale

Central post-stroke pain (CPSP) is a rare neurological disorder, in which the body becomes hypersensitive to pain as a result of damage to the spinothalamic tract (STT), although not all damage to the STT produces CPSP. It reportedly affects 2% to 5% of stroke patients. With involvement of the STT, patients have loss of temperature and pain sensation in the involved area. It is most commonly associated with lesions to the ventrocaudal nucleus of the thalamus but has been reported in brainstem lesions where there is damage to the STT. The primary symptoms are pain and loss of sensation, usually in the face, arms, and/or legs. Pain or discomfort may be felt after being mildly touched or even in the absence of a stimulus. The pain may worsen by exposure to heat or cold and by emotional distress. CPSP can dramatically hinder a patient's ability to perform ADLs, interfere with sleep and reduce quality of life.

System Implications

- Inclusion of central pain assessments as part of standard screening and assessment protocols for stroke rehabilitation
- Access to specialized services for management of central pain

Performance Measures

1. Changes in pain ratings from initiation of treatment, measured weekly, using standardized pains scales.
2. Changes in quality of life of stroke patients who experience central pain syndrome, measured using a standardized scale and at regular follow-up intervals.

Implementation Resources and Knowledge Transfer Tools

- o **Canadian Stroke Best Practices Taking Action Towards Optimal Stroke Care Resource Kit**
- o **Table 5.1**, summary of validated and frequently used screening and assessment tools for

stroke rehabilitation

- o Canadian Pain Society guidelines for the management of chronic neuropathic pain: http://www.canadianpainsociety.ca/pdf/PharmacologicalManagementChronicPain_CPS-GUIDELINES.pdf
- o Visual Analogue Scale (VAS) http://www.blackwellpublishing.com/specialarticles/jcn_10_706.pdf
- o McGill Pain Questionnaire <https://www.gem-beta.org/public/DownloadMeasure.aspx?mid=1348>
- o 0 – 10 Numeric Pain Rating Scale http://www.painedu.org/Downloads/NIPC/Pain_Assessment_Scales.pdf
- o Ways of Coping Scale (WCS) <http://www.mindgarden.com/products/waysss.htm>
- o Revised Illness Perception Questionnaire (IPQ-R) <http://www.uib.no/ipq/>
- o Beck Depression Inventory (BDI), PHQ-9 Depression Scale http://strokeengine.ca/assess/module_bdi_intro-en.html
- o **Table 7.1**, Depression Assessment and Screening Tools

Summary of the Evidence

Update 2013

Central post-stroke pain (CPSP) is a rare neurological disorder, in which the body becomes hypersensitive to pain as a result of damage to the thalamus, the part of the brain that affects sensation. The condition is rare, occurring in an estimated 2% to 5% of all stroke cases. Antidepressants including tricyclic antidepressants, serotonin–norepinephrine reuptake inhibitors and selective serotonin reuptake inhibitors are used most frequently for the treatment of neuropathic pain, although there is little published evidence of their effectiveness in CPSP. Vranken et al. (2011) randomized 48 patients with severe neuropathic pain resulting from cerebrovascular lesions or spinal cord lesions to receive escalating doses of either duloxetine (60 and 120mg/day) or placebo for 8 weeks. There was a trend towards reduction in pain associated with duloxetine treatment. At the end of treatment, the mean pain scores, assessed using a 10-point visual analogue scale were reduced from 7.1 to 5.0 (duloxetine) vs. 7.2 to 6.1 (placebo), $p=0.06$. There were no differences between groups in Patient Disability Index or EQ-5D scores but patients in the duloxetine group reported better pain scores on the bodily pain sub section of the SF-36 ($p=0.035$).

Several RCTs have been published evaluating the effectiveness of the anticonvulsant drugs, pregabalin and gabapentin. The majority of these studies have included patients with neuropathic pain of varying etiology. A single RCT included patients who were suffering exclusively from CPSP. In this study (Kim et al. 2011) randomized 220 patients to receive either 150-600 mg of pregabalin or placebo over 13 weeks. At the end of treatment the mean pain scores were reduced from 6.5 to 4.9 in the pregabalin group and from 6.3 to 5.0 in the placebo group, although the difference was not statistically significant. ($p=0.578$). Treatment with pregabalin resulted in significant improvements, compared with placebo, on secondary endpoints including some aspects of sleep, anxiety (Hospital Anxiety & Depression Scale-A), and clinician global impression of change ($p<0.05$). Adverse events were more frequent with pregabalin than with placebo and caused discontinuation of treatment in 9 (8.2%) patients compared with 4 (3.7%) of placebo patients. Vranken et al. (2008) randomized 40 patients (19 with stroke) suffering from severe neuropathic pain, to receive a 4-week course of treatment with escalating doses of pregabalin (max 600 mg/day) or placebo. At the end of treatment, patients in the pregabalin group experienced significantly greater pain relief on a 10-point visual analogue scale (mean=7.6 to 5.1 vs. 7.4 to 7.3, $p=0.01$) and had significant improvement in EQ-5D scores and in the bodily pain domain of the SF-36. There was no significant difference in Pain Disability Index scores between groups. Serpell et al. (2002) randomized 307 patients with a wide range of neuropathic pain syndromes (9 with post stroke pain) to receive either gabapentin or placebo for 8-weeks. Gabapentin was given in three divided doses to a maximum of 2400 mg/day. Patients in the treatment group experienced a significantly greater reduction in pain over the study period

(mean reduction of 21% vs. 14%, $p=0.048$). Significant differences were shown in favour of gabapentin for the clinician and patient Global Impression of Change Scale, and some domains of the Short Form-McGill Pain Questionnaire.

[Link to Evidence Table 5.9 and Reference List](#)

For further information and references, please consult the Evidence Based Review of Stroke Rehabilitation at <http://www.ebrsr.com>; and StrokEngine at www.StrokEngine.ca

Best Practice Recommendation 5.10 Rehabilitation to Improve Communication

- i. All health care providers working with persons with stroke across the continuum of care should be trained about aphasia, including the recognition of the impact of aphasia and methods to support communication (Evidence Level C).
- ii. All Stroke patients should be screened for communication deficits using a simple, reliable, validated tool [Evidence Level C]. *Refer to Table 5.10: Screening and Assessment Tools for Stroke Patients with Aphasia.*
- iii. Patients with suspected communication deficits should be referred to a Speech-Language Pathologist (SLP) for assessment of communication ability in the following areas: listening, speaking, reading, writing, gesturing, use of technology, pragmatics (e.g. social cues, turn-taking, body language, etc.) and conversation [Evidence Level C].
- iv. Persons with aphasia should have access to a combination of intensive language therapy and communication therapy according their needs, goals and impairment severity [Evidence Level B].
- v. Treatment to improve functional communication can include language therapy focusing on production and/or comprehension of words, sentences and discourse, (including reading and writing) [Evidence Level C]; conversational treatment, and constraint-induced language therapy [Evidence Level B]; use of non-verbal strategies, assistive devices and technology (e.g., I-Pads, Tablets, other computer-guided therapies) can be incorporated to improve communication [Evidence Level C]. Therapy benefits can be enhanced with computerized language therapy [Evidence Level C].
- vi. Treatment for aphasia should include group therapy and conversation groups. Groups can be guided by trained volunteers and caregivers overseen by an SLP to supplement the intensity of therapy during hospitalization and/or as continuing therapy following discharge [Evidence Level B].
- vii. Treatment to improve functional communication should include Supported Conversation techniques for potential communication partners of the person with aphasia [Evidence Level A].
- viii. All information intended for patient use should be available in aphasia-friendly formats (e.g., patient education material should be available in audio/visual format) [Evidence Level C]. This includes materials such as educational information, consent forms and information regarding participation in stroke rehabilitation research, and assessment tools.
- ix. Families of persons with aphasia should be engaged in the entire process from screening through intervention, including family education and training in supported communication [Evidence Level C].

