SINGAPORE STROKE REHABILITATION GUIDELINE

Implementation Toolkit

MINISTRY OF HEALTH
SINGAPORE

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Introduction

The Singapore Stroke Rehabilitation Guideline is adapted from the Australian and New Zealand Living Clinical Guidelines for Stroke Management (referred to as the source guideline in this document) (1). To accompany the Singapore Stroke Rehabilitation Guideline, this toolkit is developed to **support healthcare professionals in delivering evidence-based stroke rehabilitation**.

The toolkit focuses on the 30 recommendations that are rated as “Strong For” in the Singapore Stroke Rehabilitation Guideline, and provides implementation tips and resources. The toolkit is designed for healthcare professionals involved in stroke rehabilitation, including clinical educators, service managers, and quality improvement leads. The toolkit follows a Stroke Learning Health System approach (2), where continuous improvement is achieved through a cycle of clinical evidence, guidelines, performance indicators, data benchmarking, quality improvement initiatives, and clinical outcomes via the One Rehab database. By following this structured approach, healthcare professionals can systematically improve stroke rehabilitation services, leading to better outcomes and a higher standard of care.

The toolkit is summarised into three chapters with summary points as follows:

Chapter 1: Understand the Guideline

- Key recommendations (rated as “Strong For”) are provided in terms of their care settings in Singapore’s rehabilitation landscape. The broad rationale of the decision-making behind strong recommendations in the form of the GRADE approach is explained.

Chapter 2: Use Data to Identify Gaps and Track Progress

- Data here include patient/clinical outcomes, service/process outcomes and performance indicators. Comparison of data within your organisation, or against national and/or international benchmarks are encouraged, depending on availability of data. These data help to identify gaps, prioritise areas for quality improvement, and track progress of quality improvement initiatives.

Chapter 3: Implement Quality Improvement Initiatives

- Implementation tips and resources are provided. Healthcare professionals are encouraged to use them to engage in structured quality improvement efforts to enhance stroke care. Collaborate with teams to refine workflows and optimise rehabilitation services.

Chapter 1: Understand the Guidelines

The GRADE approach

The Singapore Stroke Rehabilitation Guideline is adapted from the Australian and New Zealand Living Clinical Guidelines for Stroke Management (1). Strength of the guideline recommendations was determined by the GRADE (Grading of Recommendations Assessment, Development and Evaluation) approach (3) based on the following four factors:

- the balance between desirable and undesirable outcomes (trade-offs),
- the confidence in best estimates of effects (quality of evidence),
- the confidence in values and preferences (consumer preferences), and
- the resource use (cost and implementation considerations).

Using the GRADE approach, strength of recommendations on interventions are presented as “Strong For”, “Weak For”, “Strong Against” or “Weak Against”. This toolkit focuses on the 30 (out of 98) recommendations rated as “Strong For”, and highlights interventions that meet most of the four factors, i.e., result in greater benefits than harms, are supported by moderate-high quality evidence, have strong preferences from stroke survivors and caregivers, and are affordable and readily available in terms of resources and staff. Further details of the methods in adapting the guidelines and the GRADE approach can be found in Section 5. Methods, and Section 9.2 GRADE approach to rate certainty of evidence and strength of recommendations in the Singapore Stroke Rehabilitation Guideline.

It is important to remember that guidelines serve as a support tool for decision-making, not a substitute for professional judgment and personalised care. At the end of the day, guidelines should not be enforced rigidly. Regulatory bodies, insurance providers, and legal systems should avoid interpreting recommendations as mandatory directives. Healthcare decisions should always consider the preferences and values of the stroke survivors and their families. Even strong recommendations based on high quality evidence may not be suitable for every person. When faced with weak recommendations, clinicians should engage in more detailed discussions with stroke survivors to ensure decisions align with their needs and priorities. Clinical judgment is essential. Shared decision-making is key. No guideline can account for all individual factors and unique clinical circumstances.

The following table presents the 30 “Strong For” recommendations as per the rehabilitation care settings in Singapore that they might be delivered in. These include

1. Inpatient setting: rehabilitation units/services in acute hospitals and community hospitals;
2. Outpatient setting: rehabilitation units/services in acute hospitals, community hospitals, and day rehabilitation centres;
3. Home-based setting: therapy services delivered at home by providers from any sector.

