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Canadian Stroke Best Practice Recommendations
Rehabilitation, Recovery, and Community Participation Following Stroke, Part Two: Delivery of Stroke Rehabilitation to Optimize Functional Recovery, 7th Edition Update 2025

Nancy M. Salbach, PT, PhD,[1,2] Jennifer K. Yao, MD,[3,4] M. Patrice Lindsay, RN, MEd, PhD, FWSO,[5] Michelle L.A. Nelson, PhD,[6,7] Jing Shi, MD,[8,9] Colleen O'Connell, MD,[10,11] Ruth Barclay, PhD, MHSc, BMR(PT),[12,13] Diana Bastasi, BSc (PT), MBA,[14] Mark I. Boulos, MD, CSCN(EEG), MSc,[15] Joy Boyce, BScOT, BA Hons,[16] Geneviève Claveau, MD,[17,18] Heather L. Flowers, PhD, SLP (C), CCC-SLP,[19] Norine Foley, MSc,[20] Urvashy Gopaul, MSc, PhD, PT,[2] Esther S. Kim, PhD, RSLP, CCC-SLP,[21] Alto Lo, MD,[22] Alison M. McDonald, BScPT,[23] Amanda McIntyre, PhD, RN,[24] Colleen O'Connor, PhD, RD,[25] Kara K. Patterson, PT, PhD,[1,2] Tricia Shoniker, BSc, OT, MOT,[26] Theodore Wein, MD,[27] Janice Wright, MS, ACNP(c), RN-EC,[28] Brenda Yeates, MSW, RSW,[29] Jeanne Yiu, OTR, BSc (OT), MSc,[30] Chelsy Martin, MScPT,[31] Rebecca Lund, MSc (OT),[31] Sarvenaz Mehrabi, MD, MSc,[32] Dylan Blacquiere, MD, MSc,[33,34] Debbie Timpson, BSc(PT), MD,[35] Benjamin Ritsma, MD,[36,37] Ada Tang, PT, PhD,[38] Louis-Pierre Auger, OT, PhD,[39] Jenna Beaumont, RSLP, MRSc,[40] Rebecca Bowes, HBA,[41] Imane Samah Chibane, MD,[42] Sarah J. Courtice, MD,[3,4] Rhina Delgado, BScOT,[43] Melanie Dunlop, NP, BScN, MN, BA,[23] Kimia Ghavami, MD,[44] Teresa Guolla, OT Reg(Ont.), MHA, BScOT,[45] Deborah Kean, OT(R)NL,[46] Sandra MacFayden, PT,[47] Jasmine Masse, BSW, RSW,[48] Phyllis Paterson, PhD,[49] Elyse Shumway, SLP, MA,[50] Alda Tee, MHS, BSCPT reg. PT,[51] Clinton Y.H. Tsang, MPH, MSc, RSLP,[52] Stacey Turnbull, RN CRN,[53] Katie White, BScPT, MSc,[31] Anita Mountain, MD,[54,55] and on behalf of the Canadian Stroke Best Practice Recommendations Advisory Committee, in collaboration with the Canadian Stroke Consortium, Canadian Neurological Sciences Federation, and CanStroke Recovery Trials Platform

Abstract: The Canadian Stroke Best Practice Recommendations 7th edition update of the Rehabilitation, Recovery and Community Participation module is presented in three parts. This publication, Part Two of the series, reflects the growing and changing body of research evidence available to guide direct stroke rehabilitation therapies, screening, assessment, interventions, and strategies. Topics in this module include rehabilitation of upper and lower extremity, aerobic function, balance, mobility, activities of daily living, spasticity, fall risk, communication, dysphagia, nutrition, central pain, visual and visual-perceptual issues, and bladder and bowel function. This module provides guidance in the delivery of coordinated and seamless systems of care that support timely access to rehabilitation therapies, building on progress achieved

From the [1]Department of Physical Therapy, University of Toronto, Toronto, Canada; [2]The KITE Research Institute, Toronto Rehabilitation Institute-University Health Network, Toronto, Canada; [3]Division of Physical Medicine and Rehabilitation, University of British Columbia, Vancouver, Canada; [4]Acquired Brain Injury Program, G.F. Strong Rehab Centre, Coastal Health, Vancouver, Canada; [5]MarcLind Health Consulting, Toronto, Canada; [6]Lunenfeld-Tanenbaum Research Institute, Sinai Health, Toronto, Canada; [7]University of Toronto, Institute of Health Policy, Management and Evaluation, Toronto, Canada; [8]Department of Physical Medicine and Rehabilitation, University of Saskatchewan, Saskatoon, Canada; [9]Saskatoon City Hospital, Stroke Rehabilitation Program, Saskatoon, Canada; [10]Stan Cassidy Centre for Rehabilitation, Horizon Health Network, Fredericton, Canada; [11]Dalhousie University Faculty of Medicine, Dalhousie Medicine New Brunswick, Fredericton, Canada; [12]Department of Physical Therapy, University of Manitoba, Winnipeg Canada; [13]Riverview Health Centre, Winnipeg, Canada; [14]The McGill University Health Centre, Montreal General Hospital, Montreal, Canada; [15]Hurvitz Brain Sciences Research Program, Sunnybrook Research Institute, Sunnybrook Health Sciences Centre, Toronto, Canada; [16]Nova Scotia Health Authority Early Supported Discharge Program, Halifax, Canada; [17]Stroke and Non-Traumatic Brain Injury Program, Institut de réadaptation Gingras-Lindsay de Montréal, Montreal, Canada; [18]Department of Medicine and Medical Specialties, Université de Montréal, Montréal, Canada; [19]University of Ottawa, School of Rehabilitation Sciences, Faculty of Health Sciences, Ottawa, Canada; [20]workHORSE Consulting, London, Canada; [21]Department of Communication Sciences and Disorders, University of Alberta, Edmonton, Canada; [22]Department of Medicine in the Faculty of Medicine & Dentistry, University of Alberta, Edmonton, Canada; [23]Nova Scotia Rehabilitation & Arthritis Center, Halifax, Canada; [24]Arthur Labatt Family School of Nursing, Western University, London, Canada; [25]Brescia School of Food and Nutritional Sciences, Western University, London, Canada; [26]Fanshawe College, School of Health Sciences, London, Canada; [27]Division of Neurology and Neurosurgery, McGill University Faculty of Medicine, Montreal, Canada; [28]Department of Rehabilitation and Restorative Medicine, Hotel Dieu Shaver Hospital, St. Catherines, Canada; [29]Queen Elizabeth II Health Centre Ambulatory Care Centre, Grand Prairie, Canada; [30]Department of Occupational Science and Occupational Therapy, University of British Columbia, Vancouver, Canada; [31]Heart and Stroke Foundation of Canada, Toronto, Canada; [32]Department of Physical Medicine and Rehabilitation, Lawson Research Institute, St. Joseph's Health care London, London, Canada; [33]Department of Medicine, University of Ottawa, Ottawa, Canada; [34]Ottawa Hospital Research Institute, Ottawa, Canada; [35]Department of Rehabilitation, Pembroke Regional Hospital, Pembroke, Canada; [36]Department of Rehabilitation, Providence Care Hospital, Kingston, Canada; [37]Department of Physical Medicine and Rehabilitation, Queens University, Kingston, Canada; [38]McMaster University, School of Rehabilitation Science, Hamilton, Canada; [39]Institute of Health Sciences Education, Faculty of Medicine and Health Sciences, McGill University, Montreal, Canada; [40]Stroke Services BC, Provincial Health Services Authority, Vancouver, Canada; [41]West GTA Stroke Network, Trillium Health Partners, Mississauga, Canada; [42]Department of Neurosciences, Université de Montréal, Montréal, Canada; [43]Stroke Program Edmonton Zone, Alberta Health Services, Edmonton, Canada; [44]Division of Neurology, University of British Columbia, Vancouver, Canada; [45]Program Development and Clinical Integration, Vision Loss Rehabilitation Canada Inc., Ottawa, Canada; [46]Primary Health Care, NL Health Services, St. John's, Canada; [47]Provincial Ambulatory Stroke Clinic, Queen Elizabeth Hospital, Charlottetown, Canada; [48]Community Stroke Care Service, Winnipeg, Canada; [49]University of Saskatchewan, College of Pharmacy and Nutrition, Saskatoon, Canada; [50]Clinical and Education Services, Aphasia

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Institute, Toronto, Canada; [51]Central East Stroke Network, Royal Victoria Regional Health Centre, Barrie, Canada; [52]University of British Columbia, School of Audiology and Speech Sciences, Vancouver, Canada; [53]Provincial Ambulatory Stroke Rehabilitation Services PEI, Charlottetown, Canada; [54]Division of Physical Medicine & Rehabilitation, Department of Medicine, Dalhousie University, Halifax, Canada; and [55]Acquired Brain Injury Program, Queen Elizabeth II Health Sciences Centre, Halifax, Canada.