Refer to section 7.1 for additional information on aphasia and depression.

Rationale

Aphasia is defined as the loss of ability to communicate orally, through signs, or in writing, or the inability to understand such communications. Aphasia is one of the most common consequences of stroke in both the acute and chronic phases. Acutely, it is estimated that from 21 – 38% of stroke patients are aphasic. The presence of aphasia has been associated with general decreased response to stroke rehabilitation interventions and an increased risk for mortality. Therefore aggressive management of aphasia helps to improve both language and

| | |
|---|--------------------|
| broader recovery. | |
| System Implications | |
| <p>Patients with communication deficits, and their family members and caregivers, require access to specialized inpatient and community-based communication services following their stroke:</p> <ul style="list-style-type: none"> • Programs and services should be in place in all organizations and communities with easy access and appropriate support for stroke patients with communication impairments, including access to speech-language pathologists • Telemedicine technology should be strongly considered and actively utilized, particularly in areas with limited in-person access to speech-language pathologists, to ensure equity in rehabilitation opportunities for people with post-stroke aphasia • Community support programs and peer-support groups should be established and information should be readily available in acute care and the rehabilitation settings for patients to access these groups | |
| Performance Measures | |
| <ol style="list-style-type: none"> 1. Percentage of patients screened for aphasia during acute inpatient admission; and during initial assessment in a rehabilitation setting. 2. Percentage of patients with aphasia who receive a detailed assessment by a speech-language pathologist prior to leaving acute care. 3. Median time from hospital discharge to initiation of aphasia therapy in the community. | |
| Implementation Resources and Knowledge Transfer Tools | |
| <ul style="list-style-type: none"> o Canadian Stroke Best Practices <i>Taking Action Towards Optimal Stroke Care Resource Kit</i> o Table 5.1, summary of validated and frequently used screening and assessment tools for stroke rehabilitation o Table 5.10, Screening and Assessment Tools for Stroke Patients with Aphasia o Aphasia Institute at http://www.aphasia.ca/health-care-professionals o Frenchay Aphasia Screening Tools http://strokengine.ca/assess/module_fast_intro-en.html o Western Aphasia Battery http://www.strokestrategy.ab.ca/Capital_Tools/UAHSTRK0220070928094730.pdf o American Speech-Language-Hearing Association Functional Assessment of Communication Skills in Adults (ASHA-FACS) http://strokengine.ca/assess/module_asha_2d_facfs_intro-en.html | |
| Summary of the Evidence | Update 2013 |
| <p>A recent report based on data from the Ontario Stroke Audit estimated that 35% of individuals with stroke have symptoms of aphasia at the time of discharge from acute care (Dickey et al., 2010). Risk factors for aphasia following stroke include older age and greater severity of stroke and stroke-related disability (Dickey et al., 2010; Bersano et al., 2009; Gialanella & Prometti, 2009; Pedersen et al., 2004; Ferro et al., 1999). Presence of post-stroke aphasia is associated with longer lengths of hospital stay (Gialanella & Prometti, 2009), poorer outcomes in terms of activities of daily living and mobility (Gialanella & Prometti, 2009; Paolucci et al., 2005), discharge to long-term care (Gialanella & Prometti, 2009; Dickey et al., 2010), and higher rates of mortality over both the short and long-term following stroke (Bersano et al., 2009). Additionally, aphasia has been demonstrated to have a negative impact on quality of life, mood, and social outcomes (Davidson et al., 2008; Ferro et al., 1999; Wade et al., 1986).</p> | |

In general, there is a large literature base examining the effectiveness of speech and language therapy (SLT) for the treatment of aphasia following stroke. In a recently updated Cochrane review, Brady and colleagues identified 39 RCTs (n=2518) investigating SLT for post-stroke aphasia, 19 (n=1414) of which compared SLT to no treatment (Brady et al., 2012). Patients who received SLT experienced significantly more improvement in functional communication ($p<0.01$), reading comprehension ($p<0.05$), and expressive language ($p<0.05$), as compared to patients randomized to a no treatment control group. An additional 7 trials (n=279) compared SLT to social support/stimulation. Although pooled analysis revealed mixed findings, results from a large (n=170) recent trial suggests that, as compared to unstructured social contact, SLT may not be associated with significantly greater improvement in functional language ability (Bowen et al. 2012).

Brady et al. also identified 25 studies (n=910) comparing one type of SLT with another (Brady et al. 2012). Across the 11 different treatment comparisons, few significant between group differences were identified. The authors concluded that although the results of the review generally favour SLT over no treatment/communication stimulation, there is insufficient evidence to support any specific types of therapy (Brady et al. 2012). However, when interpreting these results, it is important to note that the aphasia literature presents several potential sources of bias, including lack of sample size calculations, use of non-standardized outcome assessments, lack of clarity regarding aphasia types and levels of severity, and undocumented details of therapy (Kelly et al., 2010). Moreover, potential benefits of intensive SLT over conventional SLT may be confounded by significantly higher dropout from intensive SLT (Brady et al., 2012).

In a review examining the association between SLT intensity and treatment effect, Bhogal et al. identified 10 controlled trials examining SLT post-stroke and found that studies with more intensive therapy provision were more likely to report significant positive treatment effects whereas studies with less intensive therapy provision were more likely to report non-significant treatment effects (Bhogal et al., 2003). Bhogal and colleagues concluded that intense SLT over a short period of time is associated with improved outcomes of speech and language for patients with post-stroke aphasia. Likewise, in the recent Cochrane review, Brady et al. concluded that intensive speech and language therapy appears to have some benefit in terms of functional communication, writing, and severity of impairment (Brady et al., 2012).

There is some evidence that group SLT and/or volunteer-facilitated SLT may represent effective means of supplementing available speech language resources and/or to increase the intensity of SLT, where appropriate. Brady and colleagues identified three trials comparing group SLT to conventional SLT and four trials comparing volunteer-facilitated SLT to professional SLT: with respect to both comparisons, outcomes obtained in group and volunteer-facilitated SLT were similar to those obtained in conventional therapy delivered by trained professionals (Brady et al. 2012).

