Canadian Stroke Community-based Exercise Recommendations Update 2020

A Resource for Community-based Exercise Providers

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Comments

We welcome comments, suggestions, and questions about the development and application of the *Canadian Stroke Community-based Exercise Recommendations Update 2020*. Please forward comments to the team c/o the Writing Group Chairs:

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Glossary of Terms, Definitions and Descriptions

Activities of daily living	Activities of daily living can include basic activities of self-care, such as bathing, dressing, grooming, and feeding. They may also include more complex activities (referred to as instrumental activities of daily living) such as preparing meals, doing household chores, shopping, and moving about in the community.
Aphasia	Aphasia is an impairment that can occur after stroke, affecting aspects of language and communication (i.e., production and comprehension). There are several types of aphasia but generally the types can be grouped into two larger categories of expressive and receptive. Expressive aphasia includes persons who have greater difficulty expressing themselves when speaking, writing, or using nonverbal elements such as gestures. Receptive aphasia includes persons who have greater difficulty understanding spoken language, written material and nonverbal elements such as gestures. Aphasia can mask a person's intelligence and ability to express and to understand feelings, thoughts, and emotions.
Ankle dorsiflexors	The muscles that cross the ankle that act to flex or pull the foot/toes upward, towards the shin.
Ankle plantarflexors	The muscles that cross the ankle that act to extend or point the foot/toes downward, away from the shin.
Clonus	A series of involuntary, rhythmic, muscular contractions and relaxations which may occur with increased muscle tone.
Cognitive	A term referring to mental processes involved in gaining knowledge and comprehension, including thinking, knowing, remembering, judging and problem-solving. These are higher-level functions of the brain and encompass language, imagination, perception and planning.
Comorbid/comorbidities	Two or more coexisting medical conditions or disease processes.
Community-based exercise programs	Structured, instructional programs of exercise for groups or individuals delivered outside the public healthcare setting and available in community settings (defined below). The research studies reviewed for these *Recommendations* only considered exercise programs delivered in-person (i.e., not virtual) and on land (i.e., not pool programs) and did not include specific approaches (i.e., yoga, pilates, Tai Chi).

Community setting	For the purpose of these *Recommendations*, the community setting was defined as a setting where exercise may be implemented that is outside of the public healthcare setting and the individual's home. This may include but is not limited to fitness centres, recreation centres, seniors' centres, retirement homes, community halls, and private practice settings.
Contracture	An abnormal, often permanent shortening of muscle and/or soft tissue resulting in decreased range of motion of a joint.
Dysphagia	Dysphagia is a swallowing disorder where the individual has difficulty or discomfort with swallowing food and/or liquids. Dysphagia is caused by damage to the brain and/or nerves that control the muscles of the lips, cheek, tongue, soft palate, or throat making it difficult to move food and/or liquids through the mouth to the esophagus. In addition, the individual may have a reduced or loss of the sensation/feeling in the mouth or throat which may make it difficult to feel the food and/or liquid. Dysphagia can cause coughing or choking and can put the individual at risk of having food and/or liquid entering the lungs (aspiration).
Exclusion criteria	Condition(s) that, if present, prohibit a person from participating in a program.
Exercise	Planned, structured, repetitive physical activity specifically designed to improve or maintain physical function or fitness. Examples may include exercises for strength, balance, cardiorespiratory fitness, or functional task practice (e.g., sit-to-stands, walking, step-ups).
Exercise provider	A range of individuals who have completed training and/or certification in the provision of exercise/fitness programs. These providers are most often non-regulated staff that may include fitness instructors and recreation programmers. In some settings, exercise providers may include regulated healthcare professionals (e.g., kinesiologists, physical therapists) who deliver or assist with the delivery of the exercise program.
Extensors	The muscles that act to straighten a flexed (bent) joint.
Flexors	The muscles that act to bend a joint.
Inclusion criteria	Condition(s) that must be met in order to participate in a program.

Perception	A term referring to the ability to sense, organize, understand & interpret information from different senses such as sight, hearing & touch.
Perceptual impairment	Difficulty with the ability to sense, organize, understand and interpret information from different senses such as vision, hearing, taste, touch, and smell.
Physical activity	Any physical movement of the body that is carried out by the muscles that requires energy. Not all physical activity is exercise (see definition of exercise above). Physical activity can also include household, occupational or leisure activities. An individual walking while shopping in a grocery store may be an example of physical activity whereas an individual going for a walk intentionally every day for 30 minutes would be an example of exercise. Physical activity can contribute to overall health and wellbeing.
Program provider	The program provider is the community organization and individuals at the organizational/administrative level that are responsible for the coordination and provision of the exercise program.
Randomized controlled trial	A research study where participants are assigned randomly to one of two or more groups: one group receiving the treatment (e.g., the community-based exercise program) and the other group(s) (called the control or comparison group(s)) receiving an alternative treatment. A randomized controlled trial is considered to provide the highest level of evidence for exercise interventions.
Stroke	A stroke occurs when blood stops flowing to any part of the brain, depriving brain tissue from getting oxygen and nutrients, and leading to damage and death of brain cells. The effects of a stroke depend on the part of the brain that was damaged and the amount of damage done. An *ischemic* stroke is caused by a blockage or clot in the blood vessel of the brain; for example, plaque may build up inside the wall of the artery. Most strokes are ischemic strokes. A *haemorrhagic* stroke is caused when a blood vessel of the brain ruptures; for example, high blood pressure over time may weaken arteries. A stroke is a medical emergency.

Task-specific training	Repetitive and progressive practice of exercises that replicate functional activities used in everyday life. Examples may include repetitive sit-to-stands, step-ups, or walking-related activities. This type of training can also be referred to as task-related or task-oriented training.
Transient ischemic attack	A transient ischemic attack (TIA) is when there is a temporary blockage of the blood supply to the brain. The symptoms are similar to a stroke. The TIA symptoms usually last less than an hour and may only last a few minutes. A TIA is a medical emergency.

INTRODUCTION AND OVERVIEW

Introduction

More than 400,000 Canadians are currently living with stroke. This number is projected to nearly double in the next 20 years[1] as more people are having strokes at younger ages and the number of individuals living with long-term disability is increasing.[2] Persistent stroke-related disability has a significant impact on the individual, their caregivers, and healthcare, community, and social support systems.

People with stroke often have persistent deficits in strength and the ability to move their limbs,[3] balance,[4] and walk[5] as well as other sensory,[6, 7] cognitive,[8] and communication[9] functions. All of these can contribute to a decreased ability to engage in activities of daily living and physical activity.[10, 11] Reduced activity levels can lead to further physical deconditioning and, in turn, further disability.[12] As such, **the Canadian Stroke Best Practice Recommendations,**[13, 14] and other stroke best practice guidelines internationally,[15-17] recommend that **long-term management for people with stroke should include participation in exercise and physical activity after rehabilitation and upon return to the community.**

People with stroke and stroke-related disability can face barriers to accessing mainstream fitness and recreation programs.[18] **Community-based exercise programs that are specifically adapted for people with stroke may offer a sustainable solution** and provide multiple benefits that include:

- Providing a pathway for community reintegration from the hospital to the community;
- Increasing access to exercise to improve function and health; and
- Facilitating social interaction and support derived from the opportunity to meet others and learn from their experiences.

Studies have shown that people with stroke who participate in community-based exercise programs can experience a number of health benefits, including improvements in:

- Balance;[19-25]
- Sit-to-stand ability;[26]
- Walking capacity;[20, 22-24, 27, 28]
- Cardiorespiratory fitness;[25, 28]
- Upper-[19, 26] and lower-limb strength;[19, 20, 28]
- Exercise self-confidence;[26]
- Cognition;[25, 27]
- Activities of daily living;[20]
- Community participation;[24, 29] and
- Quality of life.[19, 29]

Participants with stroke also report improved strength, balance, mobility, exercise tolerance and confidence which have translated to improved performance in activities of daily living, community participation, and social integration.[22, 30-33]

Purpose, Target Audience, and Scope

Purpose

The ultimate **goal** of the *Canadian Stroke Community-based Exercise Recommendations* (hereafter referred to as *Recommendations*) are to promote life-long exercise participation and physical activity for people with stroke and related health, function, and social benefits, by enabling access to community exercise programming that is tailored to their needs. The **purpose** of these *Recommendations* is to support the translation of best evidence (research, best practice guidelines, and expert opinion) into clear recommendations for program and exercise providers to support the implementation of safe and appropriate exercise programs for people with stroke in a variety of community settings.

Target audiences

The principal target audiences for these *Recommendations* are: the *program provider* who is responsible for supporting or coordinating the delivery of the community exercise program, and the *exercise provider* (e.g., fitness instructor who is usually not a regulated healthcare professional) who is responsible for delivering the exercise program in the community setting.

Scope

The research studies that were reviewed to support the development of these *Recommendations* typically included **people with stroke** who were experiencing **persistent balance and/or mobility issues, but who had some capacity to stand and walk short distances without physical assistance.** The *Recommendations* should, therefore, be considered for individuals with stroke at this level of functional ability.

Exercise is also of benefit to individuals who have experienced a more severe stroke but programming for this group of clients requires further consideration of appropriate adaptations to the content and delivery of the program, including increased staff-to-participant ratios and additional training of providers, and may require more input and support from relevant healthcare professionals. Alternatively, individuals who have experienced a transient ischemic attack (TIA) or stroke but have little to no residual deficits may not require an adapted community exercise program.

Community-based exercise programs may be exclusive to people with stroke or could also include individuals with other health conditions (e.g., people with mobility deficits resulting from other medical diagnoses, neurological conditions, and/or age-related deficits). The research and guidelines cited here are specific to stroke**.** Program and exercise providers should consult with healthcare professionals for condition-specific modifications to exercise for non-stroke populations.

The research studies reviewed for the *Recommendations* only considered exercise programs delivered in-person (i.e., not virtual) and on land (i.e., not pool programs) and did not include specific approaches (i.e., yoga, pilates, Tai Chi).

Guideline Development Methodology

Development of the Post Stroke Community Based Exercise Guidelines 2010 and 2015

In 2010, an interdisciplinary, cross-sectoral provincial working group supported by the Ontario Stroke Network produced the first edition of *Guidelines for Community Based Exercise Programs for People with Stroke* to provide a framework for the safe and effective provision of exercise programs for people with mild to moderate stroke in the community and other settings. The guideline included a companion brochure (*A Guide for Choosing a Community Exercise Program for People with Stroke, 2010*) intended to assist people with mild to moderate stroke with selecting an exercise program that is safe and meets their needs.

In 2014, the guideline was updated by an interdisciplinary cross-sectoral working group representing expertise in the fields of stroke care and community exercise programming and reviewed by an expert panel. The second edition of the guideline, entitled *Post Stroke Community Based Exercise Guidelines, 2015*, consisted of recommendations, rationale, and supporting resources specific to 8 core areas: 1) Medical Clearance; 2) Screening by the Exercise Provider; 3) Class Structure and Supervision; 4) Exercise Program Principles; 5) Program Evaluation; 6) Exercise Providers; 7) Facility, and; 8) Emergency Plan and Equipment. The revised guideline and draft brochure (revised 2015 brochure title *A Guide for Choosing a Community Exercise Program for People Living With the Effects of Stroke)* were reviewed by people living with the effects of stroke. See Appendix A for contributing authors to the 2010 and 2015 Post Stroke Community Exercise Guidelines.

Update and Development of the Canadian Stroke Community-based Exercise Recommendations 2020

The current project set out to update the guideline recommendations and expand the scope of the resources to be applicable across Canada. The methodology for updating the recommendations was guided by the Appraisal of Guidelines Research and Evaluation (AGREE) II Consortium[34, 35] which includes 6 key domains: i) Scope and Purpose; ii) Stakeholder Involvement; iii) Rigour of Development; iv) Clarity of Presentation; v) Applicability; and vi) Editorial Independence. We used the Grading of Recommendations, Assessment, Development and Evaluations (GRADE)[36] methodology to grade the quality of evidence and the strength of the recommendations. The methodology for updating the recommendations included the following steps to ensure a thorough and rigorous process:

1) An expert inter-professional writing group of healthcare professionals and researchers from across Canada with expertise in stroke, best practices in stroke care, and implementation of community exercise programming was established (Appendix A);

2) A systematic search, appraisal, and update of research literature up to February and August 2020 for the first and second search strategy, respectively, was conducted (see description of searches below);

3) A systematic search and appraisal of external reference guideline recommendations were conducted;

4) Evidence summary tables were created;

A comprehensive literature search was conducted with assistance from a research librarian for relevant literature from 2015 to 2020. The question we addressed was: How should program and exercise providers structure community-based exercise programs (i.e., in both delivery and content) to ensure safe and effective implementation for community-dwelling adults with stroke? Our first search strategy was limited to systematic reviews and stroke practice guidelines using variations of terms “stroke”, “exercise”, “review”, and “guideline”. Several databases were searched including MEDLINE, Google, TRIP database, BMJ Best Practice and PeDRO (e.g., for guidelines that may not be referenced in the scientific literature). Given the limited amount of relevant synthesized research, we conducted a second search of primary studies and used variations of terms “stroke”, “exercise” and “community”. Guidelines were included for review if they made recommendations regarding exercise for adults with stroke. Systematic reviews and primary studies were included for review if they were specific to exercise programs delivered in non-healthcare community settings, included adults with stroke, and informed the implementation of community-based exercise programs (i.e., delivery and content) using the 8 original recommendations as a framework. The information obtained from the guidelines and literature review were synthesized and fomatted as evidence summary tables, to support review by the writing group;

5) The writing group reviewed and revised existing recommendations, and developed new recommendations as required, based on the evidence summary tables and expert opinion;

Based on the information from the guidelines and literature review, the writing group drafted revisions to the original recommendations and an iterative process was used to achieve consensus among members;

6) Writing group co-chairs graded the quality of evidence and the strength of each recommendation using the GRADE[36] approach;

The GRADE[36] methodology considers not only the **quality of the research evidence** but also **the strength of the recommendation.** The strength of the recommendation can be influenced by the balance between desirable and undesirable effects, the variability or uncertainty in values and preferences of people affected by the recommendations, and whether or not the recommendation represents a wise use of resources (see Table 1).

The authors acknowledge that while there is emerging research on the effectiveness of community-based exercise programming to improving various outcomes for people with stroke, **there is limited research on how best to implement these programs**. Each recommendation presented in this document represents one component of a larger complex intervention which, in most cases, has not been individually studied. Therefore, the research evidence for most recommendations is necessarily graded as low quality.

Recommendations were informed, however, by all available evidence, including research evidence, best practice guidelines, and the opinion of experts with implementation and practical experience.

To determine the **strength of the recommendation,** we drew on qualitative literature (e.g., studies including focus groups or interviews) that described the **experiences and perspectives of people with stroke and their caregivers, community fitness providers, and referring or supporting healthcare professionals.**

7) The revised recommendations, and supporting documents, were reviewed by leading experts in Canada and internationally (Appendix A). Experts included community exercise and program providers, healthcare professionals, researchers, and people with stroke and caregivers;

8) The writing group made final edits as required to the guideline;

9) Publication, public release on the CanStrokeCommunityExercise.ca website, and dissemination of the updated guideline; and

10) Continue with ongoing review and update process.

Management of Conflicts of Interest during Update 2020 of *the Canadian Stroke Community-based Exercise Recommendations*: All writing group members were required to declare actual and potential conflicts of interest in writing prior to participation. Declarations of Conflict of Interest for writing group members can be found in Appendix A.

Notable Changes in the Canadian Stroke Community-based Exercise Recommendations Update 2020

The final *Canadian Stroke Community-based Exercise Recommendations Update 2020* included:

1) Addition of 36 new references to replace or augment those in the original *Guideline*;

2) Rewording and additions to the document to align with the AGREE framework for guideline development;

3) Revisions to wording of the original recommendations;

4) Revisions to the recommendations related to Screening by a Qualified Healthcare Professional (previously Medical Clearance), Screening by the Program/Exercise Provider (previously Screening by Exercise Provider), Exercise Program Supervision and Format (previously Class Structure and Supervision), Program Evaluation, Exercise Providers, and Emergency Plan and Equipment;

5) Use of the GRADE methodology to grade the quality of evidence and the strength of the recommendations for each recommendation;

6) Addition of a new section entitled Summary of Evidence for each recommendation;

7) Updating of implementation resources to support Canada-wide implementation, and;

8) Revisions to the companion guide entitled “Choosing a Community Exercise Program After Stroke”, including reformatting to provide a printable version.