All correspondence should be addressed to: Dr. M. Patrice Lindsay, RN, M.Ed., PhD, FWSO, MarcLind Health Systems Consulting, 11 Woodbank Road, Toronto, Ontario M9B 5C3; Rebecca Lund, MSc (OT), Stroke, Heart and Stroke Foundation of Canada, 2300 Yonge Street, Suite 1200, Toronto, ON, M4E 3H4.

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Nancy M. Salbach First Author, Co-Chair.

Jennifer K. Yao Second Author, Co-Chair.

M Patrice Lindsay Corresponding Author, Senior Editor.

Anita Mountain Senior Author.

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during initial recovery, enabling people to achieve as much independence as possible and successfully resume social roles and leisure activities. Successful recovery, transitions and community participation require integrated and coordinated people-centered efforts by all members of care teams involved, and the broader community. These recommendations were developed with active involvement of people with lived experience of stroke throughout the care continuum. Evidence for effective rehabilitation therapies and support for individuals with stroke and their families continues to emerge and gaps in knowledge should drive future research.

Key Words: Clinical Practice Guideline, Stroke, Rehabilitation, Community Participation, Stroke Unit, Person-Centered Care, Transitions of Care, Virtual Stroke Rehabilitation

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Stroke is on the rise in Canada with over 108,000 individuals with stroke presenting to hospitals in 2017/18 in Canada.[1] As a leading cause of adult disability, stroke creates challenges not only during acute care, but throughout the transition to community and beyond. In 2022–2023, there were 969,095 people 20 yrs of age and older estimated to be living with the effects of stroke in Canada,[2] many of whom required some degree of rehabilitation therapy to support recovery. Among individuals with new stroke in Canada, 15% are transferred to an inpatient rehabilitation service, 8% are transferred to long-term care or complex continuing care.[3] Despite the prevalence of post-stroke disability, access to inpatient, outpatient and community-based stroke rehabilitation services and community-based supports remains inconsistent across the country.

These Canadian Stroke Best Practice Recommendations reflect the growing and changing body of research evidence available to guide rehabilitation therapies, screening, assessment, interventions, medical issues, and strategies for individuals who have experienced a stroke. Topics addressed in this module include therapy targeting upper and lower extremity function, aerobic function, balance, mobility and activities of daily living, spasticity, fall risk, communication, dysphagia, nutrition, central pain, visual and visual-perceptual issues, health, and bladder and bowel function. These recommendations provide guidance in the delivery of coordinated and seamless systems of care that support early access to rehabilitation therapies, build on progress made during the initial stages of recovery, and enable individuals to achieve as much independence as possible to optimize their ability to resume life roles and leisure activities (addressed in Part Three). The physical, emotional, psychological, social, and environmental needs of individuals with stroke are considered throughout this set of Canadian Stroke Best Practice Recommendations (CSBPR). Considerations for ensuring equitable access to needed services and supporting connections to appropriate resources must be prioritized at all stages of recovery.

Notable updates to these guidelines from the previous version include reorganization of the topics included to more closely align with the International Classification of Functioning, Disability and Health framework for improved clarity and flow; conversion to GRADE methodology for evaluating the strength of each recommendation and the quality of the available evidence; evidence supporting multiple recommendations throughout this module was upgraded to a higher level of evidence coupled with a strong recommendation. Examples include screening for swallowing impairment with referral to a trained dysphagia professional once an individual with stroke fails screening and a trial of low-dose centrally acting analgesics for persistent central post-stroke pain. A new section has been included for bladder and bowel function screening, assessment, and management. Increased emphasis has been placed on the use of validated assessment tools across the continuum of rehabilitation care.

GUIDELINE DEVELOPMENT METHODOLOGY

The CSBPR development and update process follows a rigorous framework[4,5] and addresses all criteria defined within the AGREE Trust model.[6] The methodology for development and updates to the CSBPR has previously been published[7] and detailed methodology can be found on the Canadian Stroke Best Practices website at www.strokebestpractices.ca. A broad interdisciplinary group of experts was convened and participated in reviewing, drafting, revising, and voting on all recommendation statements that were then reviewed by external experts. A group of individuals having lived experience with stroke and stroke rehabilitation also actively participated in the review and update process in a parallel review process through our Community Consultation and Review Panel. The literature for this module was current to March 2025.

A copy of the manuscript and online supplement translated in French are available as a Supplementary Files (http://links.lww.com/PHM/C852, http://links.lww.com/PHM/C853, http://links.lww.com/PHM/C854).

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CANADIAN STROKE BEST PRACTICE RECOMMENDATIONS FOR DELIVERY OF *STROKE REHABILITATION TO OPTIMIZE FUNCTIONAL RECOVERY, PART TWO 2025*

Refer to Online Supplement Appendix One for terminology definitions and descriptions used throughout these recommendations.

SECTION 1: UPPER EXTREMITY FUNCTION—GENERAL PRINCIPLES AND THERAPIES

Upper extremity impairment is one of the most common and disabling consequences of stroke, affecting up to 75% of individuals in the acute phase.[8,9] These impairments can significantly limit independence by reducing the ability to perform essential activities of daily living (ADL) and may also contribute to pain, reduced range of motion, and long-term functional decline. Given the complexity and variability of upper extremity recovery, a wide array of rehabilitation approaches has been developed to address motor function, coordination, and strength and include task-specific training,[10,11] constraint-induced movement therapy,[12] functional electrical stimulation,[13,14] virtual reality,[15] mental imagery,[16] and bilateral arm training[17] among others. The strength of the evidence supporting the interventions varies. Factors that may influence the selection of treatment options include their availability within the facility, therapist training, cost, and the preferences of the individual post-stroke.

Section 1 Upper Extremity Function—General Principles and Therapies Recommendations

Notes:

- *Many therapy approaches can be used together and may provide some synergistic benefits.* Research supporting these recommendations often combines multiple interventions, applying them simultaneously in both studies and clinical practice.
- When using specific therapeutic interventions, appropriately trained healthcare professionals should follow established protocols whenever they are available.
- The choice of therapy should be tailored to each individual with stroke and reflect the severity of impairments and be as part of a personalized rehabilitation plan.
- ***Evidence Grading System:*** *For some areas of stroke rehabilitation, the same topic area may have different evidence for early and later stages of rehabilitation and recovery. In these instances, the levels of evidence will be stated separately. The 'early' time interval is defined as less than 6 mos post-stroke, and the 'late' time interval, defined as greater than 6 mos post-stroke.*

1.1 General Principles

i. Individuals should engage in training that is meaningful, engaging, repetitive, progressively adapted, task-specific, and goal-oriented to enhance motor control and restore sensorimotor function [Strong recommendation; High quality of evidence].

ii. Training should encourage the use of the individuals' affected extremity during functional tasks and be designed to simulate partial or whole skills required in ADLs (e.g., folding, buttoning, pouring, and lifting) [Strong recommendation; High quality of evidence].