[Link to Evidence Table 5.10 and Reference List](#)

For further information and references, please consult the Evidence Based Review of Stroke Rehabilitation at <http://www.ebrsr.com>; and StrokEngine at www.StrokEngine.ca

Best Practice Recommendation 5.11 Life Roles and Activities (Driving, Vocation, Sexuality and Relationships, and Leisure)

Return to Driving

- i. Patients should be told to stop driving for at least one month after stroke, in accordance with the Canadian Council of Motor Transport Administrators (CCMTA) Medical Standards for Drivers [Evidence Level C].
 - a. Patients who have experienced one or multiple TIAs should be instructed not to resume driving until a comprehensive neurological assessment shows no residual loss of functional ability, to include motor function and cognitive ability, discloses no obvious risk of sudden re-occurrence and any underlying cause has been addressed with appropriate treatment, in accordance with the Canadian Council of Motor Transport Administrators (CCMTA) Medical Standards for Drivers [Evidence Level C].

**Refer to individual provincial and territorial laws for requirements for reporting a patient's fitness to drive to driving authorities.*

- ii. After one month, patients interested in returning to driving should be screened for any residual sensory, motor, or cognitive deficits [Evidence Level B]:
 - a. Sensory assessment should focus on vision, visual fields, visual attention and reading comprehension;
 - b. Motor assessment should focus on strength, coordination and reaction time;
 - c. Cognitive assessment should focus on perception, problem solving, speed of decision making and judgment

Refer to Table 5.11 for suggestions of tools for pre-driving screening

- iii. For patients who have relevant residual neurological deficits related to driving ability, a full comprehensive driving evaluation is recommended to determine fitness to drive [Evidence Level B].
 - a. A government-sanctioned road test is also recommended (CCMTA Medical Standards for Drivers) [Evidence Level C].
- iv. Patients can be referred to training programs, such as simulator based training, to help prepare for a road test or the resumption of driving [Evidence Level B].

Return to Vocation

- i. Patients, especially those <65 years of age, should be asked about vocational interests (i.e., work, school, volunteering) and be assessed for their potential to return to their vocations [Evidence Level C]. This initial screening should take place early in the rehabilitation phase, and become included in the individualized patient goal setting and planning for rehabilitation needs.
- ii. A detailed cognitive assessment including a neuropsychological evaluation, where appropriate and available, is recommended to assist in vocational planning [Evidence Level C].
- iii. School age stroke survivors in the community should have ongoing assessment of

- educational and vocational needs throughout their development [Evidence Level C].
- iv. Resumption of vocational interests should be encouraged where possible. A gradual resumption should occur when fatigue is a concern [Evidence Level C].
 - v. Patients should receive vocational rehabilitation services, as appropriate and where available, for advice on relevant issues such as health and disability benefits and legal rights [Evidence Level C].
 - vi. Employers and education providers should be encouraged to provide work/school modifications and flexibility to allow patients to return to work/school [Evidence Level C].

Sexuality and Relationships

- i. Patients should be given the opportunity to discuss sexuality and sexual functioning with their healthcare provider. Discussion should occur during acute care, rehabilitation and as the patient transitions back into the community. Verbal and written information should be provided and adapted to patients who have communication limitations such as aphasia [Evidence Level C].
- ii. Patients may benefit from education sessions that address expected changes in sexuality, strategies to minimize sexual dysfunction, and frequently asked questions [Evidence Level C].

Leisure Activity

- i. Patients should be given the opportunity to discuss pre-stroke leisure pursuits and be assessed for rehabilitative needs to resume these activities. Participation in leisure activities should be encouraged where possible [Evidence Level B].
- ii. Patients who experience difficulty engaging in leisure activities should receive targeted therapeutic interventions [Evidence Level: Adult-Level A; Pediatric-Level C].
- iii. Children affected by stroke should be offered advice and treatment aimed at achieving play and leisure related skills that are developmentally relevant and appropriate in their home, community, and school environments [Evidence Level C].
- iv. Patients should receive information regarding leisure activities in the community and/or be referred to relevant agencies. Use of peer support groups should be encouraged where available [Evidence Level C].

Refer to Recommendation 6.5 for additional information on community reintegration; and Section 7 for information on Mood and Cognition issues following stroke.

Rationale

Stroke survivors often experience motor, cognitive and psychosocial changes that impact their ability to resume pre stroke pursuits. Return to driving, vocation, sexual activity and leisure activities have each been cited as important rehabilitation goals for patients and evidence indicates that the resumption of these activities are associated with increased quality of life (Gabriele & Renate, 2009; Finestone et al., 2010; Carlsson et al., 2007; Boosman et al., 2011). Furthermore, given increases in the number of individuals working past traditional retirement age and in the incidence of stroke amongst younger individuals (George et al., 2011), issues related to the resumption of these life roles and activities may be increasingly relevant to a growing proportion of stroke survivors.

System Implications

There is a need for:

- open discussions between primary care providers and patients regarding the resumption of pre stroke roles, responsibilities and leisure activities;
- coordination between primary care provider and community agencies for referral to appropriate programs and services;
- active communication between the patient's vocational lead (i.e. supervisor/employer/educator), where applicable, to ensure an appropriate return to pre stroke vocation.
- For patients with aphasia, all discussions should be conducted with proper support ensuring effective communication.

Performance Measures

1. Percentage of patients screened for concerns regarding life roles and leisure activity issues during inpatient/outpatient rehabilitation and in the community within 3-months post stroke.
2. Change in outcome measurement tool scores from prior to therapy until completion of therapy for each issue addressed (*to be customized to appropriate issue and tool used*).
3. Percentage of patients who are able to return to work/vocation following stroke rehabilitation, among those who were working prior to their stroke and have set a goal to return to work.

Implementation Resources and Knowledge Transfer Tools

- **Canadian Stroke Best Practices *Taking Action Towards Optimal Stroke Care Resource Kit***
- Table 5.1, summary of validated and frequently used screening and assessment tools for stroke rehabilitation
- Canadian Council of Motor Transport Administrators (CCMTA) medical standards for drivers - www.ccmta.ca/english/pdf/medical_standards_aug_2011.pdf
- South-Western Ontario Stroke Network Return to Work Website for Patients: http://www.strokebestpractices.ca/wp-content/uploads/2012/11/OSN_RTW_Bookmark.jpg
- Older Drivers in Canada <http://www.olderdriversafety.ca/>
- Strategies for successful return to work - <http://www.iwh.on.ca/working-together>
- Resource guides for community based stroke support groups, and patients and families <http://www.lifeafterstroke.ca/>
- Assessment of Life Habits Scale (LIFE-H) at http://strokengine.ca/assess/module_lifeh_intro-en.html
- Reintegration to Normal Living Index (RNLI) at http://strokengine.ca/assess/module_rnli_intro-en.html
- Stroke Impact Scale http://strokengine.ca/assess/module_sis_intro-en.html
- Stroke Specific Quality of Life Scale http://strokengine.ca/assess/module_ssqol_intro-en.html
- Getting on with the Rest of Your Life Workbook – <http://www.strokebestpractices.ca/wp-content/uploads/2011/09/GettingOn2-EN1.pdf>
- Life After Stroke website: <http://www.lifeafterstroke.ca/>
- HSF Centre for Stroke Recovery: <http://www.centreforstrokerecovery.ca>

- o LIFE – H http://strokengine.ca/assess/module_lifeh_intro-en.html
- o SF-36 http://strokengine.ca/assess/module_sf36_intro-en.html

Summary of the Evidence

Update 2013

Return to Driving

Return to driving is a common patient inquiry during rehabilitation from stroke. Inability to drive has an impact on a patient’s lifestyle and emotional well-being and leads to a strong feeling of loss for the patient (White et al., 2012). However, driving requires a minimum level of sensory, motor and cognitive functioning that is often compromised following a stroke. Common residual deficits preventing the resumption of driving include visual disturbances, hemiparesis and spasticity (White et al., 2012).