Table 1. Summary of Criteria for Grading the Strength of the Recommendations and the Quality of Evidence

Strength of Recommendation	**Description**
Strong Recommendation	Strong recommendations are those for which we are confident that the desirable effects of an intervention outweigh its undesirable effects. A strong recommendation implies that most individuals will be best served by the recommended course of action.
Conditional Recommendation	Conditional recommendations are those for which the desirable effects *probably* outweigh the undesirable effects but uncertainty exists. Conditional recommendations result when the balance between the desirable and undesirable effects is small, the quality of the evidence is lower, and there is more variability in the values and preferences of individuals. A conditional recommendation implies that most people would want the recommended course of action but that many would not.
Quality of Evidence	**Description**
High Quality	We judge evidence as high quality when we are highly confident that the true effect lies close to that of the estimate of the effect. For example, evidence is judged as high quality if all of the following apply: there is a wide range of studies included in the analyses with no major limitations, there is little variation between studies, and the summary estimate has a narrow confidence interval.
Moderate Quality	We judge evidence as moderate quality when we consider that the true effect is likely to be close to the estimate of the effect, but there is possibility that it is substantially different. For example, evidence might be judged to be moderate quality if any of the following applies: there are only a few studies and some have limitations but not major flaws, there is some variation between studies, or the confidence intervals of the summary estimate is wide.
Low or Very Low Quality	We judge evidence to be low or very low quality when the true effect may be substantially different from the estimate of the effect. For example, evidence might be judged as low quality if any of the following applies: the studies have major flaws, there is important variation between studies, or the confidence interval of the summary estimate is very wide.

*Adapted from the GRADE approach.[36]

SUMMARY OF THE CANADIAN STROKE COMMUNITY-BASED EXERCISE RECOMMENDATIONS UPDATE 2020.

Recommendation	Statement
1. Screening by a Qualified Healthcare Professional	Exercise providers should ensure people with stroke have consulted with a qualified healthcare professional (e.g., physician, nurse practitioner, or physical therapist) before participating in any exercise program to ensure that there are no conditions that require special consideration or would be contraindicative to participating in the exercise program. [Strong Recommendation; Low Quality Evidence].
2. Screening by the Program/Exercise Provider	The program/exercise provider should undertake a formal screening process to ensure the participant meets program eligibility criteria and to ensure a match between the program and the participant. Screening processes could include a range of activities such as interviewing potential participants, reviewing health information from the physician/other referring healthcare professionals, reviewing information about the participant's functional ability level, and identifying the need for other exercise considerations. [Strong Recommendation; Low Quality Evidence]. A mechanism should be in place to ensure that the exercise provider is aware of any concerns and recommendations identified through the screening process.
3. Exercise Program Supervision and Format	The exercise program supervision and format (e.g., individual versus group) should be designed to meet the needs of the targeted population. *Supervision:* Participants with stroke should be supervised during the exercise program by trained exercise providers using a one-on-one or group format. [Strong Recommendation; Low Quality Evidence]. *Group versus individual format:* When people with stroke are able to exercise more independently, a group format should be provided to foster social support and confidence (i.e., self-efficacy). [Strong Recommendation; Low Quality Evidence]. *Participant-to-instructor ratio:* A participant-to-instructor ratio of 4:1 should be provided when supervising group exercise programs that incorporate the practice of standing and walking tasks for people with stroke and balance and mobility limitations. [Conditional Recommendation; Low

	Quality Evidence]. Participant-to-instructor ratios may vary depending on the functional ability of the participants and skill level of the exercise provider.
4. Exercise Program Principles	The exercise provider should incorporate standard exercise training principles [Strong Recommendation; Low Quality Evidence], including an emphasis on the practice of functional tasks [Strong Recommendation; Moderate Quality Evidence], within the exercise program to address the needs of people with stroke.
5. Program Evaluation	Evaluation procedures should be in place to monitor program delivery (e.g., referral and screening processes, compliance with exercise program and procedures), participant engagement, and program impact. [Conditional Recommendation, Low Quality Evidence].
6. Exercise Providers	6.1. Exercise providers should receive education and training to attain the necessary knowledge of stroke and stroke-related impairments, common comorbid health conditions, and basic exercise principles. Additionally, exercise providers should have the skills required to safely and appropriately deliver the exercise program, to safely increase or decrease the level of challenge of the exercises, and to recognize and respond to adverse events and emergencies. [Strong Recommendation, Low Quality Evidence]. 6.2. Exercise providers should establish linkages with healthcare providers who have stroke-specific and exercise expertise. These linkages can facilitate exercise program referrals, training, and ongoing consultation to support delivery of a safe and beneficial exercise program. [Strong Recommendation, Low Quality Evidence].
7. Facility	The exercise provider should offer participants a general orientation to the facility, and a safe and accessible exercise environment that meets the needs of the participants. This should include barrier-free access to parking, facility entrance, transit pick-up/drop-off areas, exercise classrooms, exercise equipment, change rooms/locker rooms and washrooms. [Strong Recommendation, Low Quality Evidence].

8. Emergency Plan and Equipment	The program provider should have an emergency plan and adverse event protocol in place that is documented and known to all exercise providers including: access to in-house first aid services from qualified personnel; phone access to Emergency Medical Services; access to an Automatic External Defibrillator (AED); and access to a source of glucose (e.g., fruit juice). There should be a quality improvement process in place to track and review incidents or adverse events. [Strong Recommendation, Low Quality Evidence].

RECOMMENDATION #1: SCREENING BY A QUALIFIED HEALTHCARE PROFESSIONAL

Exercise providers should ensure people with stroke have consulted with a qualified healthcare professional (e.g., physician, nurse practitioner, or physical therapist) before participating in any exercise program to ensure that there are no conditions that require special consideration or would be contraindicative to participating in the exercise program. [Strong Recommendation; Low Quality Evidence].

Rationale

Exercise can be undertaken with a high level of safety by most people, including people with stroke.[37] Exercise is not completely without risk, however, and people with stroke generally fall into a higher-risk category because they have an increased prevalence of cardiovascular disease, diabetes, and stroke-related impairments. People with stroke, their families,[38] referring healthcare professionals,[38] and community exercise providers,[39] have identified concerns about safety and risk related to participation in community-based exercise programs.

The majority of studies that have evaluated aerobic exercise[37] or community-based exercise programs for people with stroke[19, 20, 23-25, 27, 28, 40-47] have medically screened participants to ensure that they have no contraindications to exercise or physical activity prior to participation to ensure safety. The 2019 Aerobic Exercise Recommendations to Optimize Best Practice in Care after Stroke (AEROBICS) indicate that, before engaging in aerobic training, "all individuals post-stroke or TIA (transient ischemic attack) must undergo a screening assessment to identify medical conditions that require special consideration or constitute a contraindication to exercise".[48, 49] The AEROBICS further state that screening for aerobic training should be done by "appropriately qualified health care professionals, consistent with their scope of practice and practice setting".[48, 49]

Implementation Resources and Considerations

It is recommended that a standard exercise screening form and/or medical clearance letter, which briefly describes the exercise program, including the level of exertion and supervision, be given to the participant to review with their qualified healthcare provider (e.g., physician, nurse practitioner or physical therapist). This form or letter should review information about medical conditions and precautions or contraindications that would affect the person's entry into, or participation in, the exercise program. The program/exercise provider should review this screening form or letter prior to an intake interview and start of the program.

If the program/exercise provider needs to contact the healthcare provider directly, they should obtain written consent from the potential participant.

The following medical information is often recommended for inclusion in exercise screening and medical clearance forms:

1) Blood pressure status;
2) Presence of diabetes, including type of treatment (e.g., oral medications or insulin) as well as risk of hypoglycemia and any requirement to track blood glucose levels during exercise;
3) Cardiac/cardiovascular disease (e.g., coronary artery disease, cardiac arrhythmias, structural heart disease, heart failure), including use of nitroglycerin;
4) Medications (e.g., beta blocker) that may inhibit response to exercise;
5) Medications (e.g., anticoagulants) that may cause excessive bleeding resulting from injury;
6) Information related to any need for fluid restriction or other fluid considerations (e.g., congestive heart failure, dialysis, requirement for thickened fluids);
7) Presence of asthma or chronic obstructive pulmonary disease including type of medication used (e.g., asthma inhaler, supplemental oxygen);
8) Peripheral vascular disease/poor circulation;
9) Seizure activity;
10) Other neurological conditions;
11) History of cancer;
12) Musculoskeletal disease such as osteoporosis and osteoarthritis; also, identify any specific joint pain;
13) Specific restrictions and/or precautions related to any other existing medical conditions, injuries or surgical procedures (e.g., total hip replacement);
14) Current physical activity level; and
15) Pregnancy. The Canadian Society for Exercise Physiology (CSEP) has health screening guidelines for exercise and pregnancy: (https://csep.ca/2021/05/27/get-active-questionnaire-for-pregnancy/).

Some examples of standardized exercise screening forms are listed below:

- The Get Active Questionnaire and companion Get Active Questionnaire Reference Document guides potential exercise participants through a series of questions related to health status and current physical activity status to identify areas that require consultation with a qualified exercise professional, a healthcare provider or physician prior to starting a fitness program. These forms can be found here: https://store.csep.ca/pages/get-active-questionnaire-resources.

- The Physical Activity Questionnaire for Everyone (PAR-Q+) and the Questionnaire sur l'aptitude à l'activité physique pour tous (Q-AAP+) are questionnaires that guide exercise participants though a series of general health and medical questions. The electronic Physical Activity Readiness Medical Examination (ePARmed-X+) and Physician Clearance Forms are supplemental forms when there is a positive response to the PAR-Q+ and to advise when consultation and clearance by a physician is required. The print and electronic version of these forms can be found here: www.eparmedx.com.

The following are also some specific examples of medical clearance and physician referral forms that have been used in community-based exercise programs:

- Fit for Function - Medical Authorization Form[50] (Appendix B);
- Fitness and Mobility Exercise (FAME) Program[51] – Screening Forms (Appendix C);
- Keep Moving with Stroke[52] - Medical Clearance Form (Appendix D); and
- Together in Movement and Exercise (TIME™)[53] Program - Sample Referral Form (Appendix E).

Summary of the Evidence

Participants and their families,[38] referring healthcare professionals,[38] and community exercise providers,[39] have expressed concerns about safety and risk related to the participation of people with stroke in community-based exercise programs.

Saunders and colleagues[37] conducted a systematic review of 75 randomized controlled trials involving 3017 people with stroke who participated in exercise programs consisting of cardiorespiratory fitness training, resistance training, or both. Authors concluded that exercise is a safe intervention and there is no evidence that cardiorespiratory fitness and resistance training cause injuries or health problems. The trials in this review were not specific to community-based exercise programs. Overall, there was a low risk of death and serious adverse events attributed to the training. Authors additionally noted that their findings may be attributed to: i) the inclusion of people with milder strokes and reduced risk factors in the trials (i.e., those at higher risk were likely excluded due to contraindications), and; ii) a self-selection by participants who are more physically active with higher fitness levels. Saunders and colleagues also noted that adverse events were not typically sought as an outcome measure within the studies, but were instead reported ad hoc.[37]

Consistent with the Saunders review, the majority of participants included in community-based exercise studies are those with less severe strokes (i.e., they often have the functional capacity to walk short distance).[54] The majority of studies also reported specifically screening for contraindications to exercise prior to participation to ensure

safety.[19, 20, 23-25, 27, 28, 40-47] Medically-related exclusion criteria that have been used across community-based exercise studies include:

- Contraindications to exercise as per established guidelines (i.e., American College of Sports Medicine[43] and American Heart Association guidelines[25]);
- Uncontrolled blood pressure[20, 23, 28] or resting systolic/diastolic blood pressures that exceed 180/100;[45]
- Serious cardiac disease[20, 27, 28] including acute, unstable or severe heart failure,[23, 42, 45] active or uncontrolled angina,[45] or recent myocardial infarct (< 3 months);[45]
- Active cancer;[45]
- Infectious conditions;[46]
- Untreated depression;[25, 45]
- Musculoskeletal conditions,[20, 23, 45] or pain[25, 28, 45] restricting exercise;
- Recent injurious fall without medical assessment;[44] and
- Other neurological conditions in addition to stroke[28] that would restrict participation.[20]

A few studies excluded people with insulin-dependent diabetes[25] or atrial fibrillation.[23] While it is important to be aware of these conditions in participants, they do not present as a contraindication and do not necessarily preclude participation in exercise.

There are no systematic reviews specifically synthesizing literature on the safety of *community-based* exercise programs for people with stroke. Also, serious and other adverse events across studies are not always consistently reported.[54] However, many studies of community exercise programs that did include a safety aspect have reported no adverse events[24, 27, 42, 46, 55] or reported only minor events that did not result in injury or medical intervention.[22, 26] For example, Salbach and colleagues[22] reported 2 minor adverse events across 203 attendances to a task-related exercise program for individuals with neurological conditions including stroke: one participant lost their balance but was steadied by the caregiver and one participant had a possible hypoglycemic reaction. Kerr and colleagues[44] reported 2 adverse events resulting in minor injury, across 66 participants in a community cycling program, which were attributed to falls on a treadmill (possibly occurring during testing or during other activities that were included for motivational purposes). Stuart and colleagues[45] reported no serious adverse events and a few minor adverse events in a trial comparing a community-based adaptive physical activity program with a seated exercise program. Six of 43 (14%) participants in the adapted physical activity program reported events (i.e., faintness, shortness of breath, chest pain, muscle pain, controlled fall without injury) compared to 4 of 33 (12%) participants in the seated exercise class (i.e., muscle pain and controlled fall without injury). Dean and colleagues[43] reported that only 3 of 22 reported minor adverse events for those participating in the exercise program occurred at the venue (one fall, one trip, one ankle strain).

Serious adverse events have occurred infrequently. Two serious adverse events were reported among 21 individuals with stroke who participated in an exercise program that included both venue-based group exercise and an independent home program.[43] The investigators concluded that these events were possibly related (participant fainting) or probably related (participant experienced a transient ischemic attack) to the exercise intervention.[43] One hip fracture was reported among 30 individuals participating in a community exercise program focused on agility, balance and walking with various challenges; this occurred during a non-challenging task.[47] Further, Calugi and colleagues[42] reported that at 12-month follow-up, reports of adverse events such as falls, stroke recurrence, access to emergency department or hospitalization did not significantly differ between those who participated in a community-based exercise program versus usual care. Moreover, those who participated in the community-based exercise program were *less* likely to report fractures or need to access subsequent rehabilitation interventions compared to those who did not participate.[42]

RECOMMENDATION #2: SCREENING BY THE PROGRAM/EXERCISE PROVIDER

The program/exercise provider should undertake a formal screening process to ensure the participant meets program eligibility criteria and to ensure a match between the program and the participant. Screening processes could include a range of activities such as interviewing potential participants, reviewing health information from the physician/other referring healthcare professionals, reviewing information about the participant's functional ability level, and identifying the need for other exercise considerations. [Strong Recommendation; Low Quality Evidence]. A mechanism should be in place to ensure that the exercise provider is aware of any concerns and recommendations identified through the screening process.

Rationale

Consideration must be given to the resources required to provide a formal screening process as it is critical to ensure a match between the program and participant to maximize safety, feasibility, and benefit. The screening process must include assessment of health and functional status using a standardized process and documentation procedure. Individuals may present with a wide variety of stroke-related impairments that will need to be accommodated (see Table 2). Some people with stroke may have needs that are beyond the program provider's capacity to accommodate. For this reason, clear eligibility (inclusion/exclusion) criteria and linkages to more specialized or appropriate programs (e.g., falls prevention) and/or healthcare providers should be in place. Participants would benefit from repeated screening in response to changes in health status and capabilities to ensure that the current program is continuing to meet their needs.[48, 49] A collaborative approach with clear communication between the participant, the exercise provider, and the healthcare provider, will support an optimal experience for the participant and maximize benefits.

Implementation Resources and Considerations

Screening by the Program/Exercise Provider

Screening of program participants by the program/exercise provider should include questions to determine:

- The match between the participant and program;
- The degree of support the participant requires; and
- The program provider's ability to accommodate the participant's requirements.

A program coordinator could complete screening by telephone or via online or virtual methods. A mechanism should be in place to communicate concerns and recommendations identified through the screening process to the exercise provider.

See Table 2 for a list of suggested screening questions. These screening questions are consistent with Canadian Stroke Best Practice Recommendations[13, 14] and other stroke best practice guidelines[15, 17, 48, 49] for screening as part of the rehabilitation process.

Privacy Considerations

Program and exercise providers should refer to, and follow, relevant privacy legislation in their jurisdiction to guide policy and processes specific to the collection, use, sharing, storage and disposal of personal information or personal health information collected from exercise participants.

Inclusion/Exclusion Criteria

The development of inclusion/exclusion criteria is recommended to ensure that the exercise program is appropriate for the participant. The following are some examples of **general eligibility criteria** that may be applied when screening participants and that have been commonly used in studies evaluating community-based exercise programs.[19, 22, 25-27, 30 40, 42, 43, 46, 54] The inclusion and exclusion criteria should be tailored to the type of program offered. Some criteria pertaining to the participant's ability can be waived at the discretion of the exercise provider if a trained caregiver or volunteer accompanies the participant to assist where appropriate.

Examples of Inclusion Criteria:

The participant demonstrates the ability to:

- Walk short distances (e.g., 3 – 30 metres) with or without an assistive device (e.g., cane, walker, ankle brace) independently or with minimal supervision/support;*
- Stand up and sit down without physical assistance;*
- Perform standing exercises while holding on to a support;*
- Transfer to another surface or to equipment without physical assistance;
- Follow instructions or mimic exercises (with or without assistance);
- Self-monitor and understand the concepts of "perceived exertion" and/or "target heart rate"; and
- Communicate adverse effects such as pain or fatigue or the need for assistance.

*These are important criteria if standing and/or walking activities are included in the exercise program.