1.2 Specific Therapies

i. **Range of motion exercises** (passive and active assisted) that include placement of the upper extremity in a variety of appropriate and safe positions should be considered [Strong recommendation; Low quality of Evidence].

ii. **Functional electrical stimulation (FES)** involving electrical stimulation in combination with task-oriented training of the upper extremity is recommended to improve motor function [Strong recommendation; Moderate quality of evidence].

iii. High-intensity **constraint-induced movement therapy** (i.e., immobilization of the nonparetic upper extremity during 90% of waking hours and 3–6 hrs of task-oriented training per day is recommended for a select group of individuals with stroke who demonstrate at least 20 degrees of active wrist extension and 10 degrees of active finger extension, with minimal sensory deficits and normal cognition [Early – Strong recommendation; High quality of evidence; Late – Strong recommendation; High quality of evidence].

iv. **Mirror therapy** may be considered to improve motor and ADL function [Strong recommendation; Moderate quality of evidence].

v. **Sensory stimulation** modalities (e.g., transcutaneous electrical nerve stimulation [TENS], and acupuncture) may be considered to improve upper extremity function [Conditional recommendation; Low quality of evidence].

vi. **Biofeedback** in the form of visual and/or auditory signals during exercises of the upper extremity is recommended to improve motor function [Strong recommendation; High quality of evidence].

vii. Individuals with stroke should be encouraged to engage in **mental imagery practice** to enhance upper extremity sensorimotor recovery as an adjunct to upper extremity rehabilitation [Strong recommendation; Moderate quality of evidence].

viii. **Virtual reality**, including both immersive technologies such as head mounted or robotic interfaces and non-immersive technologies such as gaming devices, may be considered as adjunct tools to other rehabilitation therapies, to provide additional opportunities for engagement, feedback, repetition, intensity and task-oriented training [Strong recommendation; Moderate quality of evidence].

ix. Therapists should consider **supplementary training programs** aimed at increasing the active movement and functional use of the affected upper extremity between therapy sessions, such as Graded Repetitive Arm Supplementary Program, suitable for use during hospitalization and at home [Early – Strong recommendation; Moderate quality of evidence; Late – Strong recommendation; Low quality of evidence].

x. **Strength training** is recommended for individuals with mild to moderate upper extremity impairment for improvement in upper extremity motor function [Strong recommendation; High quality of evidence].

xi. **Bilateral upper extremity training** should be considered for individuals with some active movement in the affected upper extremity to improve upper extremity motor function [Early – Strong recommendation; Moderate quality of evidence; Late – Strong recommendation; High quality of evidence].

xii. **Training in compensatory techniques** and provision of adaptive equipment may be considered for individuals with stroke who are unable to produce any voluntary muscle activity in the affected upper extremity to optimize independence with ADLs [Strong recommendation; Low quality of evidence].
xiii. **Retraining trunk control** should be considered to improve function of the affected arm and hand [Strong recommendation; Moderate quality of evidence].
xiv. **Trunk restraint** (i.e., physical restraint) is recommended to decrease compensatory movements during reaching tasks to improve upper extremity function [Strong recommendation; High quality of evidence].

1.3 Adaptive Equipment

i. Adaptive equipment (e.g., long-handled shoehorn, adaptive cutting board for one-handed use, adapted guitar foot strummer) designed to improve safety and upper extremity function may be considered if other methods of performing specific functional tasks are not available or alternative methods of performing tasks cannot be learned [Strong recommendation; Low quality of evidence].

Section 1 Clinical Considerations

1. Functional dynamic orthoses for the upper extremity may be offered to individuals with stroke to facilitate repetitive task-specific training.
2. **Noninvasive brain stimulation,** including repetitive transcranial magnetic stimulation and transcranial direct current stimulation could be considered as an adjunct to upper extremity rehabilitation. *Note while these interventions are not yet available/approved for use in stroke in Canada the evidence for their use continues to be strengthened.*

SECTION 2: SHOULDER PAIN & COMPLEX REGIONAL PAIN SYNDROME FOLLOWING STROKE

The incidence of shoulder pain following stroke varies widely from 22% to 47%.[18] Typically developing within 2 wks to 2 mos post-stroke, shoulder pain can inhibit participation in rehabilitation activities and contribute to poor functional recovery, longer hospital stays, reduced active movement, depression, sleep disruption, and reduced quality of life. Management strategies for post-stroke shoulder pain are diverse and often require a multidisciplinary approach tailored to the underlying causes, which may include subluxation, spasticity, or soft tissue injury. Common interventions include physical therapies such as range-of-motion exercises,[19] positioning strategies,[20,21] and the use of supportive strategies such as providing lap trays or taping to maintain joint alignment and reduce strain.[20,22,23] Pharmacological treatments depend on the etiology of pain and may include nonsteroidal anti-inflammatory drugs,[24] corticosteroid injections,[25] or botulinum toxin injections,[26,27] particularly in cases where spasticity contributes to the pain. In addition, modalities such as FES[28] and TENS[29] have shown potential benefits in selected patients. Evidence of the effectiveness of each approach varies, and treatment must be individualized based on the patient's pain profile, functional status, and rehabilitation goals.

The incidence of Complex Regional Pain Syndrome Type I (CRPS-I) varies across different populations and studies with incidence rates ranging from 5.46 per 100,000 person-years[30] to 26.2 per 100,000 person-years.[31] There is no definitive therapeutic intervention for CRPS. A Cochrane overview of reviews conducted by O'Connell et al.[32] evaluated 19 studies that used a variety of interventions to treat pain and/or disability associated with CRPS. The authors found moderate quality evidence that intravenous regional blockade with guanethidine was not effective in treating CRPS and is associated with adverse events, and low-quality evidence for biphosphates, calcitonin, or daily IV of ketamine for the treatment of pain compared to a placebo. Both motor imagery and mirror therapy may be effective for the treatment of pain compared to a control condition. There was low-quality evidence that local anesthetic sympathetic blockade, physiotherapy, and occupational therapy are not effective for CRPS. Acupuncture has been shown to reduce pain, improve motor performance, and improve performance of ADLs when added to conventional therapy.[33,34]

Section 2 Shoulder Pain & CRPS Following Stroke Recommendations

Note: Shoulder pain after stroke is often multifactorial and may result from stroke-related hemiplegia, spasticity, injury, or acquired musculoskeletal conditions stemming from impaired joint and soft tissue integrity. Pain may be from a combination of neuropathic, nociceptive, or nociplastic causes. Accurate diagnosis of etiology is crucial for optimal management.

Refer to Section 3 for additional information on spasticity.

For these recommendations, 'Flaccid' is defined as the state of low muscle tone (hypotonia) with the absence of voluntary muscle movement and diminished resistance to passive stretch.

2.1 Prevention of Hemiplegic Shoulder Pain and Subluxation

i. Joint protection strategies should be applied during the flaccid stage of recovery to prevent or minimize shoulder pain and injury. Strategies include:
   a. Positioning and supporting the upper extremity when the individual is at rest [Strong recommendation; Moderate quality of evidence].
   b. Protecting and supporting the shoulder in neutral rotation and forearm in neutral supination/pronation using a modified lap tray designed for this purpose during wheelchair use [Strong recommendation; Moderate quality of evidence].
ii. Overhead pulleys should not be used [Strong recommendation; Low quality of evidence].
iii. The upper extremity should not be moved passively beyond 90 degrees of shoulder flexion or abduction, unless the scapula is upwardly rotated, and the humerus is laterally rotated [Strong recommendation; Moderate quality of evidence].
iv. Healthcare staff, individuals with stroke, family, and caregivers should be educated to correctly protect, position, and move the affected upper extremity [Strong recommendation; Low quality of evidence].

Section 2.1 Clinical Considerations

1. Healthcare staff, individuals with stroke, family, and caregivers should avoid pulling on the affected upper extremity.

2. The affected upper extremity should be protected and supported during functional mobility such as transfers.
3. Shoulder slings should only be considered in the flaccid stage when no other upper extremity support is possible. After the flaccid stage, use of slings should be discouraged, given that they may reduce upper extremity use, inhibit arm swing, contribute to contracture formation, and decrease body image.

2.2 Assessment of Hemiplegic Shoulder Pain

i. The assessment of the painful hemiplegic shoulder should focus on determining the cause and include evaluation of tone, active movement, changes in length of soft tissues, alignment of joints of the shoulder girdle, trunk posture, levels of pain, musculoskeletal changes in the shoulder, and impact of pain on physical and emotional health [Strong recommendation; Low quality of evidence].

Section 2.2 Clinical Considerations

1. The diagnosis of post-stroke CRPS should be considered when typical causes of shoulder or hand pain, such as acute trauma or bony fracture, have been ruled out. Clinicians should be aware of post-stroke CRPS and its clinical presentation to facilitate early diagnosis and treatment. When available, if post-stroke CRPS is suspected, referral to physiatry or other physician with experience in stroke rehabilitation or pain should be considered.