Patients often overestimate their ability to drive after stroke (Heikkila et al., 1999). A population based case-control study from the United States found that a higher percentage of drivers diagnosed with stroke who had been involved in accidents (7.3%) compared to the percentage of drivers diagnosed with stroke who were not involved in accidents (4.1%). After adjusting for age, sex, race, and driving frequency, these findings were statistically significant (OR 1.9, 95% CI 1.0-3.9) (McGwin et al., 2000). The 2009 Canadian Medical Standards for Drivers state that patients who have had a stroke *“should not drive for at least one month. They may be allowed to operate any motor vehicle after the one month waiting period provided there has been a good recovery, the condition has stabilized and there are no signs of impending recurrence and a neurological assessment indicates that they are functionally able.”* The medical standards also recommend that a neurological report be filed prior to resuming driving and a road-test is recommended for any individual with residual motor deficits. Facilitating a patient’s return to driving, where applicable, is an important part of rehabilitation. Return to driving was found to be significantly associated with an increase in community reintegration at one year post-stroke (Finestone et al., 2010).

There is limited information available regarding the sensitivity and specificity of office-based driver performance screening tools. Two systematic reviews (Devos et al., 2011; Marshall et al., 2007) outlining the screening tools that are most predictive of a pass or fail during on-road testing have been completed. The Road Sign Recognition test and Compass, which are both part of the Stroke Drivers Screening Assessment (SDSA), the Trail Making Test part A and part B, the Rey-Osterreith Complex Figure Test, and the Useful Field of View (UFOV) test have been identified as useful tools. These reviews, however, were not stroke specific. Cognitive screening tools were found to be the most predictive of outcome (pass/fail) on an on-road test.

Similarly, there have been very few randomized controlled trials to evaluate interventions that may support a successful return to driving for patients post stroke. Visual information processing training and simulator based training interventions have been assessed (Mazer et al., 2003; Crotty & George, 2009; Akinwuntan et al., 2005). No statistically significant differences were found between intervention and control groups for on-road driving performance with the use of the UFOV or Dynavision training. Visuo-perceptual scores (Mazer et al., 2003), response time, visual scanning abilities and driving self-efficacy (Crotty & George, 2009) also remained comparable between groups. The simulator based intervention assessed by Akinwuntan and colleagues found statistically significant improvements in neuropsychological test results (P<0.05) and on-road driving assessments (P=0.03) for patients receiving the intervention compared to controls (Akinwuntan et al., 2005).

Return to Vocation

A patient's pre-stroke vocation may have included work, school and/or volunteering and is particularly important to address in younger stroke survivors. Return to work is the most common vocation addressed in the literature, and has been found to improve the quality of life for both the patient and their spouse (Gabriele & Renate, 2009). A review by Morris and colleagues (Morris, 2011), found that psychological disorders, fatigue, and effects from the stroke that impair a patient's ability to perform specific work tasks have been reported in the literature as barriers for a patient's potential return to work (Morris, 2011).

A wide range of estimates for the proportion of patients who return to work after stroke have been found. A mean of 44% of patients returning to work was found across a set of studies included in a review by Daniel et al. 2009 (Daniel et al., 2009). Patients more likely to return to work include those who worked in white collar jobs as opposed to blue collar (Tanaka et al., 2011), who had a higher income and who had a higher level of education (Trygged et al., 2011). Modifications to previous working conditions (Wozniak & Kittner, 2002) and a supportive employer (Morris, 2011) have been found to help facilitate a patient's return to work. A systematic review of vocational rehabilitation interventions for patients post stroke was inconclusive in drawing conclusions regarding their effectiveness (Baldwin & Brusco, 2011). The study included six retrospective cohort studies of varying intervention types and a high level of heterogeneity; no randomized controlled trials were identified.

Although pediatric stroke is relatively rare, school aged stroke survivors are likely to have educational needs that are not typically addressed in older patients. Parent reported outcomes of school aged children in a study by Ganesan and colleagues found that 53% of patients needed school related assistance (Ganesan et al., 2000) based on a population of 90 stroke survivors between the ages of three months and 15 years (Ganesan et al., 2000). The same study reported that 62% of participants experienced at least some neurological deficits when assessed at a mean of 2.07 years post stroke. Another study, although small (n=23), found similar results, with 65% of participants aged 0 to 12 at stroke onset having at least some cognitive deficits (Rodrigues et al., 2011). Participants with a history of stroke also performed worse on arithmetic, reading and writing school performance tests compared to a control group of students (Rodrigues et al., 2011).

Sexuality

Evidence suggests that there are significant changes in sexuality and sexual functioning for patients post-stroke. A study assessing the impact of stroke on a patient's sexual functioning found that 64% of patients experienced difficulties (Kersten et al., 2002). Another study found that stroke survivors are significantly less satisfied with their sex life one year after stroke compared to a control group of individuals not having experienced a stroke ($p=0.001$) (Carlsson et al., 2007). Difficulties may include changes in libido, coital frequency, sexual arousal and sexual satisfaction (Korpelainen et al., 1999). These changes may be a result of physical or psychosocial reasons or because of the presence of co-morbidities and medication use. The fears and concerns of a patient's partner have also been suggested to contribute to a patient's decline in sexuality after stroke (Giaquinto et al., 2003).

Patients prefer to address sexuality with their physicians as opposed to other health care providers, to receive written material, and to initiate discussion early in the rehabilitation process (Stein et al., 2013). A study assessing a sexuality education intervention found that patients who received a short (40-50 minute) education session that outlined the changes that they can

expect in their sexuality post-stroke, frequently asked questions and tips to avoid sexual dysfunction were more sexually active and experienced greater sexual satisfaction than patients who did not. Interventions addressing post stroke sexuality are limited. Only one intervention was identified, consisting of patient education sessions following discharge from hospital (Song et al., 2011). Patients who received this intervention reported being more sexually active and satisfied one month post-stroke compared to control patients (Song et al., 2011).

Leisure Activity

Leisure activity has been found to be markedly reduced for individuals post-stroke (Drummond, 1990). Eighty-seven percent of individuals in a study assessing participation one year after stroke reported at least one gap or incongruence between an activity they wanted to do but were not currently doing (Eriksson et al., 2012). The same study found that the most frequently cited occupational gaps were in leisure and social activities (Eriksson et al., 2012).

The definition of leisure activities can vary quite widely among individuals. However, established tools such as the Nottingham Leisure Questionnaire (NLQ) and the Occupational Gaps Questionnaire contain a list of possible activities. For example, leisure activities on the NLQ are defined as activities that “individuals do during their free time” and can include watching TV, gardening, cooking, dancing, photography, sports etc. (Drummond et al., 2001).