Examples of Exclusion Criteria:

- Conditions that are contraindicative to exercise (see Recommendation #1);
- Impulsivity requiring close supervision to ensure the safety of the person with stroke and/or the other participants;
- Behaviours that will negatively affect others in a group setting; and

- Incontinence (unless appropriate undergarments are worn and/or personal support is provided).

If a person is ineligible for the exercise program due to a low level of function, it is recommended that the exercise provider suggest alternate strategies/exercise opportunities such as referral to a seated exercise program or a fall prevention program. Consideration should also be given to referring the individual back to their primary care provider or to appropriate healthcare professionals. This is consistent with the Canadian Stroke Best Practice Recommendations[13, 14] to support transitions and community participation that states “when issues are identified through screening and assessments, referrals to appropriate experts and services to address issues and optimize outcomes should be made for people with stroke, their families, and caregivers”.

Consideration should also be given to those participants who may have a higher level of function than is appropriate for the adapted program being provided. In these situations, a program targeted at the general population may be more appropriate.

Table 2. Questions for Screening Participants

Movement		
Domain	**Probing Question**	**Relevance***
Mobility	Is the participant able to walk? Is a cane or walker required? Is assistance required? How far can they walk? Do they use a lower extremity brace or orthosis? Do they need help to get out of a chair or wheelchair? Will it be necessary for the participant to climb stairs to access the program?	Adaptations may be required to ensure safe access to the class and participation. Screening for the ability to do stairs will be important if the person with stroke is enrolling in an exercise program where stairs are required to access the exercise space because there is no ramp or lift.
Balance and Risk of Falls	Does the participant feel unsteady when moving about their home or community? Is the participant fearful of falling? Has the participant fallen or experienced a near fall within the last three months? What was the cause of the fall? Does the participant use mobility aids and were they using these devices when the fall occurred? Would the participant like to be informed of, or obtain a referral to, fall prevention resources?	Adaptations may be required to minimize risk of falls within the class.
Fatigue/ Endurance	Can the participant be active for a 1- to 2-hour period (including travel time) without *excessive* fatigue (i.e., fatigue that limits their ability to safely participate in the rest of their daily activities)? Will there need to be a scheduled break/rest period for the participant?	A participant should have the tolerance for the class including getting ready for and traveling to/from class.
Range of Motion	Does the participant have any movement limitations? Does the participant experience any stiffness in a joint or abnormally “tight”	Adaptations to the exercises would be needed to accommodate any movement restrictions. Caution is

	muscles (i.e., high muscle tone)? Is there excessive movement at a joint or abnormally "loose" muscle (i.e., low muscle tone)?	required to minimize risk of injury to the shoulder on the more affected side.
Strength/ Coordination	Does the participant experience any weakness? Does the participant have a weaker side? Are they able to use that side? Which side is it? Does the participant experience uncoordinated movement?	Adaptations to the exercises would be needed to accommodate weakness and incoordination. Adaptations may be required to either protect the weaker side from injury or cue the individual to use the weaker side. For example, a person with a weak shoulder may need cueing to protect the shoulder to avoid injury and prevent development of shoulder pain or the participant may require the use of a shoulder sling while exercising.
Musculoskeletal	Has the participant had a joint (e.g., hip/knee) replacement or do they have severe osteoarthritis or osteoporosis? Have they had a recent injury? What movements need to be avoided?	Adaptations to the exercises would be needed to accommodate any movement restrictions, for example, avoiding twisting or high impact activities.
Perception		
Domain	**Probing Question**	**Relevance***
Pain	Does the participant have pain anywhere (common examples would be shoulder, neck, back, knees)? What makes the pain worse?	Adaptations to the exercises would be needed to prevent worsening their pain.
Sensation	Can the participant feel on the side(s) affected by the stroke? Do they know where the affected limb is in space? Does the participant forget about the side affected by the stroke? Can they feel equipment in their affected hand?	Sensation deficits can affect the participant's ability to safely perform exercise. Adaptations, such as protecting an upper limb with decreased sensation, may be needed.

Vision Loss	Does the participant have any vision loss? Do they have adequate peripheral (side) vision? Are they experiencing blurred or double vision or other visual concerns? Is corrective/special eyewear required?	Adaptation may be required to support the participant's safety if their visual field is restricted and/or if their balance is affected by blurred or double vision. For example, the space around a participant with vision impairment should be kept clear of tripping hazards.
Hearing Loss	Does the participant have any hearing loss? Is a hearing aid or other adaptive equipment needed? Does the participant speech read (also known as lip read) and/or communicate using sign language and/or use alternative assistive communication technology?	Adaptation may be required to support the participant's safety and participation. For example, background music should be kept at a low volume, and the instructor should be face-to-face when speaking with a participant with impaired hearing.
Behaviour and Cognition		
Domain	**Probing Question**	**Relevance***
Behaviour and Emotional Status	Does the participant experience episodes of anger or crying? Are they impulsive? How is this managed? Can the participant express emotion appropriate to the situation? What signs will indicate stress or unhappiness?	A response plan may be needed to manage outbursts.
Cognitive Status	Is the participant able to pay attention to and follow instructions in a group/individual setting (whichever is relevant)? Are they able to monitor themselves for level of exertion, pain, fatigue, and personal safety?	Attention, memory, and body awareness may require accommodations. For example, the instructor may need to closely observe the individual for signs of fatigue or over-exertion. Additional cueing for exercises and/or reinforcement of instructions may be required.
Communication and Swallowing		
Domain	**Probing Question**	**Relevance***
Communication (Aphasia)	Is the participant able to express basic needs? Is the participant able to understand and follow instructions? Or do they require	It is important to be aware of the specific communication strategies that are used by the participant and required of the exercise provider. Adaptation may be required to

	assistance or supportive communication strategies?	enable effective communication, as some people who have experienced a stroke will have difficulty speaking and/or understanding. (See Appendix F for strategies to support participation for adults with communication difficulties).
Swallowing (Dysphagia)	Does the participant have any difficulties with swallowing leading to choking? Are there safety precautions that need to be in place? Will they bring their own refreshments to the class?	People with difficulty swallowing post-stroke may need to avoid certain foods, textures and liquid consistencies. Restrictions identified with water or food intake must be shared with exercise providers and volunteers. For example, it may not be safe to provide water for hydration or juice as a source of glucose. (See Appendix F for strategies to support participation for adults with swallowing difficulties).
Medications		
Domain	**Probing Question**	**Relevance***
Medications	Does the participant need to bring specific medications to the exercise class? Does the participant require assistance to take the medication? Do they need to bring a glucometer to monitor their blood sugar levels (i.e., if they have diabetes)?	Some participants may need to have medication, such as nitroglycerin or a sugar pill, with them during the exercise class. The instructor should know if the participant requires assistance in case there is a need for the medication to be taken during class.
Continence		
Domain	**Probing Question**	**Relevance***
Continence	Does the participant have bowel and bladder control? If the participant is incontinent, is it contained through use of protective undergarments?	Individuals with incontinence may participate in exercise programs provided the incontinence is managed with use of protective undergarments or other suitable strategies. It is ideal if all participants have ready access

		to washroom facilities during class (i.e., program occurs in close proximity to washrooms).
Supports		
Domain	**Probing Question**	**Relevance***
Self-care	Can the participant dress, undress and use the bathroom independently?	Difficulty in these areas will affect the degree of support needed (e.g., a family member or caregiver may need to attend the class to provide assistance).
Individual Assistance	Does the participant have a family member, caregiver or volunteer to help them participate in the program, if needed?	A family member, trained caregiver, or volunteer may be able to support the exercise participant who may otherwise be excluded; for example, if the individual requires greater supervision or support due to cognitive, communication and/or behavioural issues and/or requires assistance with toileting or self-care. Support personnel will require training or orientation to safely assist the participant in the exercise program.
Transportation	How will the participant be getting to and from the program?	Lack of access to reliable transportation may affect the participant's ability to regularly attend classes. If relying on accessible transportation, ensure that the participant has a safe and appropriate place to be dropped off or wait, before or after class, respectively. Also determine if they require supervision or assistance to walk or use their wheelchair from the facility's drop-off area to the exercise class location within the facility, and vice versa.

***Refer also to Recommendations 4 and 6, which include stroke-related safety considerations when implementing the exercise program and information for exercise provider training, respectively.

Summary of the Evidence

Stroke best practice guidelines[13-15, 17, 48, 49] recommend screening for stroke-related impairments as part of the rehabilitation process. It follows that screening for stroke-related impairments should also be completed prior to participation in community-based exercise programs.

Merali and colleagues[54] conducted a scoping review to characterize studies evaluating community-based exercise programs for people with neurological conditions including stroke. All studies (n=15) reported eligibility criteria for participation in the exercise program. The most common inclusion criteria related to a minimum walking ability (67% of studies), minimum cognitive ability (53% of studies) and minimum age requirement (53% of studies).[54] Exclusion criteria for individuals at higher levels of function were not frequently reported.[54]

Examples of minimum walking criteria for participation in community exercise programs for people with stroke have included: the ability to walk with/without an aid,[19, 25-27, 30, 54] for a minimum distance (i.e., 3-30 metres),[19, 22, 26, 27, 40, 42, 43, 46, 54] a minimum amount of time (e.g., 6 minutes),[25, 45, 54] or at a minimum walking speed.[54] Other physical capacity criteria included: the ability to stand up and sit down without physical assistance,[19, 45] and transfer onto exercise equipment independently,[19] or achieving a minimum score on a standardized balance measure (e.g., Berg Balance score > 36 out of 56).[45] Duret and colleagues[19] included non-ambulatory participants in their adapted physical activity program and required them to be independent in basic wheelchair skills and transfers.

Cognitive and communicative eligibility criteria for participation in community-based exercise studies have included criteria such as sufficient cognitive and communication function to be able to participate, follow verbal instructions or exercise demonstrations,[19, 30, 43, 44, 46, 54] and communicate exertion and adverse events.[46] Some research studies have used cut-off scores on standardized cognitive measures (e.g., the Mini-Mental State Exam[42] or the Montreal Cognitive Assessment[25, 44]) to determine eligibility.

Some community-based exercise studies have excluded individuals with moderate to severe aphasia,[30, 45, 54] dementia,[45] or severe perceptual disorders (e.g., deafness or blindness).[42] It is not clear whether such impairments were thought to preclude participation in the exercise program or only participation in study-related procedures. People with stroke-related aphasia can experience barriers to social participation including participation in community-based exercise.[56] Exercise providers describe that lack of qualified personnel with aphasia-specific training is a primary barrier[57] and caregiver accompaniment may be a requirement for participation.[57] Individuals with stroke-related aphasia describe that participation in community-based exercise programs can be facilitated by having consistent staff who have an understanding of aphasia, are familiar with the participants' communication challenges, demonstrate patience, provide simple and clear instructions, and use non-verbal communication (e.g., gestures and demonstrations of exercises). Additionally, the presence of a communication partner or family support[56, 57] can be important to facilitate access to information about the programs, scheduling transportation, or completing registration forms and participation in the program.

RECOMMENDATION #3: EXERCISE PROGRAM SUPERVISION AND FORMAT

The exercise program supervision and format (e.g., individual versus group) should be designed to meet the needs of the targeted population.

Supervision: Participants with stroke should be supervised during the exercise program by trained exercise providers using a one-on-one or group format. [Strong Recommendation; Low Quality Evidence].

Group versus individual format: When people with stroke are able to exercise more independently, a group format should be provided to foster social support and confidence (i.e., self-efficacy). [Strong Recommendation; Low Quality Evidence].

Participant-to-instructor ratio: A participant-to-instructor ratio of 4:1 should be provided when supervising group exercise programs that incorporate the practice of standing and walking tasks for people with stroke and balance and mobility limitations. [Conditional Recommendation; Low Quality Evidence]. Participant-to-instructor ratios may vary depending on the functional ability of the participants and skill level of the exercise provider.

Rationale

People with stroke present with a range of medical, physical,[3] cognitive,[8] and perceptual impairments.[6, 7] People with stroke may be able to walk on their own with or without walking aids, able to walk with supervision, or unable to walk.[5] The level of supervision provided should be tailored to the needs of the targeted group to ensure safe participation and achievement of program goals. Generally speaking, as the level of participant risk (due to medical status, disability, impairment, and exercise challenge or intensity) increases, the ratio of participant-to-instructor should decrease (e.g., from 4:1 to 3:1) accordingly to enable safe participation.

Implementation Resources and Considerations

Program Considerations

- Settings should be adequately staffed with trained personnel to provide appropriate supervision. (See also Recommendation 6 specific to Exercise Providers).
- It can be challenging for exercise providers to provide supervision and ensure safety to participants with varying levels of abilities in a group format.[39] Program/exercise providers should consider eligibility criteria and class structure when considering supervision requirements. For example, in some cases a class of participants that is fairly homogeneous in terms of ability level may make supervision easier. Alternatively, a heterogeneous group that combines individuals who are more independent with those who require greater supervision may be easier to supervise than a group in which all participants require significant supervision.

- It can be difficult to maintain a roster of trained staff due to staff turnover and allocation to other programs.[40] Program providers should consider having multiple exercise instructors trained to provide back-up.
- Lower participant-to-instructor ratios (i.e., fewer participants per instructor) may increase the cost of running exercise programs for people with stroke compared to programs for the general population.[39, 58]
- To achieve the required level of supervision, consider using trained volunteers and/or caregivers, and personal support workers, where appropriate. Post-secondary health or social services education programs may also be a source of volunteers (e.g., Kinesiology, Rehabilitation Assistant or Therapeutic Recreation programs). Programs will need to consider institutional policies specific to the roles and responsibilities that volunteers may assume, and consider the resources required to support the training of volunteers.
- Instructors may find that modifying exercises for people with stroke is challenging. Exercise programs that involve opportunities to consult with healthcare professionals can help to mitigate this issue[58] (see also Recommendation 6).
- Adopting methods for program certification[40] or program evaluation[41] (i.e., to evaluate adherence to safety and quality criteria, including supervision ratios) may help to monitor and ensure that the program is being delivered as intended (see also Recommendation 5 for Program Evaluation).
- Class size and space requirements should adhere to local building, and fire code regulations and public health requirements.

Summary of the Evidence

People with stroke have a higher number of health conditions[59] and are at an increased risk of falling compared to people without stroke.[60]

Aerobic exercise guidelines recommend that exercise programs for people with stroke be conducted either using an individual (one-on-one) or group format, with the ratio of participant to supervising personnel determined by the severity of the participant's neurological and cardiac status as well as the planned exercise intensity and mode of training.[48, 49]

The majority of studies evaluating community-based exercise programs have been in group or circuit formats.[20, 22-31, 40, 43, 45, 54, 55] Community-based exercise programs incorporating individual exercise formats[38, 44, 46] or a mix of both individual and group formats[19, 21, 32] have also been examined. A growing body of literature highlights the social benefits of group-based exercise programs. Young and colleagues[61] conducted a systematic review and thematic synthesis of qualitative research describing the experiences of people with stroke participating in community exercise programs within the UK. The influence of the group was a major recurring theme with high levels of mutual encouragement and peer support described.[61] Such benefits have also been described in group-based exercise programs in Canadian settings.[30, 62] Participants with stroke and their caregivers have noted a strong sense of "belonging" that was a driver for ongoing participation.[62] A group format enables social support as it provides opportunities to relate to people with similar conditions, form friendships, and engage in activities outside of the program.[30, 43] People with stroke attending

an independent gym-based program, with minimal instructor supervision, described the program as a solitary experience.[38] Select individuals may prefer supervised individual exercise programs to optimize training intensity and avoid exercising in front of others.[33, 43]

Community-based exercise programs for people with stroke including standing and walking activities, and delivered by fitness or gym instructors (i.e., not delivered by physical therapists), have most frequently reported a participant-to-instructor ratio of 4:1,[21, 22, 41, 43] but ratios have included 2:1,[26] 3:1,[19] 5:1,[27] 6:1,[20] 9:1,[29] and 12:1.[45] The latter studies with higher ratios (i.e., more participants per instructor), however, reported that partners, family or caregivers may be included[29] or additional assistants were provided if there were new or low-functioning participants to optimize safety.[45]

RECOMMENDATION #4: EXERCISE PROGRAM PRINCIPLES

The exercise provider should incorporate standard exercise training principles [Strong Recommendation; Low Quality Evidence], including an emphasis on the practice of functional tasks [Strong Recommendation; Moderate Quality Evidence], within the exercise program to address the needs of people with stroke.

Rationale

Following standard principles will support a safe and effective exercise program. People with stroke often have difficulty with movement and performing functional tasks, and are physically deconditioned. Numerous stroke best practice guidelines[15-17, 63, 64] including the Canadian Stroke Best Practice Recommendations[13, 14] state that people with stroke should engage in exercise that is task-specific, meaningful, engaging, repetitive, progressively adapted, and goal-oriented to improve lower-limb function, balance and mobility. Exercise to improve cardiorespiratory (aerobic) fitness[13-17, 48, 49, 65] and strength[15, 17, 65] is also recommended. These exercises can complement each other to prevent physical deconditioning and optimize functional independence and mobility. Stakeholders (including people with stroke, their caregivers, healthcare professionals and community exercise providers) identify exercises that address balance and posture, mobility, sensation, cardiorespiratory fitness, leg and arm strength, and tone[62] as important to include in a community-based exercise program.