2.3 Management of Hemiplegic Shoulder Pain

i. Treatments for hemiplegic shoulder pain related to limitations in range of motion may include gentle stretching and mobilization techniques within pain-free range and increasing external rotation and abduction. [Strong recommendation; Low quality of evidence].
ii. Taping of the affected shoulder is recommended to reduce shoulder pain in the acute phase of recovery [Strong recommendation; High quality of evidence].
iii. For patients with a flaccid upper extremity, electrical stimulation should be considered [Strong recommendation; Moderate quality of evidence].
iv. The use of shoulder orthoses may be considered to reduce shoulder subluxation in the flaccid stage [Strong recommendation; Moderate quality of evidence].
v. If there are no contraindications, nonsteroidal anti-inflammatory drug analgesics (oral or topical) could be considered for pain relief on an individual basis [Conditional recommendation; Low quality of evidence].
vi. Chemo-denervation botulinum toxin is recommended for the treatment of hemiplegic shoulder pain thought to be related to spasticity [Strong recommendation; High quality of evidence].
vii. Subacromial corticosteroid injections may 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 [Conditional recommendation; Moderate quality of evidence].
viii. Acupuncture should be considered, in addition to conventional rehabilitation, in the treatment of hemiplegic shoulder pain [Conditional recommendation; High quality of evidence].
ix. Extracorporeal shock wave therapy may be considered in the treatment of hemiplegic shoulder pain [Strong recommendation; Moderate quality of evidence].

Section 2.3 Clinical Considerations

1. Active range of motion should be increased gradually in conjunction with restoring alignment and strengthening weak muscles in the shoulder girdle.

Note: For additional information on pain management, refer to Section 9 on Central Pain.

2.4 Hand Edema

Recommendations

Note, no evidence-based recommendations are included for this section.

Section 2.4 Clinical Considerations

1. For individuals with stroke who experience hand edema, the following have been shown to have some benefit:

    a. Active, active-assisted, or passive range of motion exercises.
    b. Elevating the arm when at rest if possible.
    c. Retrograde massage.
    d. Gentle joint mobilization for the hand and fingers.
    e. Compression, including use of compression garments with appropriate monitoring by health professionals with expertise in use and fit.

2.5 Complex Regional Pain Syndrome (CRPS) Management

i. Early assessment by a physiatrist or other physician with expertise in management in stroke for consideration of an early course of oral corticosteroids, on a tapering regimen, should be considered to reduce swelling and pain among patients with no contraindications [Early – Strong recommendation; High quality of evidence].
ii. Acupuncture may be considered as an adjunct therapy to reduce pain in individuals with CRPS [Conditional recommendation; Moderate quality of evidence].
iii. Extracorporeal shock wave therapy may be considered as an adjunct therapy to reduce pain in individuals with CRPS [Strong recommendation; High quality of evidence].

Section 2.5 Clinical Considerations

1. Clinicians should be aware of CRPS and its clinical presentation to facilitate early diagnosis and treatment. When CRPS is suspected, early assessment by a physiatrist or other physician with expertise in stroke is essential for consideration of treatment with oral corticosteroids. Diagnosis of CRPS clinical and is based on the presence of pain accompanied by other supportive sensory, vasomotor, pseudomotor/edema, and motor/trophic signs and symptoms, as detailed in the revised International Association for

the Study of Pain (or Budapest) criteria. This includes hyperalgesia/allodynia, temperature asymmetry, skin color changes or asymmetry, edema, sweating changes or asymmetry, decreased range of motion, motor dysfunction, and trophic (hair, nail, skin) change.
2. There is currently no established protocol for corticosteroids. A reasonable early course of corticosteroids could include starting at 30–50 mg daily for 3–5 days and then tapering off the medication over 2–3 wks.

SECTION 3: RANGE OF MOTION AND POST-STROKE SPASTICITY

Post-stroke spasticity in the upper extremity is a common complication, with studies estimating that approximately 20%–43% of individuals will develop spasticity within the first year following stroke, with higher prevalence in those with severe motor deficits.[35] Spasticity can significantly hinder functional recovery by limiting voluntary movements, causing abnormal limb postures, and contributing to joint contractures, skin compromise, and pain.[36] These complications reduce the ability to perform ADLs, negatively affect quality of life, and increase caregiver burden. Commonly used interventions include physical therapy techniques such as stretching, and range-of-motion exercises, although the evidence of their effectiveness is not strong. In an abridged republication of a Cochrane Review,[37] Harvey et al. reported that stretching programs were not associated with clinically important benefits to joint mobility, spasticity, activity limitations, or pain either after the intervention or at follow-up, when compared with usual care. Botulinum toxin type A injections are widely used for focal spasticity and are supported by strong evidence for reducing pain, muscle tone, and improving passive function.[38,39] In conjunction with botulinum toxin type A, co-interventions with evidence of benefit include electrical stimulation,[40] constraint-induced movement therapy,[41] taping,[42] and dynamic splinting.[43] Pharmacological treatments include oral antispasticity agents such as baclofen and tizanidine, although their use is limited by systemic side effects, affecting a high percentage of users.[44,45]

Lower extremity spasticity is also a common complication following stroke, although it tends to occur less frequently and is often less disabling than upper extremity spasticity.[46] Typically, lower extremity spasticity involves extensor muscles, contributing to gait disturbances such as stiff-legged gait and difficulty with foot clearance. Treatment approaches for both upper and lower extremity spasticity overlap but differ in their functional goals and target muscles. Botulinum toxin type A injections are the mainstay of management and are usually targeted at the gastrocnemius-soleus complex to improve walking efficiency. The evidence for the benefit of the treatment is strong.[47,48] There is some evidence to support the use of more invasive treatments such as intrathecal baclofen[49] and less conventional treatments such as extracorporeal shock wave therapy[50,51] and whole-body vibration.[52]

Section 3 Range of Motion and Post-stroke Spasticity Recommendations

Note: Spasticity is a common consequence of stroke and can negatively affect function, range of motion, pain, skin integrity, care needs, and engagement in rehabilitation. Routine assessment is essential to identify and manage these potential impacts effectively.

3.0 Clinical Considerations for Assessment of Post-Stroke Spasticity

1. Spasticity assessment should be a component of neurological assessments for an individual with stroke. *Refer to Section 2 on Shoulder Pain for additional information.*
2. Assessment for spasticity and its potential complications should be conducted regularly, throughout the continuum of stroke care, to ensure timely identification and management.
3. Assessment and management of complicated post-stroke spasticity should be carried out by a healthcare professional with expertise in spasticity management and an interprofessional team with specialized expertise in spasticity care whenever possible and using validated assessment and outcome measures.
4. Assessment of spasticity should include identification and consideration of factors that can increase post-stroke spasticity (e.g., noxious stimuli such as infections, pain, or constipation)

3.1 Upper Extremity

i. Static stretching with positioning orthoses may be considered to treat wrist-flexor spasticity [Conditional recommendation; Moderate quality of evidence].
   a. Routine use of splints alone for spasticity is not recommended [Strong recommendation; High quality of evidence].
   b. The use of splints may be considered to prevent complications of spasticity on an individualized basis. If a splint is used, a plan for monitoring the splint for effectiveness should be followed [Strong recommendation; Low quality of evidence].

ii. Chemo-denervation using botulinum toxin should be considered to increase passive range of motion for patients with spasticity of the shoulder [Early: Strong recommendation; Moderate quality of evidence; Late: Strong recommendation; High quality of evidence].

iii. Chemo-denervation using botulinum toxin should be considered over oral medications as first-line treatment of focal spasticity. [Strong recommendation; High quality of evidence].

Section 3.1 Clinical Considerations

1. Oral medications (i.e., tizanidine and baclofen) can be considered as an adjunct for the treatment of disabling spasticity, but side effects of fatigue and drowsiness are common.
2. Adjunct treatments (i.e., electrical stimulation, constraint-induced movement therapy, taping, dynamic splinting, extracorporeal shock wave therapy), in addition to chemo-denervation using botulinum toxin may be considered to treat spasticity.
3. Noninvasive brain stimulation may be considered in the treatment of spasticity. *Note these interventions are not yet available/approved for use in Canada.*
4. Follow-up assessments for spasticity should be included as part of the routine care plan during inpatient rehabilitation and at the start and end of outpatient rehabilitation therapy.

3.2 Lower Extremity

i. Active stretching and joint mobilization exercises is recommended in both the early and late stages to increase ankle joint range of motion and gait parameters and to decrease spasticity [Strong recommendation; Moderate quality of evidence].
ii. Chemo-denervation using botulinum toxin is recommended to reduce focal spasticity in individuals with stroke [Strong recommendation; High quality of evidence].
iii. Intrathecal baclofen may be considered for cases of severe, chronic, and intractable spasticity that cannot be effectively managed with oral antispasmodic agents [Strong recommendation; Low quality of evidence].