Decreased participation (defined as instrumental activities of daily living and leisure activities) was found to explain 50% of the variance in life satisfaction scores in a sample of 56 patients living in the community one year after stroke (Hartman-Maeir et al., 2007). Another study assessing the effects of social activity in particular (one dimension of leisure activity) on life satisfaction post-stroke found (Boosman et al., 2011) that 6.9% of the variance in a participant’s level of life satisfaction was explained by level of social activity (Boosman et al., 2011). Individuals at risk of decreased social activity are typically younger, female, not living with a partner and have a lower functioning at one year post-stroke (Schepers et al., 2005).

Results from a meta-analysis assessing community occupational therapy interventions found that interventions were effective in improving patient outcomes (Walker et al., 2004). Type of intervention, be it leisure or activities of daily living (ADL) specific, generated positive results in the corresponding outcome measure (i.e. leisure specific interventions result in positive leisure activity outcomes but do not show a similar response in general ADL outcomes. Likewise, ADL specific interventions resulted in positive ADL outcomes but did not appear to influence leisure activity outcomes). Educational sessions alone have also demonstrated effectiveness in improving leisure outcomes for patients following a stroke (Desrosiers et al., 2007).

[Link to Evidence Table 5.11 and References](#)

For further information and references, please consult the Evidence Based Review of Stroke Rehabilitation at <http://www.ebrsr.com>; and StrokEngine at www.StrokEngine.ca

Appendix A

Table 4.2: Canadian Stroke Best Practices Swallow Screening and Assessment Tools

| Author/ Name of test | Components of test Details of validation study | Results of original validation study |
|---|--|---|
| Daniels et al. 1997 ¹ "Any Two" | Items included: 6 clinical features-dysphonia, dysarthria, abnormal volitional cough (includes water-swallowing test), abnormal gag reflex, cough after swallow and voice change after swallow were assessed. Scoring: Presence of any 2 of the items distinguished patients with/without dysphagia Sample: 59 acute stroke survivors were studied within 5 days of hospital admission. | Diagnostic standard: VMBS exam Prevalence of dysphagia: 74.6% The sensitivities and specificities of individual items ranged from 31%-76.9% and 61%-88%, respectively. Overall: Sensitivity: 92% Specificity: 67% |
| Logemann et al. 1999 ² | 28 items divided into 5 categories: i) 4 medical history variables ii) 6 behavioural variables iii) 2 gross motor variables iv) 9 observations from oromotor testing v) 7 observations during trial swallows Scoring: logistic regression was used to identify best single predictors and best combination of predictors. The tool was designed to identify the presence or absence of aspiration, oral stage disorder, pharyngeal delay, and pharyngeal stage disorder. Sample: 202 consecutive patients (34% stroke) referred by their physicians for possible dysphagia. | Diagnostic standard: VMBS exam Prevalence of dysphagia: 57.5% Aspiration: Throat clearing, reduced laryngeal elevation and a history of recurrent pneumonia were the best combination of predictors. Sensitivity: 69% Specificity: 73% Pharyngeal stage swallow disorder: reduced laryngeal elevation was the best single predictor. Sensitivity: 72% Specificity: 67% |
| Perry 2001 ³ Standardized Swallowing Assessment | 7 items in 2 sections plus water swallowing test Section 1: 2 items to ensure the patient is physically capable of taking the test. Section 2: 5 items comprising a checklist Scoring: if answers to any question is no, then patient fails the screen, otherwise, proceed to water swallow test (3 trials of 1 teaspoon with progression to ½ cup). If any sign of problems (coughing, choking, change in voice quality), then patient fails. | Diagnostic Standard: Clinical judgment of SLP Prevalence of dysphagia: 47% Sensitivity: 97% Specificity: 90% |

| Author/ Name of test | Components of test Details of validation study | Results of original validation study |
|--|---|---|
| Trapl et al. 2007 ⁴ The Gugging Swallowing Screen (GUSS) | Sample: 200 consecutive admissions of acute stroke. Preliminary Assessment (vigilance, throat clearing, saliva swallow) Direct swallow (semisolid, liquid, solid swallow trials) Scoring: Total scores ranged from 0 (worst) - 20 (no dysphagia). A cut-off score of 14 was selected Sample: 50 first-ever acute stroke patients with suspected dysphagia | Diagnostic standard: fiberoptic endoscopic evaluation using the Penetration Aspiration Scale to interpret the results. Prevalence of dysphagia: 73% First group of 19 patients using the GUSS to identify subjects at risk of aspiration: Sensitivity: 100%, Specificity: 50% Second group of 30 patients Sensitivity: 100% Specificity: 69% Interrater reliability: Kappa=0.835 |
| Martino et al. 2009 ⁵ The Toronto Bedside Swallowing Screening Test (TOR-BSST) | Items included: presence of dysphonia before/after water swallowing test, impaired pharyngeal sensation and abnormal tongue movement. Scoring: pass=4/4 items; fail ≥1/4 items Sample: 311 stroke patients (103 acute, 208 rehabilitation) | Diagnostic standard: VMBS exam. Prevalence of dysphagia: 39% Sensitivity: 91% Specificity: 67% Interrater reliability (based on observations from 50 subjects) ICC =0.92 (95% CI: 0.85-0.96) |
| Edmiaston et al. 2009 USA ⁶ Acute Stroke Dysphagia Screen | Items included: Glasgow Coma Scale score <13, presence of facial, tongue or palatal asymmetry/weakness. If no to all 3 items, then proceed to 3 oz water swallowing test. Scoring: If there is evidence of change in voice quality, cough or change in vocal quality 1 minute after water swallowing test = fail. Sample: 300 acute stroke patients screened by nurses within 8 to 32 hours following admission. | Diagnostic standard: Mann Assessment of Swallowing Ability (MASA), performed by a SPL. Prevalence of dysphagia: 29% Sensitivity (Dysphagia): 91% Specificity: 74% Sensitivity (aspiration risk): 95% Specificity: 68% Interrater reliability: Kappa=94% |
| Turner-Lawrence et al. 2009 ⁷ Emergency Physician Dysphagia Screen | The two-tiered bedside tool was developed by SLPs. Tier 1 items included: voice quality, swallowing complaints, facial asymmetry, and aphasia. Tier 2 items included a water swallow test, with evaluation for swallowing difficulty, voice quality compromise, and pulse oximetry desaturation (≥ 2%). Patients failing tier 1 did not move forward to tier 2. Scoring: Patients who passed both tiers were considered to be low-risk. | Diagnostic standard: formal assessment conducted by an SLP Prevalence of dysphagia: 57% Sensitivity: 96% Specificity: 56% Interrater reliability: Kappa=0.90 |

| Author/ Name of test | Components of test Details of validation study | Results of original validation study |
|---|---|--|
| | Sample: a convenience sample of 84 stroke patients (ischemic/hemorrhagic) screened by 45 ER MDs. | |
| Antonios et al. 2010 ⁸ Modified Mann Assessment of Swallowing Ability (MMASA) | 12 of the 24 MASA items were retained including: alertness, co-operation, respiration, expressive dysphasia, auditory comprehension, dysarthria, saliva, tongue movement, tongue strength, gag, volitional cough and palate movement. Scoring: Maximum score is 100 (no dysphagia). A cut-off score of 94 was used to identify patients at risk of dysphagia Sample: 150 consecutive patients with acute ischemic stroke were assessed by 2 neurologists shortly after admission to hospital. | Diagnostic standard: MASA conducted by SLP Prevalence of dysphagia: 36.2% Sensitivity: 87% & 93% Specificity: 86% & 84% Interrater reliability: Kappa=0.76 |
| Schrock et al. 2011 ⁹ MetroHealth Dysphagia Screen | 5 Items included: Alert and able to sit upright for 10 minutes, weak, wet or abnormal voice, drooling, slurred speech and weak, or inaudible cough. Scoring: ≥1 items answered yes=failed screen Sample: 283 patients admitted to the Emergency department with acute stroke and screened for the presence of dysphagia by nurses | Diagnostic standard: VMBS Prevalence of dysphagia at 30 days: 32% Sensitivity: 95% Specificity: 55% Interrater reliability: Kappa=0.69 |