Implementation Resources and Considerations

The following exercise program principles should be incorporated into the design of a program.

Safety

People with stroke may have other health conditions (e.g., cardiovascular disease)[59] and stroke-related impairments (e.g., impairments in sensation,[6] motor function,[3] balance,[4] vision,[7] and exercise tolerance[66]) requiring consideration or modifications to ensure safety during exercise.[58] See Table 3 for stroke-related safety considerations when implementing various components of an exercise program. Pre- and post-exercise session safety screening should also routinely occur. Exercise providers may find it beneficial to use a checklist before, during, and after each session (see Appendix G for a sample checklist).

Posture, Alignment and Mechanics of Movement

Posture, alignment and movement mechanics during exercise are important to minimize risk of injury to limbs that may be weak and/or have sensory loss, and to encourage optimal use of and maximize the benefit to the affected limbs. Exercise providers should instruct participants to assume the best possible posture and alignment before beginning each exercise and to maintain appropriate movement patterns throughout the exercise. For example, when performing sit-to-stand, the participant may be cued to start at the edge of their chair, with their feet under their knees, to flex their trunk forward over their feet, and perform a controlled ascent with equal loading over their feet. Sometimes the difficulty of the exercise must be decreased for the participant to maintain a good posture and alignment.

Task-specific Exercise

Task-specific training (also referred to as task-related or task-oriented training) requires repetitive and progressive practice of exercises that replicate functional activities used in everyday life.[67] Examples of task-specific exercises include repetitive sit-to-stands, step-ups, or walking-related activities. Task-specific exercises should each have multiple difficulty levels so that the exercise can be tailored to the ability level of participants. For example, a sit-to-stand task can be made more difficult by asking the participant to stand up without using their hands or lowering the height of the sitting surface. Task-specific training is commonly used in community-based exercise programs[20-23, 25, 27-29, 42, 43, 45] as it requires minimal equipment and is feasible to teach. Large numbers of repetitions of task-specific exercises can also improve performance of functional activities whereas strength training in isolation may not improve function in people with stroke (see Specificity below).[68, 69]

Specificity

Specificity means that improvements in a functional task or skill will more likely occur with practice of that specific task. Specificity is a component of task-specific training.

Frequency, Intensity, Time and Type (FITT) Principles

The exercise provider should consider the **F**requency, **I**ntensity, **T**ime (duration) and **T**ype (FITT) of exercises prescribed to participants within the exercise program. Table 3 provides the recommended FITT for specific exercise components. However, the frequency, intensity, and time for optimal benefits from a community-based exercise program is not yet known. The exercise prescription should be considered on an individual basis according to each participant's health status and abilities. Providers of the exercise program may also need to consider other implementation factors that could influence FITT including the participants' ability to feasibly access the exercise program and required transportation, and available program resources (e.g., staff, equipment, space).

Frequency

Community-based exercise programs for people with stroke have most commonly involved two classes per week.[19, 20, 22, 27, 29, 42, 43, 54, 55] Some programs have offered one class,[21, 26] or three classes per week.[23-25, 28, 45] Notably, these programs may have various program durations (# weeks) that influence the overall amount of exercise provided (see *Time* principle below). The recommended frequencies for specific exercise components are detailed in Table 3. Exercise providers commonly consider the availability of trained instructors, space, and equipment, as well as demand for the class, when determining the optimal class frequency.

Intensity

The program should start at a conservative intensity and be slowly progressed depending on how the participants respond to the exercises based on self-report and observation by the program instructor. Exercise intensities must be individually determined based on health status, initial fitness/strength level, and physical limitations post-stroke.

The AEROBICS guidelines recommend that people with stroke have an exercise stress test with ECG prior to participating in *aerobic* exercise.[48, 49] However, this requires access to qualified healthcare professionals who have the competencies to administer the test, interpret

the test results for exercise prescription and apply the results to the exercise program (e.g., heart rate prescription and monitoring) during participation. From a practical standpoint, such tests may not be feasible to complete prior to engaging in community-based exercise programs and may be counterproductive to the goal of optimizing physical activity after stroke.[49] It is recommended that in cases where an ECG is not performed, lighter-intensity exercise should be prescribed and the reduced exercise intensity may be compensated for by increasing the frequency, duration, or both.[70] The AEROBICS guidelines suggest exercise testing without ECG may be an option if the planned exercise intensity is <50% of predicted heart rate reserve[49] (which is described as a "moderate" intensity of exercise). It follows that, in the absence of having an exercise stress test, the aerobic exercise intensity for participants should be kept at "light-to-moderate". Simple tools can be used to measure aerobic intensity such as the Borg Rating of Perceived Exertion Scale[71] or the Talk Test[72] (see Appendix H, which also includes a pictorial version of a perceived exertion scale for people with stroke and aphasia).

For resistance training, a load that can be moved 10-15 times[65, 73] comfortably with good technique and without requiring breath holding may be appropriate. Typically, patients should feel as if they could perform 2 to 3 more repetitions but not 10 or more after completing a set.

For balance-related activities, start with slow, stationary or more stable activities that use hand support prior to increasing the challenge of the balance task or reducing hand support.

See Table 3 for details on recommended intensities for each exercise component.

Time

In studies of community-based exercise programs for people with stroke, the exercise *class* duration is most commonly 1 hour[25-27, 41, 42, 45, 54] but has ranged from 30 minutes to 2 hours.[19-21, 43, 44] The duration of the exercise *program* is most commonly 8 to 12 weeks[20-23, 26, 29, 42-44, 55] but could range from 16 to 26 weeks.[19, 24, 25, 27, 28, 41, 45, 46] The recommended exercise durations for specific exercise components are detailed in Table 3. Program providers commonly consider the availability of trained instructors, space, and equipment, participant characteristics (e.g., level of fitness and function), when determining the optimal class and program duration.

Type

Most community-based exercise programs for people with stroke incorporate functional and task-specific exercises[20-25, 27-29, 41-43, 45] to target balance, walking/mobility, endurance/aerobic fitness, strength, and flexibility. Some programs have used equipment for aerobic and strengthening exercises (e.g., treadmills, stationary and recumbent bikes, recumbent steppers, exercise machines)[26, 44, 46, 55] (see Use of Equipment below). An additional consideration when developing the exercise program sequence would be to avoid having the most challenging or complex activities/exercises at the end of the class when participants may be tired. This could increase the risk of falls or injury and/or undue fatigue. See Table 3 for recommendations for each exercise component.

Progression

Progression is important for continued improvement in any component of exercise or functional task practice. As the body adapts to activity, the exercise prescription can be

modified by increasing the challenge resulting in a progressively greater effect. To progress the exercise, the provider could increase:

- The frequency of an exercise (e.g., the number of repetitions performed);
- The duration of the exercise (e.g., increasing the time walked during the class); or
- The challenge or intensity of the exercise (e.g., increasing the weight lifted during strength training, performing a sit-to-stand activity from a lower surface, increasing the perceived effort during an aerobic exercise, or increasing the challenge to balance during a standing or walking task).

Consider progressing the frequency or duration of the exercise, prior to intensity. In contrast, consider decreasing the level of challenge of an exercise and advising exercise participants to take rests if exercise participants are feeling more tired than usual or show signs of fatigue as outlined in Table 3.

Note, that for some participants, *maintenance* of their current status is an important goal, as their impairments may preclude ongoing progression.

Use of Equipment

While exercise equipment is not required for an effective exercise program, some exercise providers may elect to use equipment during the class. In these situations, the exercise provider must select equipment that is safe and appropriate to the needs and abilities of the individual participants to avoid injury (see Table 3 below for safety considerations). It may be of benefit to consult with a physiotherapist, occupational therapist, or other healthcare professional for guidance and/or further recommendations specific to the individual participant.

Promoting Exercise and Physical Activity

The benefits of exercise are only maintained if participation in exercise is ongoing. Therefore, it is important to consider strategies to facilitate exercise program attendance and to foster ongoing participation in a regular fitness routine outside of, or upon completion of, the formal program. The following strategies can be employed to maximize adherence and participation in regular exercise:

- Provide the exercise classes at a convenient time and at an accessible location;
- Gradually progress intensity of the exercises;
- Provide ongoing positive reinforcement;
- Support activity monitoring and goal setting. For example,
  - Record exercise participation and progress through use of activity logs. The participant may also opt to use off-the-shelf monitors (e.g., step counters, smart watches, etc);
  - Integrate task-related activities into the exercise classes that align with the participant's functional goals;
- Emphasize enjoyment in the program/activity;

- Where feasible, facilitate opportunities for social engagement during or after the exercise class (e.g., spaces for participants to congregate, end of program celebration);
- Encourage participants to incorporate additional opportunities for exercise and physical activity into their weekly routines (e.g., daily walks, attending other recreational activities, home exercise, finding an exercise 'buddy'); and
- Where feasible and safe, incorporate walking outside and/or in nature.

Regular participation in exercise is one component of adopting a healthy lifestyle post-stroke. Health promotion information may be accessed through the Heart and Stroke website at: https://www.heartandstroke.ca/healthy-living

Table 4 provides examples of community-based exercise programs that are specific to people with stroke.

Table 3. Exercise Class Components and Recommendations for Frequency, Intensity, Time, and Type

Component	Specific Recommendations	Stroke Specific Safety Considerations
Aerobic	Warm-up and cool-down: 3-5 minutes at a lower intensity. <u>Frequency</u> • A minimum of 3 days per week with lighter forms of physical activity on other days of the week. • Very deconditioned participants may benefit from multiple, brief daily exercise sessions. <u>Intensity</u> • Intensity should be determined on an individual basis depending on health status, ability, planned frequency and duration of exercise. • Exercises should be initiated conservatively, starting with low-intensity exercise, and progressed slowly. Consider progressing frequency and time prior to intensity. • In the absence of participants having an exercise test with ECG, intensity should be kept at "light-to-moderate". • If monitoring the participant's rating of perceived exertion (RPE) using a 0-10 scale, exercise intensity should be at a level between 1 and 3: ▪ 1 = "very light" ▪ 2 = "light" ▪ 3 = "moderate" ▪ 4 = "somewhat hard" • If using the Talk Test,[72] exercising should be at a level where the participant can carry on a conversation with little effort. • Monitoring exercise intensity using the participant's heart rate requires access to, or	Participants will require instruction on how to self-monitor and should be encouraged to: • Rest when necessary. • Inform the exercise provider if they are fatigued, experience pain or any unexpected symptoms with an activity. Some individuals who have a prescribed exercise program from a healthcare professional may opt to monitor their heart rate ranges. If the participant is using a smart watch to monitor their heart rate, it is important to note that: • Some medications (e.g., betablockers) will depress the heart rate response and may not accurately reflect the level of challenge of the exercise. • Some people with stroke may have heart arrhythmias (e.g., atrial fibrillation) that may affect the accuracy of the heart rate reading on the smart watch. Exercise providers should pay attention to the participant's perceived level of exertion when performing exercise. The individual should **<u>stop</u>** exercising immediately if the exercise provider witnesses or if the participant experiences/reports any of the following warning signs and symptoms (and the exercise provider should assess for the need to activate emergency protocols): • Chest pain, tightness, heaviness and/or radiation of discomfort towards the jaw or arm.

	consultation with, a qualified healthcare professional with the required competencies in exercise testing, interpretation and prescription. • See Appendix H for Exercise Intensity Indicators using RPE and the Talk Test, and a pictorial version of RPE for people with aphasia. • If a participant wishes to progress to a higher intensity level, an exercise stress test should be conducted by a qualified healthcare professional. Time (duration) • Progress to 20 minutes or more each session, exclusive of warm-up and cool-down. • For individuals with low fitness levels, a gradual progression may be required, starting with bouts of ≤ 5 minutes and alternating intervals of rest and increase 5-10 minutes every 1-2 weeks. • An exercise program for a minimum of 8 weeks is recommended to achieve benefits but ideally physical activity is sustained long-term for maintenance of health benefits. Type • Exercise that uses large muscle groups. • Task-specific activities can be used. Examples: ▪ Walking-related exercises. ▪ Repetitive sit-to-stand exercises. ▪ Marching on the spot. ▪ Stepping/step-up exercises. • Equipment may be used depending on participants' functional abilities, physical and cognitive impairments and safety considerations. The use of equipment is also dependent on	• Severe/unusual shortness of breath or wheezing. • Dizziness or light-headedness. • Confusion. • Paleness, blue or grey skin colour. • Cold and clammy skin. • Nausea, vomiting or severe headache. • Poor muscle coordination. • Leg cramps. • Severe fatigue. • Noticeable change in heart rhythm. • The participant requests to stop. Additional signs of participant fatigue that suggest the need to rest include: • Unsteadiness, loss of balance. • Increased need for support (e.g., relies more heavily on support from cane or walker). • Decreased quality of movement where the task may not look as smooth or coordinated. For example, on attempting to sit, the participant flops down onto chair. **Note:** If the participant becomes too fatigued, they may be at higher risk of falls during or after leaving the class (see Appendix G for pre- and post-exercise health status questions). The type of activity selected must be based on participant preferences, functional and cognitive abilities, goals, and safety considerations. Ensure appropriate supervision if participants require assistance getting on and off exercise equipment.

	program resources and training of exercise providers. Examples: ▪ Treadmill. ▪ Stationary bicycle. ▪ Arm or arm/leg ergometer. ▪ Recumbent bicycle or stepping machine. *Source:*[13, 15, 16, 49, 65, 73, 74]	**Treadmills should be used with caution.** The participant must have adequate balance to prevent falls, vision to see and manipulate the controls, arm and hand function to hold the handrail and to adjust the controls (e.g., speed, stop button), and cognition to follow instructions. Close supervision may be required.
Component	**Specific Recommendations**	**Stroke Specific Safety Considerations**
Strengthening	<u>Frequency</u> • 2-3 non-consecutive days per week. <u>Intensity</u> • Begin with light weights (e.g., 1-2 pounds, or light resistance bands). • The participant should be able to comfortably perform 10-15 repetitions, pain free with good technique. • Progress by increasing the # repetitions and/or the amount of weight used. <u>Time</u> • Start with 1 set and progress from 1-3 sets of 10-15 repetitions. Try to do 8-10 different exercises that target major muscle groups. • Rest for 2 to 4 minutes between sets and muscle groups. <u>Type</u> • Focus on major/ large muscle groups such as hip and knee flexors and extensors, hip abductors, ankle plantarflexors and dorsiflexors, as well as the upper body and trunk. Strength improvements in the major muscle groups are important for maximizing mobility, balance and posture.	Participants may have high muscle tone (i.e., where the limb may be stiff or tight) in some muscle groups due to their stroke. Strength training will not affect this stiffness adversely. These individuals can still participate in strength training, ensuring safety considerations are followed below. Do not force movement if the individual has limited range of motion or if they have muscle stiffness. Move through the available range; exercise should be pain-free. Keep arm movements at or below shoulder level if the arm that is most affected by the stroke is painful, is weak with decreased range of motion or altered movement patterns, or is known to be subluxed (partial dislocation of the arm from the socket). Arm movements above shoulder height can cause shoulder injury and/or pain in the presence of the above-mentioned conditions. People with arm weakness should be asked regularly about arm pain (e.g., during and after exercises that have incorporated the arm).