Section 3.2 Clinical Considerations

1. Oral medications (i.e., tizanidine and baclofen) can be considered as an adjunct for the treatment of disabling spasticity, but side effects of fatigue and drowsiness are common.
2. Whole body vibration may be considered to decrease lower extremity spasticity in the early stage, but not in the late stage.
3. Extracorporeal shock wave therapy should be considered to decrease spasticity and pain associated with plantar flexor spasticity.

SECTION 4: LOWER EXTREMITY, BALANCE, MOBILITY, AND AEROBIC TRAINING

Balance impairments and mobility limitations are highly prevalent post-stroke, particularly among individuals with more severe strokes, with 50%–80% of individuals experiencing some degree of difficulty with walking, balance, or movement coordination during the acute and subacute phases.[53,54] These issues often result from a combination of muscle weakness, reduced coordination, and sensory deficits, which can make movements such as standing and walking difficult. Effective rehabilitation strategies typically involve a multidisciplinary approach, using some of the same interventions as upper extremity rehabilitation. Interventions that have a broad evidence base include task-specific training,[55] aerobic training,[56] resistance training,[57] and functional electrical stimulation,[58,59] treadmill training, with or without body weight support,[60] virtual reality,[61] and mental practice. To improve balance post-stroke, effective strategies include aquatic exercise,[62–64] trunk training,[65] whole body vibration,[66,67] and balance training plus motor imagery.[68]

Section 4 Lower Extremity, Balance, Mobility, and Aerobic Training Recommendations

4.0 General Considerations

i. Patients should participate in training that is meaningful, engaging, progressively adaptive, intensive, task-specific and goal-oriented, in an effort to improve transfer skills and mobility [Strong recommendation; High quality of evidence].

4.1 Lower Extremity Function and Gait

i. Task-specific and goal-oriented training that is repetitive and progressively adapted should be delivered to improve performance of selected mobility tasks such as sit to stand, walking distance and walking speed [Strong recommendation; High quality of evidence].
   a. Both group and individual task-specific training are effective and may be considered [Strong recommendation; High quality of evidence].
ii. Resistance training should be considered for individuals with mild to moderate impairment in the lower extremity to improve strength and motor function; however, its impact on functional mobility is limited [Strong recommendation; High quality of evidence].
iii. Treadmill-based gait training (with or without body weight support) may be used to enhance walking speed, and distance walked as an adjunct to overground training or when over-ground training is not available or appropriate [Strong recommendation; High quality of evidence].
iv. Electromechanical (robotic) assisted gait training devices are not recommended over conventional gait training [Strong recommendation; High quality of evidence].
v. Rhythmic auditory stimulation should be used to improve gait (i.e., walking speed, cadence, stride length) and function [Strong recommendation; High quality of evidence].
vi. Functional electrical stimulation should be used to improve balance, gait speed, and mobility in selected individuals with stroke [Strong recommendation, High quality of evidence].
vii. Ankle-foot orthoses should be used with selected individuals with foot drop following proper assessment and with follow-up to verify their effectiveness to improve gait speed and balance [Strong recommendation; High quality of evidence].
viii. Aquatic exercise is recommended to improve walking speed and mobility [Strong recommendation; High quality of evidence].
ix. Nonimmersive virtual reality training may be considered to improve lower extremity function, balance and gait (i.e., walking speed, cadence, stride length) as an adjunct to conventional gait training [Strong recommendation; Moderate quality of evidence].
x. Biofeedback, in the form of visual and/or auditory signals, may be used to improve lower extremity function [Strong recommendation; Moderate quality of evidence].
xi. Mental imagery practice may be considered as an adjunct to gait training to improve gait speed [Strong recommendation; Low quality of evidence].

Section 4.1 Clinical Considerations

1. The need for gait aids, wheelchairs, and other assistive devices should be evaluated on an individual basis.
   a. Once equipment has been provided, individuals with stroke should be reassessed, as appropriate, to determine progress, if changes or adjustments are required, and, if and when the equipment is no longer needed.

4.2 Balance

i. The following therapies should be considered to improve balance following stroke (in addition to recommendations 4.1 ix and vi):
   a. Trunk training/seated balance training [Strong recommendation; High quality of evidence].
   b. Aquatic balance training [Strong recommendation; High quality of evidence].
   c. Tai Chi [Strong recommendation; High quality of evidence].

d. Balance training combined with visual feedback or motor imagery training may be considered as an adjunct therapy [Strong recommendation; Moderate quality of evidence].
e. The use of unstable surfaces and balance boards [Strong recommendation; Moderate quality of evidence]
f. Whole-body vibration training is recommended as an adjunct therapy [Conditional recommendation; High quality of evidence].

ii. Force platform biofeedback is not recommended over conventional balance training [Strong recommendation; High quality of evidence]

Section 4.2 Clinical Considerations

1. Therapists should consider both anticipatory and reactive balance control within their assessment and treatment.

4.3 Sit-to-Stand Function

i. Sit-to-stand practice should be considered to improve sit-to-stand capacity [Strong recommendation; Moderate quality of evidence].

4.4 Aerobic Training

Refer to AEROBICS guidelines for additional information.[69]

i. Once medically stable, individuals with stroke should be considered for their ability to participate in aerobic exercise training [Strong recommendation; Moderate quality of evidence].
ii. Pre-participation evaluation should include assessment of physical activity behaviors and exercise history and a medical history and physical examination by appropriately qualified healthcare professionals with expertise in aerobic training to identify factors that require special consideration or constitute a contraindication to aerobic exercise [Strong recommendation; Moderate quality of evidence].
iii. If the plan is to conduct aerobic training at light intensity (e.g., <40% of predicted heart rate reserve), a submaximal exercise test may be considered [Strong recommendation; Moderate quality of evidence].
iv. Screening aerobic exercise tests should be conducted with monitoring of clinical signs and symptoms, heart rate, blood pressure, and rating of perceived exertion [Strong recommendation; Moderate quality of evidence].
    a. During a symptom-limited exercise stress test, an electrocardiogram should also be used to monitor electrocardiography [Strong recommendation; Moderate quality of evidence].
v. Individually tailored aerobic training involving large muscle groups should be incorporated into a comprehensive stroke rehabilitation program to enhance cardiovascular endurance, balance, and walking [Strong recommendation; High quality of evidence].
    a. To achieve a training effect, patients should participate in aerobic exercise for a minimum of 8 wks [Strong recommendation; High quality of evidence], at least 3 times weekly progressing as tolerated from 5 to 20 mins or more per session, exclusive of warm-up and cool-down [Strong recommendation; Moderate quality of evidence].
    b. Clinical signs and symptoms, heart rate, blood pressure, and rating of perceived exertion and other pertinent medical factors should be monitored during training to ensure safety and attainment of target exercise intensity [Strong recommendation; Moderate quality of evidence].
vi. To ensure long-term maintenance of health benefits, a planned transition from structured aerobic exercise to more self-directed physical activity at home or in the community should be implemented [Strong recommendation; Moderate quality of evidence].
    a. Strategies to address specific barriers to physical activity related to individuals with stroke, healthcare providers, family, and/or the environment should be employed [Strong recommendation; Moderate quality of evidence].

SECTION 5: FALLS PREVENTION AND MANAGEMENT

Individuals post-stroke are at a higher risk of falling compared with many other hospitalized patients, with incidences ranging from 14% to 65%.[70] Falls most commonly occur within the first week following stroke during the acute phase and then again as mobility increases. Falls occur mainly due to a combination of impairments in balance, mobility, cognition, sensation, vision, and strength.[71] These falls can result in serious injuries such as fractures or head trauma, in addition to other negative consequences including fear of falling, loss of independence, and extended hospital stays, all of which can negatively impact rehabilitation outcomes. Early assessment of fall risk and targeted interventions, such as balance training, treadmill training, strengthening exercises, perturbation training, and Tai Chi, can be effective in reducing the risk of falling.[72] Environmental modifications and patient education are also essential to promote safety.