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Appendix B

Table 5.10: Suggested Screening and Assessment Tools for Aphasia

| Assessment Tool | Time to Complete | Items and Scores | Required Equipment |
|---|------------------|---|--|
| Acute Aphasia Screening Protocol (AASP) Crary et al., 1989 | 10 minutes | 44-items representing 4 domains: Attention/orientation to communication, auditory comprehension, expressive ability, and conversational style. Total scores range from 0-50 and are expressed as a percentage. | Several commonly available objects. |
| Frenchay Aphasia Screening Test (FAST) Enderby et al., 1987 | 3-10 minutes | Respondents are presented with tasks representing 4 language domains: comprehension, speech, reading, and writing. Respondents are scored on the basis of completeness/correctness of responses, with total scores ranging from 0-30. Lower scores indicate greater language impairment. | A stimulus card and written instructions. |
| Mississippi Aphasia Screening Test (MAST) Nakase-Thompson et al., 2005 | 5-10 minutes | 46-items representing 9 subscales: Naming, automatic speech, repetition, yes and no accuracy, object recognition, verbal instructions, reading instructions, verbal fluency, and writing/spelling diction. Scores can be summed for each individual subscale, combined to form two index scores representing expressive and receptive language, or summed to provide a global score out of 100. Lower scores indicate greater language impairment. | A photo, several commonly available objects, and written instructions. |
| Reitan-Indiana Aphasia Screening Examination (ASE) Reitan and Wolfson, 1985) | N/A | 32-items assessing language reception, expression, and comprehension. Scores are summed to yield a total score out of 77, with higher scores indicating greater language impairment. | A single commonly available object and written instructions. |
| ScreeLing Doesborgh et al., 2003 | 15 minutes | 72-items representing 3 subscales: Semantics, Phonology, and Syntax. Scores can be calculated for each subscale, yielding a score from 0-24, or can be summed to provide a global score ranging from 0-72. Lower scores indicate greater language impairment. | No equipment is required. |
| Ullevall Aphasia Screening Test (UAS) | 5-10 minutes | Respondents are shown a picture and asked to follow a set of standardized instructions. | The stimulus painting, reading cards, and several commonly |

| Assessment Tool | Time to Complete | Items and Scores | Required Equipment |
|-------------------------|------------------|---|--------------------|
| Thommessen et al., 1999 | | Seven aspects of language are used to assess responses and individuals are rated based on overall performance as having normal language ability or mild, moderate, or severe language disorder. | available objects. |

Note: adapted from Salter et al., 2006.

References

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| 2. | Doesborgh SJ, van de Sandt-Koenderman WM, Dippel DW, van Harskamp F, Koudstaal PJ, Visch-Brink EG. Linguistic deficits in the acute phase of stroke. <i>Journal of Neurology</i> 2003;250:977-982. |
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Appendix C

Table 5.11: Suggested Assessment Tools for Pre-Driving Screening

Developed by the Toronto Rehabilitation Institute Driving best Practice Group (D. Hebert et al, 2013)

| Assessment/ Domain | Cut-Off Scores Correlated with Driving Risk/Return to Driving and Patient Populations | References |
|--|---|--|
| <p>Dynavision</p> <p>Domain: visual scanning, peripheral visual awareness, visual attention, visuomotor reaction time, execution of visuomotor response sequence, basic cognitive skills (short term memory), and physical and mental endurance</p> | <ul style="list-style-type: none"> o There has been some evidence that visual-motor training using this tool can result in improvement of a client's on-road driving performance with the stroke population. o Limited data results indicate that safe drivers achieve approximately 52 or more hits on a 1 minute self-paced button Mode A task; 42 or more hits on a 60-second apparatus paced task; 200 or more hits on the 4-minute self-paced endurance (continuous) task; and 35 or more hits on the 1-minute apparatus-paced with 1-digit task. o A 4 minute endurance subtest with a cutoff of 195 correct responses over the 4 minute period from the Dynavision was superior to the CDBI in predicting success/failure in the on-road driving test (75%) | <p>Klavora, P., Gaskovski, P., Martin, K., Forsyth, R.D., Heslegrave, R. J., Young, M., et al. (1995). The effects of Dynavision rehabilitation on behind-the-wheel driving ability and selected psychomotor abilities of persons after stroke. <i>The American Journal of Occupational Therapy</i>, 49, 534-542.</p> <p>Klavora, P., Gaskovski, P., & Forsyth, R. (1995). Test-retest reliability of three Dynavision tasks. <i>Perceptual Motor Skills</i>, 80(2), 607-610.</p> <p>Klavora, P., Heslegrave, R.J., & Young, M.(2000). Driving skills in elderly persons with stroke: comparison of two new assessment options. <i>Archives of Physical Medicine & Rehabilitation</i>, 81(6), 701-705.</p> |
| <p>Motor Free Visual Perceptual Test</p> <p>Domain: overall visual perceptual ability-spatial relationships, visual discrimination, figure ground, visual closure, and visual memory.</p> | <p>The MVPT was designed and standardized for adults for the normal population and the brain-injured population. It has norms for people aged 18-80.</p> <p>This test provides a profile of basic visual perceptual skills needed to drive, as well as an indication of a client's speed of processing visual information, and has been correlated to driving performance for the stroke population.</p> <ul style="list-style-type: none"> o Mazer, Korner-Bitensky & Sofer (1998) o MVPT (cut off, 30), positive predictive value 86.1%, negative | <p>Korner-Bitensky, N., Mazer B.L., Sofer, S., Gelina, I., Meyer, M.B., Morrison, C., et al. (2000). Visual testing for readiness to drive after stroke: a multi-center study, <i>American Journal of Physical Medicine & Rehabilitation</i>, 79(3), 253-259.</p> <p>Mazer, B., Korner-Bitensky, N.A., & Sofer, S. (1998). Predicting ability to drive after stroke, <i>Archives of Physical Medicine &</i></p> |