	• Task-specific functional strengthening exercises may be used; examples include: ▪ Sit-to-stand. ▪ Heel raises. ▪ Step-ups. ▪ Squats. ▪ Lunging. • Equipment may be used depending on the participant's functional and cognitive abilities and safety considerations; examples include: ▪ Free weights. ▪ Resistance bands. ▪ Weight machines. *Source:*[13, 15-17, 65, 73]	The use of overhead pulleys is <u>not</u> advised. To use free weights or exercise machines, the participant must have adequate sensation and movement of the limbs to grasp and move the weights safely.
Component	**Specific Recommendations**	**Stroke Specific Safety Considerations**
Stretching	<u>Frequency</u> • 2-3 days per week (e.g., stretching may be done before and after the class). <u>Intensity</u> • Stretch to the point of feeling tightness or slight discomfort but not pain. <u>Time</u> • Static stretches should last for 10-30 seconds, followed by a rest and then be repeated 2-4 times. <u>Type</u> • Stretching can be static (where the position is held) or dynamic (which is a controlled movement of the limbs through range). Stretching should address major muscle groups such as hip and	Refer to the strengthening section for safety considerations related to the arm that is most affected by the stroke. Stretching should be slow, gradual, and sustained. Rapid, forceful stretching should not be undertaken. Participants with stroke may have permanent contractures or joint limitations. They may also have issues with high muscle tone (i.e., where the limb may be stiff or tight) or low muscle tone (i.e., where the limb may hang limply). If muscle tone increases while exercising (e.g., the elbow or fingers become more flexed), encourage the participant to slowly stretch that specific area to decrease the stiffness and restore the available range.

	knee flexors and extensors, hip adductors, ankle dorsiflexors and plantarflexors, as well as the upper body and trunk. *Source:*[65, 74]	Participants with increased muscle tone may experience clonus (a series of involuntary, rhythmic, muscular contractions and relaxations). This commonly occurs in the affected foot; for example, you may observe the participant's foot involuntarily tapping. Clonus can also occur in the arm. Clonus is not harmful but may interfere with the participant's ability to perform the exercise or task. If this occurs, ask the participant to perform a very slow, prolonged, gentle stretch or position the body part experiencing clonus into a weight-bearing position. For example, if the participant experiences involuntary tapping of their foot, encourage them to shift their weight onto their affected limb so that they are weight bearing more through their heel. Here are some links to videos that demonstrate clonus in the foot and wrist: https://www.youtube.com/watch?v=4SrhgjGIZ30&ab_channel=NEJMvideo https://www.youtube.com/watch?v=aZCGF-nJEKU
Component	**Specific Recommendations**	**Stroke Specific Safety Considerations**
Balance and Coordination	Frequency • Minimum of 2-3 days per week. Intensity Challenge to balance can be increased by: • Reducing grip/hold on the support surface (e.g., from firm grip, to light grip, to releasing grip/hold).	The type of activity selected must be based on participants' abilities and safety considerations. Care must be taken to minimize risk of falls during balance training. **Ensure appropriate stand-by supervision and safeguarding** is provided. If participants require one-on-one supervision, the assistant should stand

	• Decreasing the base of support (e.g., from feet wide apart, to feet together, or balancing on one foot).
	• Increasing the range of movement (small weight shifts to larger weight shifts towards limits of stability).
	• Keeping feet in place and moving around their base of support to progressing to moving the feet (e.g. balancing while standing with feet in place versus balancing while stepping or walking).
	• Changing the sensory or cognitive demands (eyes open to eyes closed; single task to dual task, for example, where the participant is balancing while counting, or holding an object).
	• Making the environment more challenging (no obstacles/flat surface to obstacles/inclines, declines or uneven surfaces).
	• Slow movements to rapid, high tempo movements (self-paced walking to fast walking, self-paced sit-to-stands to rapid sit-to-stands).
	
	<u>Type</u>
	Task-specific practice of balance is recommended.
	
	• For **seated exercises**, examples include range of motion exercises for arms and legs including:
	  • Coordinated, simultaneous arm and leg movement.
	  • Weight shifting in all directions including reaching to floor.
	  • Reaching beyond arm's length if possible (supervision may be required).
	  • Incorporating an everyday task (e.g., reach for a cup on a table).
	• For **standing exercises**, practice without upper extremity support where able (or gradually reduce
		no more than one arm's length away, stand on the participant's weak side and slightly behind.
		
		Chairs, railings, participant's gait aid (e.g., walker) or other environmental aids can be used to ensure safety and minimize risk for falls during balance and coordination activities.
		
		Exercise instructors may need to be **particularly vigilant** with tasks that:
		• Increase demands on a weak leg (e.g., weight shifting towards a weaker side, balancing on the weaker leg).
		• Require weight shifting backwards (e.g., looking up or reaching up over the head).
		• Require complex leg movements, where limb collisions (e.g., one leg gets tangled up with the other when turning or performing complex stepping patterns) or tripping may occur, or where the individual may 'catch' their toe (e.g., turning, obstacles, walking on different surfaces, kicking a ball).
		• Are high tempo movements or require the participant to react quickly (e.g., fast walking, moving to catch a ball).
		• Remove vision (e.g., looking away from the direction the participant is standing or moving, closing the eyes).
		• Require more attention, are dual task, or are being performed in distracting environments (e.g., walking while talking or carrying an item, environments that are noisy or with lots of visual distractions).

	the amount of support by reducing the grasp on the support).
	• Examples of ***static* standing** balance exercises ("holding" balance in one position) include:
	  • Standing with feet close together.
	  • Standing in stride position or heel-to-toe.
	  • Standing on one foot.
	  • Standing with eyes closed.
	• Examples of ***dynamic* standing** balance exercises (balancing while moving but with the feet in place, or balancing while also moving the feet) include:
	  • Weight shifting/modified lunges in all directions including turning to look over shoulder or reaching towards the floor.
	  • Sit-to-stands.
	  • Stepping in all directions.
	  • Tap-ups or step-ups.
	  • Walking.
	• If and when appropriate, more challenging ***agility*** tasks may be introduced that require more complex coordination or include high tempo movements, for example:
	  • Kicking a ball.
	  • Walking sideways and backwards.
	  • Walking on a line.
	  • High knee walking.
	  • Walking with challenges, obstacles, varying surfaces/ inclines.
	  • Rapid sit to stands.
	  • Rapid raising of arms.
	  • Rapid stepping.
	
	Source:[13, 15-17, 64]	

Table 4. Examples of Evidence-based Exercise Programs Specific to Stroke*

Note: Please see *Stroke Recovery in Motion: A Guide for Starting and Maintaining a Community-based Exercise Program* for detailed instructions on how to implement community exercise programs for people with stroke [www.afterstroke.ca/ or contact afterstroke@marchofdimes.ca].

Program Name	Program Details	Resources
Fit for Function	**What is this program?** Fit for Function was developed to help with the transition home following acute stroke treatment. The program provides supervised exercise, social interaction, and stroke-specific education. It is a 12-week program offered through the YMCA, comprised of 3 exercise classes (two group classes, one individual exercise session) and 1 educational class each week. *Goal of the Program:* To provide a safe and effective community-based wellness program for people with stroke. *Program Objectives:* 1) To improve or maintain mobility. 2) To decrease risk of falls by improving balance and strength. 3) To provide opportunities for social support. 4) To provide opportunities for improving quality of life. 5) To promote activity and improve general fitness level. **Who is appropriate for the program?** Fit for Function is a community exercise program designed specifically for people with stroke who meet the below criteria: 1) 18 years of age or older. 2) Living in community. 3) Able to walk a distance that is ≥10 metres. 4) Able to tolerate 60 minutes of activity with rest intervals. 5) Able to independently follow instructions. 6) Medically cleared by a physician.	**Program website:** http://mobilityresearch.ca/fit-for-function-2/ **Key references:** Richardson J, Tang A, Guyatt G, Thabane L, Xie F, Sahlas D, Hart R, Fleck R, Hladysh G, Macrae L. 2018. FIT for FUNCTION: study protocol for a randomized controlled trial. Trials 19:39 Free paper

	What is the format of the program? Fit for Function takes place three days/week and is comprised of: 1) Exercise, and 2) Self-management education. 1) **Exercise** frequency 3 days/week comprised of: • **Group Exercise**. 2 classes/week, 60 minutes/class. Adapted from Community-based Exercise Program for Persons Living with Stroke and includes: 1) Warm Up (10 minutes); 2) Task-Oriented Strengthening and Cardiovascular Conditioning (20 minutes); 3) Mobility and Balance (20 minutes); 4) Cool-down (10 minutes) • **Independent Exercise**. 1 class/week. Duration and exercises performed are developed with a kinesiologist or fitness trainer. Participants have full access to YMCA facilities. Intended to build independence outside of a group setting. 2) **Self-management education** (*Living with Stroke*™). 1 class/week. Helps to build knowledge and capacity for self-management of stroke, scheduled on the same day as Independent Exercise. Program duration: 12 weeks **Who teaches the program?** Fit for Function group exercise classes are delivered by kinesiologists or fitness professionals. Instructors complete an 8-hour training workshop for the exercise component, and receive a DVD training package. Competency checklist available. Fit for Function is also supported by a stroke rehabilitation physiotherapist who provides on-site consultation 4 hours/week, and remote consultation 3 hours/week. *Living with Stroke*™ education sessions are led by facilitators who have completed a 3-hour facilitator training workshop.	

	Who developed the program? Fit for Function was adapted from the Community-based Exercise Program for Persons Living with Stroke developed originally by stroke rehabilitation physiotherapists at Thunder Bay Regional Health Sciences Centre, and revised by physiotherapists at Hamilton Health Sciences and McMaster University, with input from kinesiologists at the YMCA and people with stroke. The *Living with Stroke*™ education program was developed by the Heart and Stroke Foundation, https://www.heartandstroke.ca/stroke/recovery-and-support/living-with-stroke. **Where is the program running?** Fit for Function is running at the Les Chater Family YMCA in Hamilton, Ontario. **How do I implement this program?** Please contact Julie Richardson jrichard@mcmaster.ca or Ada Tang atang@mcmaster.ca for more information.	
Fitness and Mobility Exercise (FAME) Program	**What is this program?** FAME is a group exercise program that has been shown to improve mobility, muscle strength, memory, thinking, balance, and cardiovascular fitness, and reduce falls in people with stroke. A module can be added on for upper extremity strengthening. Exercises include functional exercises, agility and fitness exercises, as well as challenging balance exercises. Exercises can be organized for a single group or circuit and have multiple levels of difficulty to enable tailoring to ability level. An instructor-to-participant ratio of 1-to-4 or higher is recommended. If FAME is started in the hospital (inpatient, outpatient therapy), then it is ideal to have a referral pathway developed to transition to FAME undertaken in a community setting (e.g., community centre) for continuity and continued recovery. **Who is appropriate for the program?** FAME was designed for people with stroke, although it has also been used in general neurological populations who meet the criteria below:	**Program website:** www.fameexercise.com. **Key references:** Rand D, Eng JJ, Liu-Ambrose T, Tawashy AE. Feasibility of a 6-month exercise and recreation program to improve executive functioning and memory in individuals with chronic stroke. Neurorehabil Neural

	1) Able to take a few steps on their own, or with a cane or walker. 2) Can perform standing exercises while holding onto a support. Trained care partners may be able to help, but this should be assessed on an individual basis. 3) Able to pay attention and follow instructions for one hour. 4) Aware of their safe limits of ability. 5) Have goals to improve their walking and mobility. **What is the format of the program?** FAME is a group exercise class. Each session lasts one hour. The minimal frequency is 2 to 3 classes per week for a minimum of 2 months. FAME has been delivered in hospital inpatient and outpatient settings, as well as in community centres and private practices. **Who teaches the program?** As FAME has been delivered in different countries and settings (inpatient, community), the delivery model is customized to the specific healthcare service or community program. It is typically delivered by physical therapists and rehabilitation assistants in the hospital or private practice setting. In the community centre setting, it has typically been delivered by fitness instructors who have received training under the guidance of a health professional with experience in stroke (e.g., physical therapist, occupational therapist, nurse, or physician). A comprehensive instructor manual is available free at www.fameexercise.com. **Who developed the program?** The University of British Columbia developed FAME with funding from the Heart and Stroke Foundation and the Canadian Institutes of Health Research. **Where is the program running?** FAME currently operates in hospitals, community centres and private physical therapy practices in Canada as well as internationally. See website for current programs. It is ideal for a FAME outpatient program to feed into a FAME community program to facilitate transitions in care.	Repair. 2010;24:722-9. Free paper. Marigold DS, Eng JJ, Dawson AS, Inglis JT, Harris JE, Gylfadóttir S. Exercise leads to faster postural reflexes, improved balance and mobility, and reduced falls in older persons with chronic stroke. J Am Geriatri Soc. 2005;53:416-423. Free paper. Pang MYC, Eng JJ, Dawson AS, McKay HA, Harris JE. A community-based Fitness and Mobility Exercise (FAME) program for older adults with chronic stroke: A randomized controlled trial. J Am Geriat Soc. 2005;53:1667-1674. Free paper.

	How do I implement this program? The FAME Program is free to implement. Visit the program website www.fameexercise.com to download the FAME instructor manual. If you have reviewed the manual and are planning to implement FAME at your site, contact stroke.rehab@ubc.ca for further information.	
Keep Moving with Stroke	**What is this program?** The Keep Moving with Stroke class includes aerobic conditioning, functional strengthening, mobility, and balance exercises specifically designed to meet the needs of those living with chronic stroke. The program offers modifications allowing each participant to work at their own comfort level and ability. Prior to registration, participants will be screened by a physical therapist for program eligibility and will require the consent of a physician or nurse practitioner to participate. Information will be provided to the instructor regarding restrictions or health conditions that may influence the participant's ability to exercise. **Who is appropriate for the program?** People with a diagnosis of stroke, living in the community who have: 1) Finished all therapy programs. 2) Written consent to participate in a fitness program from a physician or nurse practitioner. 3) Ability to follow instruction and awareness of physical exertion. 4) Ability to walk at least 10 metres with or without a walking aid. 5) Ability to perform exercises in standing with or without support. Participants will be free of serious medical problems restricting physical exercise and be able to tolerate 2 exercise sessions per week for 60 minutes with rest breaks. Participants will also be able to access transportation to/from the facility. Some flexibility may be applied to the eligibility criteria at the discretion of the screening physical therapist and on an individual basis. Spouses or care partners are also welcome to participate to support the stroke survivor and foster their own wellbeing as a caregiver.	**Program websites:** Keep Moving with Stroke: https://www.northwesthealthline.ca/displayService.aspx?id=189285 **Fitness Instructor Training Program:** https://tbrhsc.net/programs-services/stroke-program/nwostroke/about-us/network-publications-and-resources/fitness-instructor-training-programme/ **Key references:** https://tbrhsc.net/programs-services/stroke-program/nwostroke/about-us/network-publications-and-resources/

	What is the format of the program? Keep Moving with Stroke is a 1-hour class offered twice per week. Sessions typically run between 6 and 8 weeks depending on facility and seasonal scheduling variations. **Who teaches the program?** Keep Moving with Stroke is taught by fitness instructors in municipal recreation centres. Fitness instructors complete a standardized training program developed by physical therapists. A physical therapist visits the class periodically and provides ongoing support to fitness instructors. **Who developed the program?** Keep Moving with Stroke was developed by Thunder Bay physiotherapists with support from St. Joseph's Care Group and the Northwestern Ontario Regional Stroke Network at Thunder Bay Regional Health Sciences Centre. Grants supporting the program development were obtained from the North West Local Health Integration Network, the Ontario Ministry of Health and Long Term Care - Ontario Stroke System, and the Ontario Ministry of Health Promotion - Communities in Action Fund. **Where is the program running?** Keep Moving with Stroke takes place in a large, multipurpose room at a municipal fitness centre in Thunder Bay, Ontario. The class is offered on the main floor with accessible washrooms in close proximity. The recreation centre also has accessible parking, as well as an on-site first aid response team and automated external defibrillator. **How do I implement this program?** For questions regarding the program, please contact St. Joseph's Care Group Outpatient Neurology Physiotherapist, Catharine Tombs at (807) 343-2431 extension 2537, or email tombsc@tbh.net. For questions about the Fitness Instructor training program, please contact the Northwestern Ontario Regional Stroke Network Regional Stroke Rehabilitation Specialist, Esmé French at (807) 684-6498 or email at frenche@tbh.net or nwostroke@tbh.net.	

Together in Movement and Exercise (TIME™)	**What is this program?** TIME™ is a functional exercise program that was designed to improve leg strength, balance, functional mobility, and fitness through the practice of everyday activities. Activities include sit-to-stand, multi-direction lunges, step-ups, and walking. Exercises are organized in a circuit and have multiple levels of difficulty to enable tailoring to ability level. The TIME™ program is licensed by the University Health Network (UHN). **Who is appropriate for the program?** TIME™ was developed for people with balance and mobility challenges who can: 1) Walk at least 10 metres (30 feet), with or without a cane or walker. 2) Perform standing exercises while holding onto a support. 3) Can pay attention, follow instructions, and mimic exercises for one hour. People with health conditions such as stroke, arthritis, multiple sclerosis, and acquired brain injury, as well as those who experience age-related balance and mobility challenges, commonly register. A family member, friend, or personal support worker may attend the class to support individuals who require assistance with communication, staying on task, or moral support in class, as well as physical assistance with activities outside of class such as toileting. **What is the format of the program?** TIME™ involves a one hour, group exercise class that includes a warm-up and cool-down. The classic program involves two classes per week for 12 weeks. Community centres typically offer the class at a frequency and duration that fits with their programming schedule. A participant-to-instructor ratio of 4:1 is recommended to ensure safety. **Who teaches the program?** TIME™ is taught by fitness instructors in municipal community centres, recreation centres (e.g., YMCA), and disability support organizations such as March of Dimes Canada. Fitness instructors complete a standardized training program run by healthcare professionals. A healthcare professional, called	**Program website:** https://www.uhn.ca/TorontoRehab/Clinics/TIME **Key references:** Salbach NM, Howe JA, Brunton K, Salisbury K, Bodiam L. Partnering to increase access to community exercise programs for people with stroke, acquired brain injury, and multiple sclerosis. J Phys Act Health. 2014;11(4):838-845. Skrastins O, Tsotsos S, Aqeel H, et al. Fitness coordinators' and fitness instructors' perspectives on implementing a task-oriented community exercise program within a healthcare-recreation partnership for people with balance and mobility limitations: a qualitative study. Disabil Rehabil. 2019:1-9.

	the healthcare partner, visits the class periodically and provides ongoing support to fitness instructors. **Who developed the program?** TIME™ was designed by physical therapists at the Toronto Rehabilitation Institute-University Health Network with support from the Department of Physical Therapy at the University of Toronto, the Ontario Stroke Network, and the British Columbia Fraser Health Authority. **Where is the program running?** TIME™ is available at 48 sites across Canada. Visit the program website for up-to-date details about program locations. **How do I implement this program?** There is a nominal fee to purchase the program license. The license must be renewed every 2 years by completing an attestation form. After signing the program license, a toolkit (*Implementing a Community-based Exercise Program for People with Balance and Mobility Challenges: A Step-by-Step Toolkit*) is made available which supports the implementation of the TIME™ exercise program. Terms and conditions apply. Toronto Rehabilitation Institute-University Health Network also hosts a members' webpage, which provides access to other resources, such as links to educational webinars, and a newsletter, to support successful program implementation. The TIME™ team is also available for consultation. Visit the program website for more details.	Merali S, Cameron JI, Barclay R, Salbach NM. Experiences of people with stroke and multiple sclerosis and caregivers of a community exercise programme involving a healthcare-recreation partnership. Disabil Rehabil. 2019:1-7.