Section 5 Falls Prevention and Management Recommendations

i. All individuals with stroke should be screened for fall risk, including fall history at admission, at all transition points, after a fall, and whenever there is a change in health status, using validated tools [Strong recommendation; High quality of evidence].
    a. Screening should include identification of medical, physical, cognitive, medication related, and environmental factors associated with risk of falling, fear of falling, and fall injuries [Strong recommendation; Moderate quality of evidence].
ii. Individuals identified as being at risk for falls should undergo a comprehensive interdisciplinary assessment using validated tools [Strong recommendation; Moderate quality of evidence].
    a. Comprehensive falls assessment should include medical and functional history, evaluation of mobility, vision, perception, cognition, cardiovascular status, medications, and environment [Strong recommendation; Moderate quality of evidence].
iii. Based on assessment findings, an individualized falls prevention plan and fall prevention strategies should be implemented [Strong recommendation; Moderate quality of evidence]. *Refer to appropriate topics within this module for*

strategies to mitigate falls risk (e.g., leg weakness, impaired balance, visual disturbances, cognitive impairment, sensory loss).

a. The individual with stroke, family, and caregiver should be made aware of the individual's increased risk for falls and provided education on precautions and strategies to reduce their risk of falling [Strong recommendation; Moderate quality of evidence].
b. The individual with stroke, their family, and caregivers should receive skills training to enable them to safely transfer and mobilize, including what to do if a fall occurs and how to get up from a fall [Strong recommendation; Low quality of evidence].
c. For individuals with stroke who are at risk of falling, an individualized exercise program should be provided including balance training and advice on safety [Strong recommendation; Moderate quality of evidence].
d. The individual with stroke, their family, and caregivers should receive education regarding recommended and appropriate mobility aids, footwear, and transfer devices, with consideration of the healthcare, home and community environments [Strong recommendation; Low quality of evidence].

iv. Where applicable, bed and chair alarms should be provided for individuals with stroke at high risk for falls in accordance with local organizational fall prevention protocols [Strong recommendation; Low quality of evidence].
v. If an individual with stroke experiences a fall, they should be assessed for possible injury and the circumstances surrounding the fall to identify precipitating factors. Preexisting falls prevention plans should be reviewed and modified to reduce the risk of further falls [Strong recommendation; Low quality of evidence].

SECTION 6: SWALLOWING (DYSPHAGIA), NUTRITION, AND ORAL CARE

Dysphagia is a common complication following stroke, affecting an estimated 37%–78% of patients in the acute phase,[73] and is associated with an increased risk of aspiration pneumonia, malnutrition, dehydration, and prolonged hospital stay.[73,74] Early identification using a standardized screening tool is essential to help prevent these potential complications, with many such tools available.[75] More detailed assessments by trained clinicians using evaluations, such as videofluoroscopic swallow studies or fiberoptic endoscopic evaluation, may also be indicated. The most commonly used interventions include dietary modifications (e.g., thickened liquids), swallowing therapy exercises, and behavior modification. Less frequently used interventions include acupuncture, surface neuromuscular electrical stimulation, pharyngeal electrical stimulation, physical stimulation (thermal, tactile), and noninvasive brain stimulation.[76] In severe cases, temporary non-oral feeding strategies may be required using feeding methods such as nasogastric or percutaneous endoscopic gastrostomy tubes.[77] For patients who can safely eat orally, protein and energy supplementation can be used for those unable to consume sufficient calories and protein to maintain body weight or meet energy requirements or for those with premorbid malnutrition.[78,79]

Section 6 Swallowing (Dysphagia), Nutrition, and Oral Care Recommendations

6.1 Swallowing (Dysphagia) and Feeding

i. Screening for swallowing impairment in individuals with stroke is recommended before any oral intake (e.g., medications, food, liquid) by an appropriately trained health professional, using a valid screening tool [Strong recommendation; High quality of evidence].
ii. Referral to a trained dysphagia professional is recommended when the initial swallowing screen has failed to prompt further comprehensive assessments and a plan for interventions to address swallowing, feeding, nutrition, and hydration [Strong recommendation; High quality of evidence].
    a. An individualized management plan should be developed to address therapy for dysphagia, dietary needs, and specialized nutrition plans [Strong recommendation; Low quality of evidence].
iii. Instrumental swallowing assessments including video fluoroscopic swallow study (VFSS) or fiberoptic endoscopic examination of swallowing, should be considered for individuals with stroke who have (oro)pharyngeal dysphagia or suspected poor airway protection, identified during the bedside swallowing assessment, to guide therapeutic intervention [Strong recommendation; Low quality of evidence].
iv. Dysphagia therapy to optimize the efficiency and safety of the oropharyngeal swallow should be implemented with monitoring and reassessment as required [Strong recommendation; Low quality of evidence].
    a. Behavioral interventions (such as oropharyngeal exercises) are recommended [Strong recommendation; Moderate quality of evidence].
    b. Modified food and/or fluid consistency to address swallowing difficulty and feeding efficiency should be provided [Strong recommendation; Moderate quality of evidence].
    c. Electrical stimulation (particularly pharyngeal placement) may be considered as an adjunct to improve dysphagia [Strong recommendation; Low quality of evidence].
v. Enteral nutrition support (i.e., tube feeding) is recommended for individuals with stroke who cannot safely swallow or meet their nutrient and fluid needs orally [Strong recommendation; High quality of evidence].
    a. The decision to proceed with enteral nutrition support should be made as early as possible after admission, usually within the first 3–7 days after admission in collaboration with the individual with stroke, family (or substitute decision maker), and the interdisciplinary team [Strong recommendation; Low quality of evidence].
    b. A percutaneous endoscopic gastrostomy tube is recommended for enteral feeding if the individual with stroke requires a prolonged period of enteral nutrition (i.e., 4 wks or longer) to reduce the risk of treatment failure and feeding interruption [Strong recommendation; High quality of evidence].
vi. Individuals with stroke, their family, and caregivers should receive interdisciplinary education

on swallowing, prevention of aspiration, and feeding recommendations [Strong recommendation; Moderate quality of evidence].

Section 6.1 Clinical Considerations

1. To reduce the risk of aspiration pneumonia, individuals with stroke should be permitted and encouraged to contribute to feeding themselves whenever possible (e.g., hand-over-hand assistance).
2. To reduce the risk of choking and aspiration pneumonia, individuals with stroke should be appropriately positioned while eating or receiving enteral nutrition.
3. Noninvasive brain stimulation may be considered as an adjunct treatment to train muscles for post-stroke dysphagia. *Note these interventions are not yet available/approved for use in Canada.*

6.2 Nutrition and Hydration

i. Individuals with stroke should be screened for malnutrition and dehydration within 24–48 hrs of inpatient admission using a valid screening tool [Strong recommendation; Low quality of evidence].
   a. Routine and repeated screening for nutritional and hydration status is recommended while supporting individuals with stroke during inpatient admission and after discharge to the community [Strong recommendation; Low quality of evidence].

ii. Referral to a dietitian is recommended for individuals with stroke who fail screening or have nutritional concerns, hydration deficits, or other comorbidities that may require nutritional intervention [Strong recommendation; High quality evidence].
   a. Meet nutritional and fluid needs through enteral and/or oral routes while supporting recommendations for food texture and fluid consistency [Strong recommendation, Moderate quality of evidence].

iii. Nutritional supplementation should be considered in individuals with stroke who are experiencing malnutrition [Strong recommendation; Moderate quality evidence].

6.3 Oral Health

i. Active oral hygiene interventions (e.g., brushing, oral rinse) are recommended at least twice daily to maintain oral health in individuals with stroke, especially if dysphagia is present [Strong recommendation; Moderate quality of evidence].

ii. Individuals with stroke, their family, and caregivers should receive interdisciplinary education and training in safe and proper oral care [Strong recommendation; Low quality of evidence].

iii. Referrals should be made to appropriate healthcare professionals with expertise in oral health as needed [Strong recommendation; Low quality of evidence].

SECTION 7: LANGUAGE AND COMMUNICATION

Aphasia affects 21%–38% of individuals post-stroke[80–82] and is associated with increased length of hospital stay, inpatient complications, overall neurological disability, mortality, and discharge disposition.[83] Individuals with aphasia are also at higher risk for depression and social isolation. Management strategies include early and intensive speech-language therapy, of sufficient duration, which has been shown to improve communication outcomes compared with no speech-language therapy or less intensive speech-language therapy.[84,85] Less conventional treatments include constraint-induced language therapy, computer-assisted interventions, and group therapy.