| Assessment/ Domain | Cut-Off Scores Correlated with Driving Risk/Return to Driving and Patient Populations | References |
|---|---|---|
| | <p>predictive value 53.3%</p> <ul style="list-style-type: none"> o MVPT and Trail Making B, poor performance on both tests 22 times more likely to fail on-road evaluation o Predictive values varied by side of lesion, MVPT higher for right lesion, and Trail Making B higher for left lesion o Korner-Bitensky et al. (2000) o Lower predictive values for MVPT in multi-centre site, concluding it should not be used on own o Older, right hemisphere lesion and lower MVPT scores more likely to fail on-road test (regression analysis) | <p><i>Rehabilitation</i>, 79(7), 743-749.</p> |
| <p>Trail Making Test Domain: Tests of visual conceptual and visuomotor tracking.</p> | <p>This test has been highly correlated with driving performance. Norms are available for persons aged 18-89 years, and it has been noted that scores decrease for individuals with advanced age or lower education levels.</p> <ul style="list-style-type: none"> o Mazer, Korner-Bitensky & Sofer (1998) o Trail Making B (cut off, 3 errors or more), positive predictive value 85.2%, and negative value 48.1% o MVPT and Trail Making B, poor performance on both tests 22 times more likely to fail on-road evaluation o Predictive values varied by side of lesion, MVPT higher for right lesion, and Trail Making B higher for left lesion <p>A U.S. government study suggested that a timed score of 100 seconds on the Trails B subtest would indicate a need for further testing of driving performance because it correlated with increased crash risk.</p> | <p>Hopewell, C.A. (2002). Driving assessment issues for practicing clinicians. <i>Journal of Head Trauma Rehabilitation</i>, 179(1), 48-61.</p> <p>Tombaugh, T.N. (2004). Trail making Test A and B: normative data stratified by age and education. <i>Archives of Clinical Neuropsychology</i>, 19(2), 203-214.</p> <p>Mazer, B., Korner-Bitensky, N.A., & Sofer, S. (1998). Predicting ability to drive after stroke, <i>Archives of Physical Medicine & Rehabilitation</i>, 79(7), 743-749. Please see this article for details regarding administering the Trail Making Test for Driving Ax purposes</p> <p>Pellerito, J.M. (2006). <i>Driver rehabilitation and community mobility: Principles and practice</i>. St. Louis, Missouri: Elsevier MOSBY.</p> <p>National Highway Traffic Safety Administration: model driver screening and evaluation program: final technical report.</p> |

| Assessment/ Domain | Cut-Off Scores Correlated with Driving Risk/Return to Driving and Patient Populations | References |
|--|---|--|
| | | Volume 1: Project summary and model program recommendations (DOT HS 809 582), Washington, DC, 2003, U.S. Department of Transportation. |
| Colour Trails Test | Color Trails Test comparable to test above | Elkin- Frankston, Lebowitz, B. K., Kapust, L. R. Hollis, A. M., and O'Connor, M. G. (2007), The use of the Color Trails Test in the assessment of driver competence: Preliminary report of a culture-fair instrument pg. Archives of Clinical Neuropsychology, 22 (5), pg. 631-635 |
| Clock Drawing Test Domain: Executive Function (planning/organization), memory, visual perceptual skills, visuo-spatial skills | Methods of administration and scoring of Clock Drawing Test can vary. See <i>AMA Physician's Guide to Assessing and Counseling Older Drivers</i> found in the Candrive website for 1 method (Freund Clock Scoring) of administering and scoring The Clock Drawing Test: http://www.ama-assn.org/ama1/pub/upload/mm/433/phyguidechap3.pdf Preliminary research indicates an association between specific scoring elements of the clock drawing test and poor driving performance. | American Medical Association. <i>AMA physician's guide to assessing and counseling older drivers.</i> http://www.ama-assn.org/ama/pub/physician-resources/public-health/promoting-healthy-lifestyles/geriatric-health/older-driver-safety/assessing-counseling-older-drivers.shtml |
| Snellen Eye Chart BIVABA Domain: Visual Acuity, Visual Field, Visual Attention, | <u>Ministry of Transportation of Ontario Standards</u> Visual Acuity – Effective May 29/05 Class of License: G and H – a vision acuity not poorer than 20/50 with both eyes open and examined together | On May 29, 2005 Regulation 340/94 of the Highway Traffic Act relating to the vision standards for driver licensing was amended to reflect: Changes to the vision standards for all classes of license o Lower the visual acuity o Provide a specific definition for the |

| Assessment/ Domain | Cut-Off Scores Correlated with Driving Risk/Return to Driving and Patient Populations | References |
|--|--|---|
| | <p>Class of License: A,B,C,D,E, F – a visual acuity not poorer than 20/30 with both eyes open and examined together, with the worse eye no poorer than 20/100</p> <p>Horizontal Visual Field- Effective May 29/05 Class of License: G and H – a horizontal visual field of 120 continuous degrees along the horizontal meridian and 15 continuous degrees above and below fixation with both eyes open and examined together</p> <p>Class of License: A,B,C,D,E, F – a horizontal visual field of 150 continuous degrees along the horizontal meridian and 20 continuous degrees above and below fixation with both eyes open and examined together</p> <p>Vision Waiver program only applies to the visual field of G1, G2, and G drivers. There is currently no waiver program for visual acuity.</p> | <p>horizontal visual field</p> <p>Vision waiver program was created for drivers of passenger vehicles (class G, G1 or G2) who do not meet the horizontal visual field standards. Prior to applying to this program one must first meet the entry criteria: visual acuity of 20/50 with both eyes, and horizontal visual field loss which occurred more than 3 months ago.</p> <p>Driver Improvement Office, Medical Review Section of the MTO 1-800-268-1481 or 416-235-1773.</p> |
| <p>UFOV – Useful Field of View Test Domain: Tests visual memory, visual attention, and divided attention with structured and unstructured components. The concept of “useful field of view” refers to the brain’s ability to comprehend visual info with the head and eyes in a stationary position. This test is administered on a computer.</p> <p>UFOV also includes a training component.</p> | <p>The UFOV has been shown to be a strong predictor of crash risk in older drivers.</p> <p>It is recommended for people who are age 55 years old or older, who have suffered health problems that cause deficits in thinking skills, who are concerned about their driving ability, and who have had multiple vehicle crashes.</p> <p>In one study of 294 drivers aged 55-90years, UFOV displayed high sensitivity (89%) and specificity (81%) for predicting which older drivers had a history of crash problems.</p> | <p>Owsley, C., Ball, K., McGwin, G. Jr., Sloane, M.E., Roenker, D.L., White, M.F., et al. (1998). Visual processing impairment and risk of motor vehicle crash among older adults. <i>Journal of the American Medical Association</i>, 279(14), 1083-1088.</p> <p>Ball, K., Owsley, C., Sloane, M.D., Roenker, D.L., & Bruni, J.R. (1993). Visual attention problems as a predictor of vehicle accidents in older drivers. <i>Investigative Ophthalmology and Visual science</i>, 34, 3110-3123.</p> <p>Ball, K., & Owsley, C. (1993). The useful field of view test: A new technique for evaluating age-related declines in visual function.</p> |