*This table includes programs that have been developed by healthcare professionals, and evaluated for safety and feasibility in people with stroke.

Summary of the Evidence

Of the studies reviewed, the majority of community-based exercise programs included functional and task-specific exercises[20-25, 27-29, 41-43, 45] whereas a few programs included a combination of functional task exercises and equipment-based exercises.[19, 26, 45] One study implemented an equipment-based cycling program[44] and another implemented a program specifically targeting strength using exercise machines.[55]

Exercise that is task-specific, meaningful, goal-oriented, repetitive and progressive is strongly recommended across numerous stroke best practice guidelines to improve lower-limb function, transfers, balance and walking/mobility skills during rehabilitation.[13-17, 63, 64] It follows that this exercise approach should be considered in community-based exercise programs as well.

There have been a few randomized controlled trials (i.e., where participants with stroke were randomly assigned to either the community exercise program or a control group) evaluating task-specific programs that have been specifically delivered by community fitness instructors (not regulated healthcare professionals). Harrington and colleagues[29] demonstrated significantly greater improvements in physical participation and quality of life for those who participated in the exercise program versus those who received only information about community groups or who were on the waiting list. Stuart and colleagues[45] demonstrated that those in a task-specific exercise program targeting balance and mobility significantly improved on measures of walking endurance and speed whereas those in a seated upper body exercise program did not. However, the study was not able to demonstrate significant between-group differences; the investigators suggest this was due to an inadequate sample size. Liu-Ambrose and colleagues[27] evaluated outcomes of people with stroke who were randomized to either a task-specific community exercise program (with a recreational component) or a waiting list and demonstrated significant improvements on measures of cognition and secondary measures of walking endurance for those who participated in the exercise program. Numerous other studies (that have not included a randomized control group) have demonstrated improvements in participants' functional balance,[19-24] sit-to-stand ability,[26] walking capacity,[20, 22-24] upper-[19, 26] and lower-limb strength,[19, 20] exercise self-confidence,[26] activities of daily living,[20] participation,[24, 29] and quality of life[19, 29] upon completion of the exercise program.

Stroke best practice guidelines recommend that people with stroke should participate in aerobic exercise and physical activity to promote cardiorespiratory fitness as part of their stroke rehabilitation program.[13, 14, 17, 48, 49] Importantly, it is also recommended that participation continue in the home or in the community upon completion of formal stroke rehabilitation.[13-17] Aerobic exercise is recommended to be part of an overall exercise program that may also include task-oriented training of motor control, balance and gait, and muscle strengthening.[49, 65] One randomized controlled trial[28] and one pilot randomized controlled trial[25] evaluating the effectiveness of community-based exercise programs for people with stroke demonstrated greater improvements in cardiorespiratory fitness/aerobic capacity for those who participated in a task-specific community-based exercise program versus a seated upper extremity group and

stretching group, respectively. In both of these studies,[25, 28] however, physical therapists co-delivered the exercise program with community fitness instructors.

Participant preferences should be sought and exercises should be individually tailored based on the participants' functional limitations, health-related goals, and social and environmental factors.[15, 16, 49] Bird and colleagues[62] explored the desired content of community-based exercise programs from the perspectives of 27 stakeholders (people with stroke, their caregivers, healthcare providers and community program managers and fitness instructors). The most frequently cited components to include in the exercise intervention were balance (85%), posture (67%), mobility (67%), sensation (67%), cardio (63%), leg strength (63%), arm strength (56%), and tone (52%).

The optimal dose of exercise (combination of frequency, time/duration or intensity) of a community-based exercise program for people with stroke has not been determined. The above-mentioned benefits of community-based exercises have been demonstrated across programs of varying frequencies and durations. Of the studies reviewed, community-based exercise programs were most commonly offered twice per week,[19, 20, 22, 27, 29, 42, 43, 54, 55] but with frequencies in other studies ranging from once per week[21, 26] to three times per week[23-25, 28, 45] or a drop-in format.[46] The duration of the exercise class was most commonly 1 hour[25-27, 41, 42, 45, 54] but also could be 30 minutes,[44] 1.5 hours[20, 21] or 2 hours.[19, 43] The duration of the exercise program was most commonly 8 to 12 weeks[20-23, 26, 29, 42-44, 55] but could range from 16 to 26 weeks.[19, 24, 25, 27, 28, 41, 45, 46] Collectively, the overall "volume" of exercise provided (# hours of exercise/week X # weeks) could range from 9 hours[26] to 104 hours[19] of exercise.[19-29, 41-45]

RECOMMENDATION #5: PROGRAM EVALUATION

Evaluation procedures should be in place to monitor program delivery (e.g., referral and screening processes, compliance with exercise program and procedures), participant engagement, and program impact. [Conditional Recommendation, Low Quality Evidence].

Rationale

Evaluation provides information to inform improvements to service provision to optimize the safety and appropriateness of exercise programming and participant satisfaction. Evaluation can also inform community recreation planning and program marketing, thereby supporting sustainability.

Implementation Resources and Considerations

Evaluation can be undertaken to understand any aspect of the exercise program, including marketing, screening and registration, program delivery, participant engagement, and program impact. When designing the evaluation approach, exercise providers should consider the:

- Objectives of the evaluation;
- Resources (e.g., staff, need for training) available to conduct the evaluation;
- Burden on the participants and/or caregivers; and
- Privacy legislation (i.e., policy and processes specific to collecting, using, sharing, storing or disposing of the personal information or personal health information of exercise participants).

The evaluation approach should specify the data to collect (see examples below), and the frequency and method of data collection (e.g., paper questionnaire, online survey, in-person interviews and/or focus groups). Where possible, exercise providers should make use of existing data collection systems (e.g., administrative databases, intake questionnaires). The participant voice is often one of the most powerful and meaningful ways to learn about the impact of a program. Consider obtaining permission to use participant feedback/quotes to improve or endorse the program. The evaluation approach should also consider how, where, for what purpose, and with whom the collected information will be shared.

Measures of Program Delivery and Participant Engagement could include:

- Number of participants referred and referral source;
- Number of participants registered;
- Participant characteristics (e.g., age, gender, need for mobility device (e.g., wheelchair, walking aid), distance of home to program);

- Number of new participants;
- Number of individuals referred or screened but not eligible, and reasons for ineligibility;
- Number on wait list; length of time on wait list;
- Number attending each class; number of missed classes;
- Number of dropouts and reasons for dropout;
- Number of instructors and volunteers;
- Instructor qualifications;
- Ratio of staff (instructors and volunteers) to participants;
- Number of caregivers assisting;
- Compliance with program components (e.g., checklist that exercise program and procedures are implemented as planned); and
- Number of sessions offered annually.

Measures of Program Impact could include:

- Participant satisfaction questionnaires, including participant testimonials;
- Number of returning participants;
- Number of participants transitioning to non-adapted exercise programs;
- Reduced reliance by individual participants on caregivers or volunteers for support/supervision during program activities (e.g., anecdotal report/observation);
- Participant health-related benefits. These may include maintenance of, or improvement in, physical or functional ability, or health-related quality of life (see Participant Health-Related Benefits and Table 5 below); and
- Number and description (type) of adverse events/near misses (e.g., falls, angina) measured through facility incident reports.

Participant Health-Related Benefits:

There are many standardized measures validated for use in the stroke population that can be administered before and after the exercise program to measure program impact on health. The measures provided in Table 5 were selected for consideration, as:

1) They measure key aspects of health that may be improved through participation in community-based exercise programming;
2) There is evidence for their reliability and validity when used with people with stroke;
3) They can detect change over time with exercise training; and

4) They may be feasible to implement (e.g., freely available, minimal time required for administration, low training requirements, minimal equipment required).

For the scores to be accurate, the measures in Table 5 must be consistently administered using standardized instructions and protocols. Note that for some participants, a change in the standardized outcome measures may not be observed. For those individuals, success may be better measured through ongoing participation in the adapted exercise program and integrating exercise into daily life.

Table 5. Standardized Measures of Participant Health-Related Benefits

Goal	Measure	Training Required	Where to find out more or access the measure
Leg Strength	• Five Times Sit-To-Stand[75, 76]	Yes (review of test protocol and training for safeguarding required)	https://www.sralab.org/rehabilitation-measures/five-times-sit-stand-test
Lower-limb Function (functional strength, balance, walking)	• Short Physical Performance Battery[77-80]	Yes (review of test protocol and training for safeguarding required)	https://www.sralab.org/rehabilitation-measures/short-physical-perfromance-battery https://geriatrictoolkit.missouri.edu/SPPB-Score-Tool.pdf
Balance Confidence during daily activities	• Activities-specific Balance Confidence Scale[81-83]	No	https://strokengine.ca/en/assessments/activities-specific-balance-confidence-scale-abc-scale/
Functional Mobility	• Timed 'Up and Go'[84, 85]	Yes (review of test protocol and training for safeguarding required)	https://strokengine.ca/en/assessments/timed-up-and-go-tug/

Walking Ability (endurance and speed)	• 2- or 6-minute walk test[86-89] • 10-metre walk test[87, 90-93]	Yes (adherence to standard protocol and training for safeguarding required)	https://strokengine.ca/en/assessments/two-minute-walk-test-2mwt/ https://strokengine.ca/en/assessments/six-minute-walk-test-6mwt/ https://www.physicaltherapy.utoronto.ca/research/ktalab/ongoing-research/rehabilitation-tools-guidelines-applications/ [iWalk toolkit to support use of 10-metre and 6-minute walk tests]
Health-related Quality of Life	• Stroke Specific Quality of Life Scale (SS-QOL)[94] • Stroke Impact Scale[95, 96]	No (self-administered)	https://strokengine.ca/en/assessments/stroke-specific-quality-of-life-scale-ss-qol/ https://strokengine.ca/en/assessments/stroke-impact-scale-sis/

Summary of Evidence

In previous research, it has been common and feasible to evaluate *exercise program delivery* using the following measures:

- The number of referrals to the program (e.g., from healthcare organizations/partners or from the community);[26, 45]
- The number of individuals enrolled in the program;[19, 22, 26, 46]
- The proportion of enrolled individuals who complete the program[19, 26, 44, 45] and reasons for dropouts (e.g., personal, transportation, scheduling, physical symptoms, health);[19, 44, 45]
- The proportion of exercise sessions attended[22, 23, 26, 44-46] and reasons for non-attendance;[26]
- The number who enroll for ongoing exercise programming;[19, 45, 46] and
- Recording adverse events to monitor program safety.[22, 24, 26, 43-46]

Recreation and healthcare personnel have described challenges with ensuring consistent delivery of the community exercise program over time.[40] Checklists have been used in several studies,[41, 45] for example, to evaluate whether the exercise content was delivered and procedures were followed.[45] Bird and colleagues[41] developed a checklist of the essential components required for an effective, evidence-based community exercise program and used this during staff training and also as part of a subsequent audit and feedback process. Results of the checklist audit were provided to the instructors and managers, used in subsequent workplace coaching sessions, and helped to evaluate improvement and ensure that the program was implemented as intended.

The Aerobic Exercise Recommendations to Optimize Best Practices in Care After Stroke (AEROBICS) recommend that measures to evaluate participant outcomes be aligned with *participant-oriented goals and anticipated benefits*.[48, 49] Across several studies, participants with stroke have described diverse and inter-related benefits from the exercise program including improved strength, balance, mobility, exercise tolerance and confidence which has translated to improved performance in activities of daily living, community participation, and social integration.[22, 30-33] Similarly, outcome measures commonly used in studies to evaluate participant health-related benefits have included those that evaluate upper and lower-limb strength,[19-21, 26, 28, 42, 44] lower-limb function,[24, 42, 45] functional balance,[19-22, 24, 26-29, 42, 45, 46] functional mobility, walking speed and endurance,[19-22, 24-29, 42-46] participation,[20, 22, 29, 44] mood,[24, 27, 29, 55] and health-related quality of life.[19, 21, 23-26, 29, 43, 44, 55] Additional measures of balance confidence,[22] exercise confidence,[26, 43] physical activity,[28, 43] cardiorespiratory fitness,[28] fatigue,[43] sleep quality,[44] cognition,[27] performance in basic activities of daily living,[20, 24, 42] caregiver burden,[24, 29, 43] and health service utilization[42, 43] have been used.

Various methods have been used to seek *stakeholder feedback* (e.g., from participants with stroke, caregivers, fitness instructors and healthcare partners) regarding the

exercise program's acceptability, feasibility and impact or barriers and facilitators to program delivery. These methods have included use of interviews,[30, 31, 38, 43, 44] focus groups,[22, 26, 32, 40, 62] in-person or telephone-based evaluation questionnaires,[44] and on-line surveys.[40, 41]

RECOMMENDATION #6: EXERCISE PROVIDERS

6.1. Exercise providers should receive education and training to attain the necessary knowledge of stroke and stroke-related impairments, common comorbid health conditions, and basic exercise principles. Additionally, exercise providers should have the skills required to safely and appropriately deliver the exercise program, to safely increase or decrease the level of challenge of the exercises, and to recognize and respond to adverse events and emergencies. [Strong Recommendation, Low Quality Evidence].

6.2. Exercise providers should establish linkages with healthcare providers who have stroke-specific and exercise expertise. These linkages can facilitate exercise program referrals, training, and ongoing consultation to support delivery of a safe and beneficial exercise program. [Strong Recommendation, Low Quality Evidence].

Rationale

The American College of Sports Medicine (ACSM)[97] recommends that fitness personnel who have responsibility for pre-activity screening or prescribing, instructing, monitoring, or supervising of physical activity programs should have current automated external defibrillation and cardiopulmonary resuscitation (AED and CPR) certification. ACSM recommends that fitness personnel who have responsibility for oversight, supervision and/or instruction of physical activity and exercise training programs should have the appropriate education, work experience and/or certification.[97] Further, facility operators should consider having fitness professionals who have demonstrated the proper level of competency, as evidenced by appropriate education and/or certification, conduct assessments with and prescribe physical activity for individuals with special needs.[97]

People with stroke may present with persistent stroke-related impairments and additional health conditions requiring instructors to have specific knowledge and skills to support the safe and optimal delivery of the exercise program. Exercise providers should be aware that participants may have weakness or paralysis and may experience changes to their muscle tone, sensation, perception and vision. These issues may affect movement, joint stability, balance, walking, and activities of daily living. Participants with stroke may also have issues with communication, swallowing, fatigue, remembering or understanding instructions, and mood/depression. As well, they may experience evolving challenges with comorbid conditions, such as cardiovascular disease, diabetes, and high blood pressure (i.e., hypertension).

Some community-based exercise programs for people with stroke have supportive partnerships between community exercise providers and healthcare professionals.[20, 22, 24, 29, 41, 58, 98] Studies suggest that exercise providers, healthcare partners, and participants with stroke perceive this partnership as valuable for education and training, access to consultation, and ensuring the safety and quality of the exercise program.[40, 58, 62] These partnerships are endorsed in several best practice guidelines. The Canadian Stroke Best Practice Recommendations[13, 14] state that “supervision by a healthcare professional (such as a physiotherapist) at exercise initiation should be considered in

individuals with stroke at risk of falls or injury, or in individuals with other comorbid disease (such as cardiac disease), which may place them at higher risk of medical complications." The Aerobic Exercise Recomendations to Optimize Best Practices in Care after Stroke (AEROBICS)[49] state "[exercise] supervision may be provided by a qualified healthcare professional or an exercise instructor who has been trained by the healthcare professional." The American Heart Association/American Stroke Association Guidelines for Stroke Rehabilitation and Recovery[16] state "developing partnerships between healthcare professionals and fitness centres or community exercise programs could help to address a concern expressed by patients after stroke that exercise instructors must be suitably trained and knowledgeable about stroke." The Royal College of Physicians National Clinical Guidelines for Stroke[15] state that "physical activity programmes for people with stroke …may be delivered by therapists, fitness instructors or other appropriately trained people, supported by interagency working where possible".

Implementation Resources and Considerations

Exercise providers may receive certification from a variety of organizations. It is critical that exercise providers work within their scope of practice as defined by the relevant certification program and insurance coverage parameters.

Exercise provider training may be supported through healthcare partnerships and can occur as a combination of e-learning modules, use of exercise program manuals, in-person workshops, on-site visits, and/or consultation through email, telephone and/or videoconferencing.