Section 7 Language and Communication Recommendations

i. Healthcare providers working across the continuum of care should undergo training about aphasia and other communication disorders, including recognition of the impact of aphasia and methods to support communication [Strong recommendation; Low quality of evidence]

Note: Other communication disorders may include dysarthria, apraxia of speech and cognitive communication deficits.

ii. All individuals with stroke should be screened for communication impairments, ideally by a healthcare professional with expertise in communication, using a validated screening tool [Strong recommendation; Low quality of evidence].

iii. Individuals with stroke with suspected communication impairments should be assessed by a speech-language pathologist or other healthcare provider with expertise in communication impairments, using standardized, valid assessment to identify impairments, activity limitations, participation restrictions, and the impact on relationships related to communication deficits, across the rehabilitation care continuum [Strong recommendation; Low quality of evidence].

iv. Individuals with aphasia and other communication disorders (e.g., speech apraxia) should have early access to a combination of intensive speech, language, and communication therapy according to their needs, goals and impairment severity to improve functioning [Strong recommendation, High quality of evidence].

v. Training in supported conversation techniques for potential communication partners of individuals with aphasia should be offered [Strong recommendation; High quality of evidence].

vi. All information intended for the use of individuals with aphasia should be available in aphasia-friendly formats [Strong recommendation, Low quality of evidence].

vii. Families of individuals with aphasia should be engaged in the entire process from screening through intervention, including family education and training in supported communication [Strong recommendation; Low quality of evidence].

Section 7 Clinical Considerations

1. Treatment to improve functional communication may include interventions such as language therapy focusing on impairments-based approaches, conversational treatment, training on use of assistive devices, and computer therapy.
   a. Production and/or comprehension of words, sentences, and discourse, (including reading and writing) is recommended to improve functional communication.

   b. Use of nonverbal strategies, assistive devices, and technology (e.g., iPads, tablets, other computer-guided therapies), which can be incorporated to improve communication.
   c. Use of computerized language therapy for reading practice and word finding and to enhance benefits of other therapies.
2. Treatment for aphasia may include group therapy and conversation groups. Groups can be used to supplement the intensity of therapy during hospitalization and/or as continuing therapy following discharge.
3. Individuals with aphasia should be assessed for their potential to benefit from using augmentative alternative communication modalities (e.g., iPad, tablet, electronic devices, alphabet board) or other communication support tools, ideally that are culturally relevant.

SECTION 8: VISUAL AND VISUAL-PERCEPTUAL IMPAIRMENT

Post-stroke visual impairment is a common but often under-recognized consequence of stroke affecting more than half of all individuals with stroke.[86] It can manifest as decreased vision, diplopia, visual field deficits, eye movement disorders, and visual inattention or neglect or visual perceptual disorders. More than half of stroke survivors will experience vision impairment.[86] Individuals with post-stroke vision impairment often face a decline in their quality of life, reduced independence, increased depression, and higher chance of social isolation.[87] Recognizing vision impairment can be particularly challenging when patients have neurological or cognitive deficits, such as visual-spatial inattention and communication impairment, which can obscure the symptoms. Standardized screening has been shown to be feasible and beneficial to improve the detection of vision loss after stroke.[88,89] Interventions for the rehabilitation of impaired perception (i.e., hearing, smell, somatosensation, touch, taste, and/or vision post-stroke) following stroke, include repeated figure drawing, computer-based games, and therapist-led functional activities.[90] A wide range of interventions to improve spatial neglect post-stroke have been evaluated and include visual interventions (e.g., visual scanning training, half-field eye patching), prism adaptation, body awareness interventions (e.g., limb activation, trunk rotation, mirror therapy), mental function interventions (mental imagery, virtual reality training, and general cognitive rehabilitation), movement interventions (e.g., robotic upper extremity treatment, constraint-induced movement therapy, and visuomotor feedback training), noninvasive brain stimulation, electrical stimulation (e.g., TENS, FES, and EMG-triggered electrical stimulation), and acupuncture.[91]

Section 8 Visual and Visual-Perceptual Impairment Recommendations

8.0 Visual and Visual-Perceptual Impairments

i. All individuals with stroke should be screened for central vision impairment, ocular motility disorders, visual field deficits, and visual perceptual disorders early after stroke as a routine part of the broader rehabilitation assessment process [Strong recommendation, Moderate quality of evidence].
ii. Individuals with stroke with suspected perceptual impairments (e.g., visuo-spatial impairment, agnosia, body schema disorders, and apraxia) should be assessed using validated tools [Strong recommendation, Low quality of evidence].
iii. Individuals with stroke who have vision or visual-perceptual impairment, their family and caregivers, should receive education on visual-spatial impairment and other perceptual deficits as well as treatment recommendations and safety considerations [Strong recommendation, Low quality of evidence].

8.1 Vision Impairments

i. Individuals with visual impairment impacting their ability to locate themselves and travel safely and independently either indoors or outdoors should receive training in compensatory techniques, including sighted guide, orientation to space, and mobility training in familiar and unfamiliar spaces [Strong recommendation, Moderate quality of evidence].
ii. Individuals with difficulties completing ADL and instrumental ADL activities related to visual impairments post-stroke should receive assessment and training from appropriate vision rehabilitation specialists when feasible [Strong recommendation, Moderate quality of evidence].
   a. Intervention should focus on the use of specialized compensatory techniques (such as scanning) and modifications to the task or environment such as increase of luminance/lighting or contrast [Strong recommendation, Moderate quality of evidence].

8.2 Visual-Perceptual Impairments

i. Visual scanning training may be considered to improve spatial neglect [Strong recommendation, Moderate quality of evidence].
ii. Mirror therapy should be used to improve visual spatial neglect in the early-stage post-stroke [Strong recommendation, Moderate quality of evidence].
iii. Eye patching of the nonaffected hemi field (ipsilateral to the lesion) may be considered to improve visual spatial neglect reading and neglect symptoms [Strong recommendation, Low quality of evidence].
iv. Virtual reality may be considered to improve visual spatial neglect [Strong recommendation, Low quality of evidence].
v. Limb activation may be considered to improve visual spatial neglect [Strong recommendation, Moderate quality of evidence].
vi. The use of prisms may be considered to expand the visual field and increase scanning abilities; however, there is no evidence of impact on functional performance [Strong recommendation, Moderate quality of evidence].

Section 8 Clinical Considerations

1. Body awareness training and movement interventions may be used to improve visual spatial neglect symptoms and activities of daily living.
2. Noninvasive brain stimulation may be considered to improve visual spatial neglect. *Note these interventions are not yet available/approved for use in Canada.*
3. Consider education on compensatory strategies to improve functional performance or comfort, such as unilateral

translucent patching for double vision, binasal occlusion for spatial vision, environmental modifications, or cues for neglect.
4. For individuals with vision impairment following stroke, referral to a neuro-ophthalmologist or an optometrist experienced in post-stroke vision rehabilitation may be considered.

SECTION 9: CENTRAL PAIN

Central post-stroke pain is a type of neuropathic pain that typically arises when a stroke damages areas such as the thalamus, brainstem, or cortical regions involved in sensory processing.[92] Central post-stroke pain is characterized by persistent, often severe pain that may feel burning, stabbing, or aching, and it can occur even in response to normally nonpainful stimuli or be exaggerated after mild stimuli. The pain can develop weeks to months after the stroke and is often located on the side of the body affected by the stroke. The incidence of central post-stroke pain is estimated to be between 1% and 12%.[92,93] Central pain is difficult to treat. Antiseizure medications (lamotrigine) and antidepressants including tricyclic antidepressants, serotonin–norepinephrine reuptake inhibitors, and selective serotonin reuptake inhibitors are the most frequently used drugs for the treatment of neuropathic pain.[94–98]

Section 9 Central Pain Recommendations

i. An individualized approach for management of central pain syndrome should be implemented by an interdisciplinary team that includes healthcare professionals with expertise in mental health and central pain management [Strong recommendation; Low quality of evidence].
ii. Individuals with stroke should be assessed for central pain. The diagnosis of central post-stroke pain should be based on established diagnostic criteria after other causes of pain have been excluded [Strong recommendation; Moderate quality of evidence].
iii. Individuals with persistent central post-stroke pain should receive a trial of low-dose, centrally acting analgesics [Strong recommendation; High quality of evidence].
    a. Individuals should receive a gabapentinoid class of anticonvulsant (e.g., gabapentin or pregabalin) as a first-line treatment for central nervous system pain [Strong recommendation; High quality of evidence].
    b. Other pharmacological treatment options that may be considered in the treatment of central pain include tricyclic antidepressants (e.g., amitriptyline), or a serotonin and norepinephrine reuptake inhibitors (particularly duloxetine). [Strong recommendation; quality of evidence].