| Assessment/ Domain | Cut-Off Scores Correlated with Driving Risk/Return to Driving and Patient Populations | References |
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| | | <p><i>Journal of the American Optometric Association, 64, 71-79.</i></p> <p>Owsley, C., & Ball, K. (1993). Assessing visual function in the older driver. <i>Clinics in Geriatric Medicine: Medical Considerations in the older driver, 9, 389-401.</i></p> <p>Ball, K., & Rebok, G. (1994). Evaluating the driving ability of older adults. <i>The Journal of applied Gerontology, 13, 20-38.</i></p> |
| DriveABLE | <p>Positive predictive validity of the DriveAble in identifying those who would fail the Road Test was 97% (n= 32 of 33). Negative predictive validity was 47%. Sensitivity was 76% Corresponding specificity of 90%.</p> | <p>Korner-Bitensky, N. and Sofer, S (2009) The DriveABLE competence screen as a predictor of on-road driving in a clinical sample. 56(3).</p> |
| Executive Function | <p>Most predictive executive function test depends on patient. Refer to reference.</p> | <p>Asimakopulos, J., Boychuck, Z., Sondergard, D., Poulin, V., Menard, I, and Korner-Bitensky, N. Assessing executive function in relation to fitness to drive: a review of tools and their ability to predict safe driving. Australian Occupational Therapy Journal. 59(6):402-27, 2012 Dec</p> |
| <p>Elemental Driving simulator</p> <p>The Elemental Driving Simulator (EDS) is a computer-based quasi-simulator for use by professionals in driver rehabilitation with cognitively at-risk persons (e.g., older drivers, persons returning to</p> | <p>There are three testing phases of the EDS: Phase 1: Patient is required to keep a "car" in the middle of a "road". Phase 2: Added requirement of responding to "Fred" (a small face symbol) with the turn signal. Phase 3: Added requirement of decision-making. Patient must respond to constant faces by turning the signal towards the face, and respond to flashing faces by turning the signal away from the flashing face.</p> | <p>Gianutsos, R., Campbell, A., Beattie, A., & Mandriota, F. (1992). The driving advisement system: a computer-augmented quasi-simulation of the cognitive prerequisites for resumption of driving after brain injury.] <i>Assistive Technology. 4(2), 70-86.</i></p> |

| Assessment/ Domain | Cut-Off Scores Correlated with Driving Risk/Return to Driving and Patient Populations | References |
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| <p>driving after a head injury or stroke). The EDS helps address the issue of whether the individual possesses sufficient information processing capabilities to drive safely. The EDS was developed to facilitate a driving advisement process based on objective, norm-referenced measures of the cognitive abilities regarded as critical for driving, including mental processing efficiency, simultaneous information processing, perceptual - motor skills, and impulse control. A unique feature of the EDS is its attempt to measure insight, and, hence, judgment, by comparing self-appraisal with performance.</p> <p>Validation of the EDS shows good agreement with decisions based on a comprehensive on- and off-road driving assessment, large differences between old and young drivers, and a statistically significant correlation with at-fault accidents.</p> | <p>A summary of results is provided on page 2 of the EDS report. Patient's performance can be scored as "high", "average", "fair", or "unsafe". A standard score of 100 represents the average, and a score less than 70 is considered unsafe.</p> <p>Patients are scored according to 6 categories. Patients need to 'pass' 4 out of the 6 categories in order to 'pass' the overall assessment,</p> <p>1) Steering Control Information regarding this measure is provided on both pages 1 and 2 of the EDS report. Page 1 The data presented on page 1 allows us to monitor whether steering control changes across phases, as task complexity increases. <i>Mean score</i> – Reflects a general tendency to stay towards the left (negative value) or right (positive value) of the road. <i>Standard Deviation</i>- This is the variability in deviation of the car from the center of the road. <i>Wobble</i> – Measures "jiggle", or moment-to-moment variation. According to the EDS manual, standard deviation has proved to be a more valid measurement than wobble. Page 2 The score for Steering Control reflects the average standard deviation across all 3 phases.</p> <p>2) Speed of Reaction Page 1 If there is a big difference between the mean and median values, this suggests lapses or irregularities in performance. We can determine whether there is a difference between reaction time to left and right-sided stimuli. A higher value reflects a bigger difference between left and right-sided response times. Positive difference – slower to respond to right-sided stimuli</p> | |

| Assessment/ Domain | Cut-Off Scores Correlated with Driving Risk/Return to Driving and Patient Populations | References |
|-----------------------|--|------------|
| | <p>Negative difference – slower to respond to left-sided stimuli By comparing reaction time across phases 2 and 3, we can see the difference between simple and complex (i.e. involving decision making) reaction time.</p> <p>Page 2 The score for Reaction Time reflects the median reaction time for phase 2.</p> <p>3) Field of Vision Page 2 The score for Field of Vision reflects the absolute difference between left and right median reaction times for phases 2 and 3 combined. The reaction speed scores on page 1 provide more detail on the side of lateralization.</p> <p>4) Adjusting Page 2 The score for Adjusting reflects the median reaction time for phase 3 only. Therefore, this is a measure of complex reaction time, involving a decision-making component.</p> <p>5) Self Control Page 2 The score for Self Control reflects percent response errors in phase 3. This could represent a person’s ability to resist the urge to act quickly when more thought is required.</p> <p>6) Consistency Page 2 The score for Consistency measures the difference between mean and median reaction time for phases 2 and 3 combined. The intention of this measure is to record lapses in performance – a lapse in reaction time would be reflected in the median score but not the mean score.</p> <p>Self-Appraisal</p> | |

| Assessment/ Domain | Cut-Off Scores Correlated with Driving Risk/Return to Driving and Patient Populations | References |
|-----------------------|--|------------|
| | <p><i>Performance Self-Appraisal Index (PSA)</i> – This score is displayed at the bottom of page 1. A score of less than 100 reflects over-confidence in ability.</p> <p><i>Driver Self-Report (DSR)</i> – Reports “when” items (e.g. patient rates whether they drive as often as others on highways, in the rain, in snow, at night, in high traffic areas, unfamiliar roads, and trips longer than 1 hour).</p> <p>The EDS manual suggests that the DSR is more likely to reflect a person’s intentions and behaviours, while the PSA reflects feelings of competence and confidence.</p> <p>For Multiple Administrations of the EDS:</p> <p>What represents clinically meaningful change? According to Rosamund Gianutsos (the EDS developer), improvement from an unsafe to a safe designation is clinically meaningful.</p> <p>How many times is it recommended to administer the EDS in total? Rosamund Gianutsos adopts a “3 times and you’re out” stance – i.e. if after a maximum of 3 tests on EDS with unsuccessful scores, the person is not permitted to retry.</p> <p>How far apart can you administer repeat trials? There is no set time interval. Gianutsos recommends 3 months between repeat administrations, although this is not based on psychometrics.</p> <p>Other Considerations:</p> <p>When interpreting EDS results, also consider the patient’s physical limitations, vision (including visual field width), visual perception, attention skills, and other medical conditions (e.g. seizures, cardiac conditions) or medications that could affect driving. Refer to the EDS Manual for a more in depth discussion of results interpretation.</p> | |

| Assessment/ Domain | Cut-Off Scores Correlated with Driving Risk/Return to Driving and Patient Populations | References |
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