Training programs for exercise providers who are leading programs that include people with stroke should cover the following competencies:

- Demonstrating stroke-specific knowledge,[49, 98] including:
  - Causes of stroke;
  - Comorbidities;
  - Stroke-related physical, cognitive, and communication impairments;
  - Transfers and mobility challenges;
  - Use of assistive devices; and
  - Effect of medication on exercise response.
- Demonstrating knowledge of basic exercise principles;
- Judging the ongoing status of participant eligibility for the program;[98]
- Strategies for implementing or modifying the exercise program to address stroke-related impairments[58, 98] (e.g., handling and positioning of weak limbs for joint protection;[13, 17] supportive communication strategies,[13-15, 17, 57] reducing distractions

and cognitive demands for those with poor attention;[15] strategies to increase awareness for those with neglect of their affected side[13]);

- Demonstrating appropriate techniques for safeguarding and providing stand-by supervision, and implementation of falls prevention strategies;[13, 15, 16]
- Progressing exercise safely to avoid falls, excessive muscle soreness, fatigue, and/or cardiovascular stress;[49, 98]
- Recognizing when exercise should be stopped, adverse events, when the participant should be referred to an appropriate healthcare provider before resuming participation, or the need for emergency response procedures;[22, 49, 98]
- Recognizing when to liaise with appropriate healthcare providers (e.g., physical therapists) for ongoing consultation or support;
- Supervising assistants, volunteers and caregivers specific to their role in supporting participants in the exercise program; and
- Providing motivational support and modeling.[24, 49]

See also Recommendation 4, Table 3 for details on stroke-specific safety considerations when implementing exercise programs.

For additional stroke-related fitness instructor education resources, see:

1) Recommendation 4, Table 4, "Examples of Evidence-based Exercise Programs Specific to Stroke":
    - Provides links to community-based exercise program information and associated instructor training resources.
2) Heart Wise Exercise Training Program. University of Ottawa Heart Institute:
    - Access here: http://heartwise.ottawaheart.ca/professionals/heart-wise-exercise-training;
    - Self-directed online learning and live in-person sessions (where available) for fitness providers to develop programs that are appropriate for people who may be living with chronic health conditions, including stroke.

See Appendix I, for additional resources providing general information on stroke for exercise providers, people with stroke and caregivers.

Summary of Evidence

In the studies reviewed, community-based exercise programs were predominantly supervised by exercise or fitness instructors[19-22, 24, 26, 27, 29, 38, 41-45, 55] whereas a few were supervised by physical therapists in combination with an exercise instructor,[25] or in combination with an occupational therapist and an exercise instructor.[28] The level of detail regarding qualifications of the exercise instructors varied across studies. Some studies did not provide this information,[20, 23, 25, 28, 41, 42] some studies referred to exercise instructors being generally "qualified", "certified" or "accredited",[26, 27, 29, 44, 55] whereas other studies specified required certifications[22, 24, 43, 45, 46] (e.g., first aid, cardiopulmonary resuscitation, certifications with Can-Fit-Pro®, the Athletics and Fitness Association of America, the America Council on Exercise and the United Kingdom Registered Exercise Professionals). Most studies indicated that the exercise instructors received formal training[19, 24, 29, 41, 44, 45] or were accredited to implement the specific community exercise program.[21, 43] Two studies made mention of using healthcare student volunteers[26, 46] and one study referenced that caregivers and family members were encouraged to help, but did not make mention of specific training.[29]

Concerns about the safety of people with stroke participating in community exercise programs have been voiced by people with stroke and their families,[38] referring healthcare providers,[38] and community exercise providers.[39] Exercise providers have cited challenges with implementing exercise programs for people with stroke,[39, 41] but have identified the availability of stroke-specific theoretical and practical training as a key enabler.[38, 39] Exercise providers who received stroke-specific training were less likely than those who did not receive training to report being fearful of doing harm during exercise provision.[39] People with stroke have described the importance of the exercise provider's knowledge and skills in the development of a trusting relationship.[62] Some community-based exercise studies reported using partnerships with healthcare professionals, commonly physical therapists, to support the exercise instructors.[20, 22, 24, 29, 41, 58] Physical therapists have led the initial exercise provider training,[22, 24, 29, 41] audited the classes to provide ongoing feedback and support,[22, 24, 41] or were available for consultation.[22, 24] Across several studies exploring the perceptions of stakeholders (i.e., healthcare professionals, community exercise providers, patients and caregivers), establishing and maintaining partnerships between the healthcare and recreation settings has been strongly endorsed.[40, 58, 62] In particular, the provision of initial training and ongoing support and in-class consultation (e.g., regarding exercise modifications to suit participant abilities) with the exercise provider helped to ensure the safety, quality, and appropriate delivery of the program.[40, 58, 62]

People with aphasia (i.e., difficulty producing and comprehending language) may face additional barriers to accessing community exercise programs.[56, 57] Community providers identify that a lack of aphasia-specific training is a primary barrier to access to community exercise programs for those with communication impairments.[57] The study authors suggest that, in addition to training on exercise delivery, fitness instructors receive training on appropriate communication adaptations, to facilitate access to community-based exercise programming for people with aphasia.[57]

RECOMMENDATION #7: FACILITY

The exercise provider should offer participants a general orientation to the facility, and a safe and accessible exercise environment that meets the needs of the participants. This should include barrier-free access to parking, facility entrance, transit pick-up/drop-off areas, exercise classrooms, exercise equipment, change rooms/locker rooms and washrooms. [Strong Recommendation, Low Quality Evidence].

Rationale

Orientation to the facility ensures that the participant has the proper information and guidance to commence and engage in a safe and effective physical activity program.[97] A barrier-free facility supports safe participation for people with stroke who may experience a variable number and severity of impairments. People with stroke, caregivers, and exercise providers have consistently identified that accessible space, equipment, parking and transportation are key factors that support participation in community-based exercise programs.[32, 39, 40, 61, 99]

Implementation Resources and Considerations

The program provider should ensure that the exercise environment is wheelchair accessible with adequate space to permit transfer to/from any exercise equipment that may be used. There should also be adequate floor space and sufficient room between participants so that they may safely perform exercises and walk/move safely in the presence of participants using walkers, wheelchairs, or other mobility aids. The exercise provider, in collaboration with the participant and their support persons, should also identify the transportation needed to attend the program. Additionally, for an appropriate exercise environment, consideration should be given to the temperature of the exercise room, the proximity of washrooms, the noise levels within the environment, and access to water* to safeguard against overheating or dehydration. Although not specific to the delivery of the exercise program, providers may consider whether there are areas for participants and their caregivers to wait and socialize before, during, and/or after the class.

**Exercise providers should be aware of participants who have swallowing impairments and should recommend that these participants bring their own refreshments if water is not appropriate (e.g., if they require thickened fluids).*

Accessibility Standards and Barrier-free Designs

The American College of Sports Medicine (ACSM)[97] provides standards and guidelines on health/fitness facility design and construction as they pertain to helping promote a safe physical activity environment. For details, see ACSM's Health/Fitness Facility Standards and Guidelines.[97]

Program providers should access their regional and local standards and resources with respect to accessibility and barrier-free facility design.

The Accessible Canada Act is federal accessibility legislation with a stated purpose to have a barrier-free Canada by 2040. Accessibility Services Canada provides information about the legislation and links to accessibility acts and standards across Canada. It also provides education and training resources to support accessibility and barrier-free design (https://accessible.canada.ca/).

Summary of Evidence

The ACSM[97] recommends that, once a new or prospective participant has completed the health screening process, facility operators should offer the participant a general orientation to the facility.

The Aerobics Exercise Recommendations to Optimize Best Practices in Care after Stroke (AEROBICS)[48, 49] state that "exercise programs can be administered in a variety of barrier-free and accessible settings" and that implementation considerations include having a barrier-free space for exercising with temperature control and wheelchair access to facilitate access and safety. Further, exercise equipment should be certified for participant use.

Community-based exercise programs for people with stroke have been feasibly implemented in various settings including community/recreation centres,[20-22, 25, 26, 29, 30, 38, 40, 41, 43, 44] fitness facilities and gyms,[19, 24, 42, 43, 45, 46, 55] a church,[43] and community halls.[28]

Key factors consistently identified by people with stroke, their caregivers, healthcare and exercise providers to support accessibility include the facilities' space, equipment, and available transportation options.[61, 99] Adequate space to deliver the class, and store exercise equipment, is needed.[39, 40, 43] Additional important features of the venue included accessible parking[43, 61] and convenient options for transportation.[32, 61] Distance,[43] the unreliability of adapted transport services,[40] and transportation costs,[40] were identified as barriers. As well, participants with stroke identified the need for exercise venues to provide fluids, and voiced concerns about environments that were too noisy or insufficiently heated.[43] Although not specific to the exercise program, access to a coffee shop at the venue was an important feature for some participants and caregivers to socialize before, during, or after the class.[32, 61]

Lack of access to suitable equipment to meet the needs of people with various abilities has been identified as a barrier.[38-40, 99] Physical therapists have voiced concerns about participant safety when using standard gym equipment (e.g., treadmills, stationary bikes, rowing machines, etc). This has led to some therapists limiting referrals to community exercise programs to individuals with minimal functional impairments.[38] Notably, not all community exercise programs require use of gym equipment.[22, 23]

RECOMMENDATION #8: EMERGENCY PLAN AND EQUIPMENT

The program provider should have an emergency plan and adverse event protocol in place that is documented and known to all exercise providers including: access to in-house first aid services from qualified personnel; phone access to Emergency Medical Services; access to an Automatic External Defibrillator (AED); and access to a source of glucose (e.g., fruit juice). There should be a quality improvement process in place to track and review incidents or adverse events. [Strong Recommendation, Low Quality Evidence].

Rationale

The exercise provider should be prepared to respond to an emergency situation in a timely manner in support of a safe environment. The emergency response plan should address the major emergency situations that might reasonably occur. Among these situations are those medical emergencies that may occur with exercise, such as hypoglycemia, cardiac arrest, stroke, and heat illness, as well as injuries that are orthopedic in nature.[97] The emergency response system should also consider other emergencies not associated with physical activity, such as fires, major power outages, severe weather.[97]

Implementation Resources and Considerations

Participants should be closely monitored throughout the exercise session. The exercise provider should be positioned to ensure they can see the entire group. See Table 6 Symptom Response.

The American College of Sports Medicine (ACSM)[97] outlines the following standards and guidelines for emergency planning and policies:

- Facility operators must have written emergency response policies and procedures which shall be reviewed regularly and physically rehearsed a minimum of twice annually. These policies shall enable staff to respond to basic first aid situations and other emergency events in an appropriate and timely manner;
- AEDs in a facility should be placed in a location that would allow a time of three to five minutes or less from collapse caused by cardiac arrest to defibrillation. A three-minute response time can be used to help determine how many AEDs are needed and where to place them;
- A staffed facility shall assign at least one staff member, who is currently trained and certified in the delivery of cardiopulmonary resuscitation (CPR) and in the administration of AED, to be on duty during all facility operating hours;

- Facility operators should ensure that a safety audit that routinely inspects all areas of the facility is conducted to reduce or eliminate unsafe hazards that may cause injury to employees and health/fitness facility members or users; and
- Facilities should have an incident report system that provides written documentation of all incidents that occur within the facility or within the facility's scope of responsibility. Such reports should be completed in a timely fashion and maintained on file, according to the regulatory statute of limitations for the location in which the facility does business.

For further details, see The ACSM's Health/Fitness Facility Standards and Guidelines.[97]

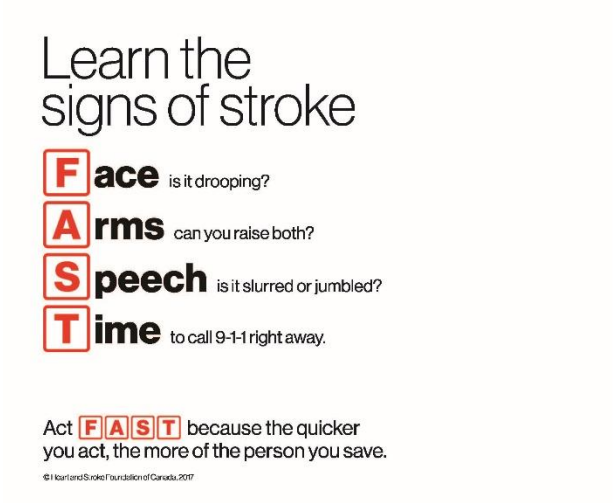
Table 6. Symptom Response

Signs and symptoms which require the participant to IMMEDIATELY STOP exercising and the exercise provider to assess for activation of emergency protocols:

- Chest pain, tightness, heaviness and/or radiation of discomfort towards jaw or arm.
- Pale appearance, cold or clammy skin.
- Excessive or unusual shortness of breath.
- Dizziness or light-headedness.
- Nausea, vomiting or severe headache.
- Seizures.
- Excessive thirst.
- Trembling.
- Palpitations.
- Irritability, nervousness, confusion.
- Numbness or tingling in tongue or lips.

If you suspect a cardiac arrest: Call 911 immediately, access and activate an AED (if available) and start CPR if warranted

https://www.heartandstroke.ca/heart-disease/emergency-signs



IF A PARTICIPANT IS EXPERIENCING ANY OF THESE SIGNS OF A STROKE, CALL 911 IMMEDIATELY AND/OR FOLLOW EMERGENCY PROCEDURES.

APPENDIX A

WRITING GROUP of the CANADIAN STROKE COMMUNITY-BASED EXERCISE RECOMMENDATIONS UPDATE 2020

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Nielsen, Dave	Caregiver of a person with stroke	Ontario, Canada	No conflicts to declare
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APPENDIX B

Healthcare Partner Logo

Fit for Function
Stroke Wellness Program

McMaster University

Fit for Function Community Stroke Wellness Program

Medical Authorization

Fit for Function is a 12-week program for individuals who have had a stroke that includes a modified group fitness class two days per week, as well as fitness centre exercise and education one day per week. The program is supervised by a YMCA kinesiologist and a physiotherapist.

Functional exercise classes	Community-Based Exercise Program for Persons Living with Stroke (1 hour, 2x/week) • Warm-up • Task-Oriented Strengthening and Cardiovascular Training • Mobility and Balance • Cool Down
Independent gym exercise	Supervised drop-in sessions at the fitness centre (1 hour, 1x/week)
Education sessions	Weekly sessions based on the Heart and Stroke Foundation's *Living with Stroke* program

To refer your patient to this program, please complete the attached Medical Authorization Form.

Fit for Function
Stroke Wellness Program

Fit for Function Community Stroke Wellness Program

Medical Authorization

Participant's Name:	DOB:
Address:	
City:	Phone #:

Please check one and provide details if required:

- ☐ I am not aware of any contraindications or concerns toward participation in this program.
- ☐ The applicant can participate in the program, but I urge caution because:
- ☐ The applicant can participate in the program, but should **not** engage in the following activities:
- ☐ The applicant is not advised to participate in the program because:

This patient has my approval to begin an exercise program with the recommendations or restrictions stated above.

Physician's signature Date

Physician's name (print) Phone

Please give this form to your patient, or send by fax to:
(Provide YMCA contact and fax number)

APPENDIX C

FAME
Fitness and Mobility Exercise Program

Modified Physical Activity Readiness Questionnaire (PAR-Q)

Name:_____ Date: _____
DOB: _____ Age:_____

Regular exercise is associated with many health benefits, yet any change in your activity level may increase your risk of injury. Completion of this questionnaire is a first step when planning to increase the amount of physical activity in your life. Please read each question carefully and answer every question honestly:

Has a physician ever said you have a heart condition and you should only do physical activity recommended by a physician?

☐ Yes ☐ No

When you do physical activity, do you feel pain in your chest?

☐ Yes ☐ No

When you were not doing physical activity, have you had chest pain in the past month?

☐ Yes ☐ No

Do you ever lose consciousness or do you lose your balance because of dizziness?

☐ Yes ☐ No

Do you have a joint or bone problem that may be made worse by a change in your physical activity?

☐ Yes ☐ No

Is a physician currently prescribing medications for your blood pressure or heart condition?

☐ Yes ☐ No

Have you been diagnosed with Osteoporosis or had any fractures?

☐ Yes ☐ No

Do you have any lung or breathing problems?

☐ Yes ☐ No

Do you have insulin dependent diabetes?

☐ Yes ☐ No

Do you know of any other reason you should not exercise or increase your physical activity?

☐ Yes ☐ No

If you answered yes to any of the above questions, if you are over 40 years of age and have been inactive, or if you are concerned about your health, talk with your doctor BEFORE you participate in a fitness test or become substantially more physically active. Tell your doctor your intent to exercise and to which questions you answered yes. If you answered no to all questions you can be reasonably positive that you can safely increase your level of physical activity gradually.

Signature: _____ Date: _____

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FAME
Fitness and Mobility Exercise Program

FAME Medical Information Form

I, _____(participant's name) consent to and authorize _____ (Doctor's Name), to release health information concerning my ability to participate in the exercise program. Authorization is not valid beyond 6 months from the date of signature. Further disclosure of release of my health information is prohibited without specific written consent of the person to whom it pertains.