SECTION 10: BLADDER AND BOWEL FUNCTION

Urinary incontinence is a frequent complication after stroke, with reported incidence ranging from 32% to 79% in the acute phase.[99] While many patients regain continence as they recover, up to 25% may continue to experience incontinence at 6 mos post-stroke.[100] Management can include nonpharmacological interventions such as bladder training programs (e.g., pelvic floor muscle training, and timed voiding), which have shown to be of modest effectiveness in reducing urinary incontinence.[101,102] Anticholinergic medications have been associated with significant improvements in condition-specific quality of life, and patient perception of cure or improvement. They also lead to a significant reduction in the mean number of urgency episodes per 24 hrs but are associated with a high risk of adverse effects.[103] Complementary medicines (acupuncture, electroacupuncture and moxibustion) and physical therapy (transcutaneous posterior tibial nerve stimulation, TENS, and sensory-motor biofeedback) have also been evaluated for the treatment of urinary incontinence.[104]

Management strategies for fecal incontinence and constipation have not been well studied in the stroke population. Patients who received a structured intervention, including a nursing assessment (history and rectal examination), followed by patient/carer education (booklet) and provision of diagnostic summary and treatment recommendations, experienced reduced episodes of fecal incontinence, compared to usual care.[105] In a recent Cochrane review, nursing interventions and physical therapies (abdominal massage, standing intervention, transanal irrigation, osteopathic manipulative treatment) were associated with a significant reduction in constipation symptoms.[106]

Section 10 Bladder and Bowel Function Recommendations

10.1 Bladder Function

10.1.1 Screening of Bladder Function

i. Individuals with stroke should be screened for urinary incontinence and retention [Strong recommendation; Moderate quality of evidence].

10.1.2 Assessment of Bladder Function

i. Individuals with stroke experiencing persistent urinary incontinence should be assessed by trained personnel to determine the underlying cause and develop an individualized management plan [Strong recommendation; Moderate quality of evidence].
ii. The use of a bladder scanner should be considered to assess post-void residual as the preferred least-invasive method [Strong recommendation; Low quality of evidence].

Section 10.1 Clinical Considerations

1. A structured assessment for urinary incontinence may include:
    a. Clinical history including location of stroke; past medical history of any previous incontinence or urinary symptoms and associated treatments; past gynecological or urological surgeries; history of vaginal birth; pre-stroke bladder habits and schedule; recent use of an indwelling catheter; current urinary symptoms and incontinence; daily liquid intakes.
    b. Physical examination including cognitive status, abdominal, pelvic, and sacral examination.
    c. Review of medications for any potential contribution to the urinary symptoms of the individual.
    d. Use of a bladder voiding calendar, including details such as frequency, urgency, time of voiding or incontinence, difficulties starting urine, and volumes (voided or catheterized).
    e. Post-voiding residual volumes, measured with a portable ultrasound machine, to rule out incomplete voiding or retention.

f. Urinalysis and urine culture and sensitivity if there is suspicion of a urinary tract infection.
g. In case of urinary retention, presence of concomitant constipation/fecaloma should be evaluated and appropriately treated.
h. Referral to a urologist and/or urodynamic studies in selected cases, to further guide treatment.

2. Individuals with stroke experiencing incontinence should be assessed for environmental and functional factors (e.g., limited mobility, limited communication) that may contribute to urinary incontinence.

10.1.3 Management of Bladder Function

i. Routine use of indwelling urinary catheters in individuals with stroke is not recommended due to the risk of adverse outcomes, such as urinary tract infections [Strong recommendation; High quality of evidence].
   a. If used, indwelling urinary catheters should be assessed daily and removed as soon as possible [Strong recommendation; High quality of evidence].
   b. Peri care and infection prevention strategies should be implemented to minimize risk of infection [Strong recommendation; Moderate quality of evidence].
ii. Behavioral interventions, like timed voiding or a systematic voiding program, may be considered to reduce the number of urinary incontinence episodes and to improve quality of life [Strong recommendation, Moderate quality of evidence].
iii. Pelvic floor muscle training may be used to improve voiding frequency and urinary symptoms (including incontinence) [Strong recommendation; Moderate quality of evidence].
iv. Medication, such as anticholinergic or adrenergic agonists, should be considered for stress incontinence or urinary urgency, to improve urinary frequency and urgency, and decrease episodes of incontinence [Strong recommendation; Moderate quality of evidence].
v. Transcutaneous electrical nerve stimulation may be considered to reduce urinary incontinence after stroke [Strong recommendation; High quality of evidence].

10.2 Bowel Function

10.2.1 Screening of Bowel Function

i. Individuals with stroke should be screened for fecal incontinence and constipation [Strong recommendation; Moderate quality of evidence].

10.2.2 Assessment of Bowel Function

i. Individuals with stroke experiencing persistent constipation or bowel incontinence (for more than 2 wks) should be assessed by trained personnel to determine the underlying cause and develop an individualized management plan [Strong recommendation; Moderate quality of evidence].

10.2.3 Management of Bowel Function

i. An educational and behavioral program may be considered to reduce constipation/increase the frequency of bowel movements in individuals with stroke [Strong recommendation; Low quality of evidence].

Section 10.2.3 Clinical Considerations

1. Dietary choices, judicious use of pharmaceutical treatments (e.g., suppositories, stool softeners), abdominal massage, and trans-anal irrigation may be considered as part of a bowel management program.
2. Establish bowel routines, including sitting on toilet at the same time daily; sitting upright with feet supported; with minimum of 10–15 mins each time to help evacuate bowel.

Section 10 Additional Clinical Considerations

1. Screening for bladder and bowel incontinence may also take place at various stages throughout the continuum of stroke care, especially at transition points or if there are changes in health status.
2. The use of assistive equipment, clothing design, and augmented assistive communication may be considered to prevent and support individuals experiencing bladder and bowel incontinence.

SUMMARY

The 7th update of the *Canadian Stroke Best Practice Recommendations for Delivery of Stroke Rehabilitation to Optimize Functional Recovery* provides evidence-informed recommendations applicable to all adults in Canada who have experienced a stroke and require rehabilitation therapies and support throughout recovery. These recommendations, guided by empirical evidence and the experiences and insights of people with lived experience, are comprehensive, and span the continuum of care. Adopting the International Classification of Functioning, Disability and Health Framework has strengthened the recommendations by providing a consistent language and more holistic structure emphasizing function, activity, and participation.

There is an urgent need for healthcare systems to provide necessary services and resources in an equitable, accessible, and coordinated way to support the rehabilitation needs of all individuals recovering from stroke. These holistic physical, emotional, psychological, social, spiritual, sexual, and environmental needs of individuals are considered throughout this set of CSBPR along with the importance of tailoring stroke rehabilitation to the specific needs and goals of each individual with stroke. Evidence consistently shows that timely access to specialized, adequately resourced, coordinated rehabilitation therapies and services optimizes recovery and reduces long-term disability. As healthcare systems face increasing pressures from an aging population and rising prevalence of stroke, prioritizing comprehensive rehabilitation becomes not only a clinical necessity but also a social imperative.

Accessing best practice stroke rehabilitation services must be addressed at all stages of recovery. However, a comprehensive and integrated approach to planning and delivering stroke rehabilitation requires coordinated systems to be in place in all regions of Canada; a challenge given the vast geographical area with many smaller, and in some cases, isolated communities. Virtual care modalities represent a promising approach to overcoming geographical barriers and a potential mechanism for optimizing the dose and intensity of rehabilitation, and engaging family members in rehabilitation and transition planning. However, they must be implemented with careful attention to digital literacy, access to

technology, and the need for some in-person assessment and treatment components.

Looking toward the future, several emerging trends are shaping the landscape of stroke rehabilitation. Research investigating noninvasive brain stimulation, not yet available or approved for use in Canada for stroke-related indications, reveals broad application for the treatment of post-stroke upper extremity impairment, spasticity, depression, dysphagia, visual spatial neglect, and cognitive impairment.[107–109] Technology-supported rehabilitation shows promise for augmenting traditional approaches and providing sustainable, accessible supports, which may be maintained in the chronic phase. For example, tele-rehabilitation combined with the use of wearable devices and mobile applications can enable remote monitoring and facilitate provision of personalized rehabilitation.[110,111]

The goal of disseminating these recommendations is to increase the implementation of evidence-based stroke care across Canada, to reduce practice variations in care delivery, and to narrow the gap between current knowledge and clinical practice. These recommendations are reviewed and updated every 3–5 yrs, as new evidence emerges that requires changes in practice.

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