Participant's Signature:_____ Date:_____

Instructor's Signature: _____ Date:_____

Dear Doctor: Your patient, _____, wishes to participate in the Fitness and Mobility Exercise Program (FAME) for People with stroke. This program will include a 5 minute warm-up, 5 minute stretching component, 15 minute functional strengthening (e.g., repetitive sit-to-stand), 15 minute fitness and agility (e.g., step up stepper while holding onto support) and a 15 minute balance component (e.g., standing and reaching). The classes run two to three times a week over an 8 to 12 week period. The intensity will be gradually increased to a moderate intensity of 60% age-predicted heart rate maximum (i.e., fairly light to somewhat hard effort).

By completing this form, you are not assuming any responsibility for the exercise. However, this information will help us determine whether your patient is appropriate for the program. When completed, please fax this form to:_____.

Physician's Recommendation (please check 1 box)

I authorize the applicant to participate in the FAME program

- ☐ I am not aware of any contraindications toward participation in this program
- ☐ I believe the applicant can participate, but urge caution because:
  _____
  _____
- ☐ The applicant should not engage in the following activities:
  _____
  _____

☐ I recommend the applicant NOT participate in the FAME program

Physician's signature:_____ Physician's name (printed:) _____

Address:_____ Date:_____
_____

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FAME
Fitness and Mobility Exercise Program

Community Center Information Form (Sample)

Assessment date: _____
Performed by: _____

Community Exercise Program for Stroke Participant Information Sheet

Demographics	
Name	
Address	
Postal Code	Date of Birth
Telephone (Home)	(Work)
Emergency Contact (Name)	(Telephone)

Information on Stroke		
Date of Stroke (dd/mm/yyyy)		
Post-Stroke Impairments	☐ Left Sided Weakness ☐ Right Sided Weakness ☐ Communication ☐ Shoulder Pain	☐ Memory ☐ Attention ☐ Perception ☐ Vision
Assistive Devices	☐ Ankle Foot Orthosis (AFO) ☐ Cane	☐ Shoulder Brace/Sling ☐ Walker

Other Medical Conditions		
☐ Osteoarthritis of the...	☐ Knee ☐ Ankle	☐ Hip ☐ Other _____
☐ Osteoporosis		
☐ Cardiovascular Condition	☐ Congestive Heart Failure ☐ Heart Attack ☐ Heart Surgery ☐ Arrhythmia	☐ High Blood Pressure ☐ Valve Disease ☐ Angina ☐ Other _____
☐ Diabetes	☐ Type 1 (Insulin Dependent)	☐ Type 2 (Adult Onset)
☐ Other Conditions		

Safety - Risk of Falls		
☐ Low Risk	☐ Intermediate Risk	☐ High Risk
Increased supervision needed with the following exercise activities:		
Additional Information:		

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FAME
Fitness and Mobility Exercise Program

FAME Program Participation Consent Form

FAME is a group exercise program developed for people with stroke who have some standing and walking ability. I am knowledgeable of the program components, which include warm-up exercises, functional strengthening, balance, flexibility and agility, and cool-down activities. I understand the purpose of the FAME program and desire to improve my motor function (muscle strength, balance, mobility), cardiovascular fitness, and executive functioning as a result of participating in the FAME program. Progression of exercises is based on the discretion of the instructor and my needs as the participant. I understand that I am responsible for monitoring my own condition throughout the FAME program and should any unusual symptoms occur (pain, dizziness, nausea), I will cease my participation and inform the instructor of any symptoms, injuries or illnesses.

In the event that a medical clearance must be obtained prior to my participation, I agree to consult and obtain written permission from my physician before commencing.

Also, I agree to assume the risks and consequences of exercising, which include pain, fatigue, falls, fractures, and in very rare cases, severe injuries or death. In no event will the University of British Columbia or developers of the program, be liable for any tort, personal injury, medical malpractice, death, product liability, loss of profit or data, or for special, indirect, or punitive damages, however caused and regardless of the theory of liability, arising out of or related to the use or inability to use the FAME program.

By signing this consent form, I affirm that I have read this form in its entirety and that I understand the description of the FAME program components. I also affirm that my questions regarding the FAME program have been answered to my satisfaction.

Signature of Participant: _____ Date_____

Signature of Lead Instructor: _____ Date:_____

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APPENDIX D

ST. JOSEPH'S CARE GROUP

Referral for Medical Clearance

☐ Keep Moving With Stroke-Community Exercise Program

☐ Moving on after Stroke

Place Patient Label with Barcode Here

Patient Name: _____ **Telephone Number:** _____

Date of Birth: _____
DD / MM / YYYY

Primary Diagnosis:

Secondary Diagnosis:

This patient can participate in a 60 minute, self-paced, group exercise program focusing on balance, strength, flexibility and endurance. The program will be done either in person in Thunder Bay or via videoconference in rural Northwestern Ontario.

Yes ☐ No ☐

Are there ANY concerns with participation in this program? Yes ☐ No ☐

If Yes, please comment below:

_____

_____

_____

_____

Physician's Name: _____

Address: _____

_____

Telephone Number: _____

_____ _____

Date **Physician's Signature**

Should you require any further information, please contact the **Program Coordinator at 807-343-2431 ext. 2537**

Please have your patient return this form to the Program Coordinator at St. Joseph's Care Group or **fax directly to 807-346-2302**

SREFMEDCLEAR

CF-0323(Rev April 2019)

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APPENDIX E

TOGETHER IN MOVEMENT AND EXERCISE (TIME™) SAMPLE REFERRAL FORM

(To be completed and signed by Physician, PT, or RN/NP)

_____ [name] is interested in participating in a group exercise program for people who have challenges with balance and mobility. Fitness instructors lead the exercise program. Eligible persons are those who can walk a minimum of 10 metres with or without a walking aid.

This program provides exercise for health and wellness, not physiotherapy. It offers exercises to address strength, balance and endurance. Classes include:

- The practice of everyday activities such as standing up from a chair, walking, reaching and bending, and stepping on and off steps. Supports are provided for balance as needed.
- Light to moderate aerobic exercise; 1-hour of exercise, once or twice per week for about 12 weeks per session and up to 3 sessions per year.
- A supportive environment with a safe staff (fitness instructor and volunteer) to participant ratio.

If your patient has either of the following, he/she would not be suitable for this program. Please indicate if either of the following apply: □ Uncontrolled angina □ Uncontrolled hypertension

Is a support person needed to assist with personal care needs (i.e., washroom)? □ YES □ NO

Is your patient presently medically stable and safe to participate in exercise? □ YES □ NO

Can your patient walk by him/herself 10m, with or without a walking aid? □ YES □ NO

Does your patient have a history of, or currently have the following (check all that apply):

□ Stroke
□ MS
□ Acquired brain injury
□ Cognitive and/or behavioural issues that may impede group participation
□ Diabetes
□ Peripheral vascular disease
□ Seizures: Date of last one: _____ Frequency: _____
□ Other medical conditions: _____
□ Osteoporosis
□ Severe joint pain preventing exercise

The following are precautions for which a graded exercise test/stress test is recommended. Does your patient have a history of (check all that apply):

□ Cardiac arrest □ Congestive heart failure □ Asthma/COPD that worsens with activity

Do "Hip Precautions" apply? □ YES □ NO In effect until: _____

☐ **Please attach a printed list of your patient's current medications.**

Considering all aspects of my patient's medical history, I agree that _____ does not have any health issues that would prevent him/her from participating in the exercise program as described.

Referring Professional's Name (please print): _____ Phone #: (___) _____

Signature: _____ Date: _____

Send completed form to:

[add your contact information here]

APPENDIX F

STRATEGIES TO ENHANCE PARTICIPATION FOR ADULTS WITH COMMUNICATION (APHASIA) AND SWALLOWING (DYSPHAGIA) DIFFICULTIES

Persons living with aphasia and/or dysphagia can participate in "aphasia/dysphagia friendly" community exercise programs designed for people living with stroke with a high degree of success. In fact, participation in leisure activities can reduce the social isolation often experienced by people with aphasia and can provide a safe environment where they may be able to enhance their communication capacity through practice.

Aphasia is an impairment of language and communication that can occur after stroke. Individuals may have difficulty expressing themselves when speaking, writing, or using nonverbal communication such as gestures (expressive aphasia). Individuals may have difficulty understanding spoken language, written material and nonverbal elements such as gestures (receptive aphasia). Aphasia can mask a person's intelligence and ability to express and to understand feelings, thoughts, and emotions. During the intake assessment it is important to establish the preferred method of communication with the participant. This may include nonverbal cues such as demonstrations, pictures, key words on a clipboard, writing, or having a "communication partner". It is recommended that instructors have access to paper and pens, or an electronic "writing tablet" to facilitate communication by using supported conversation techniques.

Dysphagia describes the difficulty with swallowing food and/or liquids that some people experience after a stroke. This difficulty can cause coughing or choking on foods and/or liquids. During the intake assessment it is important to identify any/all restrictions on types of fluids the participant is able to safely swallow and any/all special needs in this regard (e.g., thickened fluids, honey thick, by teaspoons or sips from a cup). If so, arrange with the participant that they bring in the appropriate types of fluids for hydration.

Strategies to ensure classes are accessible to persons living with **aphasia** include:

- Supporting a participant's request to **bring a communication partner** to the exercise sessions.
- Providing the **time** needed for the participant to communicate, allowing extra time for the participant to understand the message.
- **Speaking slowly and clearly** while facing the participant.
- Remembering that **aphasia does not mean a lack of intelligence**.
- May need to keep verbal instructions **shorter and simpler.**
- Using **supported conversation strategies** such as pictures, key words, written choice communication (i.e., offering the participant key-word choices that relate to the conversation topic) and written transcripts.
- Using **facial expressions and gestures** to relay messages and/or to support spoken and written messages.

- Using **non-verbal communication** such as exercise demonstrations, gestures and pantomime.
- **Adapting materials to be aphasia friendly** by including pictures and words.
- Providing assistance as needed with scheduling transportation, understanding program information, and filling out registration forms.
- Having **consistent staff** who are able to build a relationship with the person living with aphasia and learn the communication strategies that work best. You can **ask the person his/her specific strategies**, or ask the caregiver.
- The participant may need guidance during the exercise program including one-on-one attention and modification of exercises as needed.
- Keeping routines as consistent as possible including scheduled exercise program times and class format.

See links below to the Aphasia Institute that provides resources, tools and education including an on-line introductory course "Supported Conversation for Adults with Aphasia (SCA™).

Strategies to ensure classes are accessible to persons living with **dysphagia** include:

- The provision of written guidance to all staff prior to food and/or liquids being provided to the participant.
- Developing a plan to ensure that appropriate foods and/or liquids are available (participant may need to bring their own refreshments).

Source:

Aphasia Institute www.aphasia.ca https://www.aphasia.ca/communityhub
https://www.aphasia.ca/health-care-providers/education-training
https://www.aphasia.ca/health-care-providers/resources-and-tools

Blonski DC, Cover M, Gautheir R, Monas A, Murray D, O'Brien KK, Mendelson AD, Huijbregts M. Barriers to and Facilitators of Access and Participation in Community-Based Exercise Programmes from the Perspectives of Adults with Post Stroke Aphasia. *Physiotherapy Canada* 2014; 66(4): 367-75.

Canadian Stroke Best Practices Guidelines 2019. Rehabilitation & Recovery Following Stroke. Dysphagia. Rehabilitation and Recovery Following Stroke. *7.1 Dysphagia.* Retrieved from: https://www.strokebestpractices.ca/recommendations/stroke-rehabilitation/assessment-and-management-of-dysphagia-and-malnutrition-following-stroke

Royal College of Physicians National Clinical guidelines for Stroke 5th edition 2016. 4. Rehabilitation & Recovery. 4.16 *Swallowing.* p 107. Retrieved from: http://guideline.ssnap.org/2016StrokeGuideline/html5/index.html?page=107

APPENDIX G

EXERCISE SESSION CHECKLIST – Example

Use this checklist before, during and after each session to support the safety, efficiency and effectiveness of the program.

ITEM	POTENTIAL COMPONENTS	Initial
BEFORE SESSION		
Emergency procedures	AED and working telephone available, entrances and exits clear, working fire extinguisher available, emergency communication system in place.	
Facility	Check temperature, lighting, cleanliness, washrooms. Elevator operational (if applicable).	
Equipment	Clean, correct number, not damaged.	
Program Files	Handouts, participant information, attendance sheet as required.	
Readiness for Class	Reminder to participants to take required medications as prescribed, bring required medications, a bottle of water, and usual walking aids, wear appropriate footwear, clothing, and eyewear, use washroom facilities.	
Exercise Space	Clear of tripping hazards, sufficient handholds and armchairs for taking a rest. Ensure sufficient “traffic space” for participants to move safely between equipment or items.	
Pre-exercise Health Status	Ask each participant if they have experienced any change in health status (e.g., illness, injury, fall, change in medication, unexpected medical visit) since the last exercise class.	
DURING SESSION		
Hydration	Remind participants to stay hydrated, remember accommodations for participants who have dysphagia.	
Exertion Level /Fatigue	Remind participants to exercise at their own pace and to self-monitor their exertion during the class.	
Updates	Provide any updates (e.g., changes to class time, change in instructor, number of sessions remaining).	
Wrap Up	Remind participants to continue to self-monitor and to continue with a range of exercises/activities on a daily basis.	
AFTER SESSION		
Post-exercise health status	Ask each participant if they are feeling well, or are experiencing any symptoms (e.g., light-headedness, dizziness, weakness, excessive fatigue, etc.), feel safe to walk or need further rest or supervision.	
Transportation	Ensure participants have secured their transportation (e.g., that they have confirmed their schedule if using accessible transportation).	
Updating	Update participant files as needed (e.g., any special considerations for next session).	
Planning	Ensure class plan is in place for next session.	

APPENDIX H

INDICATORS OF EXERCISE INTENSITY

The table below presents methods of estimating exercise intensity using the Borg CR10 Rating of Perceived Exertion (RPE)[71] scale and the Talk Test.[72] Approximate relationships among indicators of exercise intensity are based on data from studies involving **non-disabled individuals.**
In the absence of having an exercise stress test, the aerobic intensity for participants with stroke should be "light-to-moderate".

Clinical Indicators of Exercise Intensity			
Exercise Intensity	**RPE Scale**		**Talk Test**
	0-10	**Description**	**Description**
Very Light	0	Nothing at all	Can sing and converse with no effort
	.5	Extremely light	
Light	1	Very Light	Can converse with almost no effort
	2	Light	
Moderate	3	Moderate	Can converse comfortably with little effort
	4	Somewhat hard	
Vigorous	5	Hard	Can converse with some effort → Converses with quite a bit of effort
	6		
	7	Very hard	
Near maximal or maximal	8		Can converse with quite a bit of effort and must stop talking to catch breath → Converses with maximum effort → Unable to converse
	9		
	10	Extremely hard	

Adapted from the Aerobic Exercise Recommendations to Optimize Best Practice in Care after Stroke (AEROBICS) 2019 Update.[49]

PICTORIAL VERSION OF RATING OF PERCEIVED EXERTION

The figure below provides a Facial Pictorial Rating of the Rating of Perceived Exertion (RPE) scale which may be helpful for people with stroke and aphasia.

Source:

The Aerobic Exercise Recommendations to Optimize Best Practice in Care after Stroke (AEROBICS) 2019 Update.[49]

APPENDIX I

ADDITIONAL EDUCATIONAL RESOURCES – FITNESS INSTRUCTORS AND PARTICIPANTS

Resource	Access	Description
Heart and Stroke Foundation	Heart and Stroke Foundation https://www.heartandstroke.ca	Website for people with stroke and their caregivers providing information on stroke prevention, recognition, care and treatment.
Taking Action for Optimal Community and Long-Term Stroke Care - A resource for healthcare providers (TACLS)	https://www.strokebestpractices.ca/resources/professional-resources/tacls	Developed by the Heart and Stroke Foundation of Canada, this resource provides practical guidance and stroke care information. Target audience includes Personal Support Workers, Health Care Aides, Home Care Attendants, Rehab Assistants, and others providing care for people with stroke.
Stroke Engine	Stroke Engine http://strokengine.ca/	Website for professionals, people with stroke and their caregivers. Provides current information and resources to support stroke rehabilitation and recovery.

March of Dimes Canada After Stroke Program	March of Dimes Canada https://www.marchofdimes.ca/en-ca/programs/afterstroke/	Resources for people with stroke and their caregivers. Resources include peer support programs, caregiver support resources, self-management resources, exercise, aphasia and communication, and recreational programs.
Canadian Stroke Best Practice Recommendations - Patient & Caregiver Resources	https://www.strokebestpractices.ca/resources/patient-resources	Website for Canadian Stroke Best Practice Recommendations and links to patient & caregiver resources.
The Aphasia Institute	https://www.aphasia.ca/ https://www.aphasia.com/aphasia-resource-library/aphasia-treatments/supported-conversation-for-adults-with-aphasia-sca/ https://www.aphasia.ca/communityhub/	Provides information and resources about aphasia for healthcare professionals and people with stroke and caregivers. Includes links to Supported Conversations for Adults with Aphasia (SCA)™ to teach communication partners how to support the person with aphasia.
Canadian Partnership for Stroke Recovery	https://canadianstroke.ca/tools/	This website contains many resources including a series of videos on various stroke impairments that may be helpful to people with stroke, caregivers and others.

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