It is possible that some recommendations may apply to stroke survivors in nursing homes. In the event that a stroke survivor is receiving active rehabilitation in a nursing home, we encourage clinicians to determine the applicability of the guideline recommendations based on the needs of the stroke survivor.

Table 1. Recommendations rated as "Strong For" in the Singapore Stroke Rehabilitation Guideline

[Section of Guidelines] Recommendations rated as "Strong For" (n = 30)	Inpatient	Outpatient	Home-based
1. **[Secondary prevention – Lifestyle modifications]** **Recommendation 1:** Non-pharmacological interventions addressing secondary stroke risk factors should be used for all people with stroke and transient ischemic attack. Such interventions should include multiple components including individual (support and counselling) and organisational approaches (regular reviews by relevant health care professionals) and include exercise training as a component.	✓	✓	✓
2. [Commencement of Rehabilitation] **Recommendation 3:** All stroke survivors should commence mobilisation (out-of-bed activity) within 48 hours of stroke onset unless otherwise contraindicated (e.g. receiving end-of-life care).	✓		
3. [Amount of Rehabilitation] **Recommendation 5:** For stroke survivors, rehabilitation should be structured to provide as much scheduled therapy (occupational therapy and physiotherapy) as possible. For stroke survivors, group circuit class therapy should be used to increase scheduled therapy time.	✓	✓	
4. [Early supported discharge services] **Recommendation 7:** Where appropriate home-based coordinated stroke services are available, early supported discharge services should be offered to stroke survivors with mild to moderate disability.	✓		
5. [Goal setting] **Recommendation 9:** Health professionals should initiate the process of setting goals, and involve stroke survivors and their families and carers throughout the process. Goals for recovery should be client-centred, clearly communicated and documented so that both the stroke survivor (and their families/carers) and other members of the rehabilitation team are aware of goals set.Goals should be set in collaboration with the stroke survivor and their family/carer (unless they choose not to participate) and should be well-defined, specific and challenging. They should be reviewed and updated regularly.	✓	✓	✓
6. [Sensorimotor impairments (Weakness)] **Recommendation 10:** For stroke survivors with reduced strength in their arms or legs, progressive resistance training should be provided to improve strength.	✓	✓	✓

[Section of Guidelines] Recommendations rated as "Strong For" (n = 30)	Inpatient	Outpatient	Home-based
7. [Sensorimotor impairments (Loss of cardiorespiratory fitness)] **Recommendation 14:** For stroke survivors, rehabilitation should include individually-tailored exercise interventions to improve cardiorespiratory fitness.	✓	✓	✓
8. [Activity limitations (Sitting)] **Recommendation 15:** For stroke survivors who have difficulty sitting, practising reaching beyond arm's length while sitting with supervision/assistance should be undertaken.	✓	✓	✓
9. [Activity limitations (Standing up)] **Recommendation 16:** For stroke survivors who have difficulty in standing up from a chair, practice of standing up should be undertaken.	✓	✓	✓
10. [Activity limitations (Standing)] **Recommendation 17:** For stroke survivors who have difficulty with standing, activities that challenge balance should be provided.	✓	✓	✓
11. [Activity limitations (Walking)] **Recommendation 19:** Stroke survivors with difficulty walking should be given the opportunity to undertake tailored repetitive practice of walking (or components of walking) as much as possible. The following modalities may be used: • Circuit class therapy (with a focus on overground walking practice) • Treadmill training with or without body weight support	✓	✓	✓
12. [Activity limitations (Arm activity)] **Recommendation 22:** For stroke survivors with some active wrist and finger extension, intensive constraint-induced movement therapy (minimum 2 hours of active therapy per day for 2 weeks, plus restraint for at least 6 hours a day) should be provided to improve arm and hand use.	✓	✓	✓
13. [Participation restrictions (Activities of daily living)] **Recommendation 30:** Community-dwelling stroke survivors who have difficulties performing daily activities should be assessed by a trained clinician. Community-dwelling stroke survivors with confirmed difficulties in personal or extended activities of daily living should have specific therapy from a trained clinician (e.g. task-specific practice and training in the use of appropriate aids) to address these issues.		✓	✓

[Section of Guidelines] Recommendations rated as "Strong For" (n = 30)	Inpatient	Outpatient	Home-based
14. [Communication difficulties (Aphasia)] **Recommendation 35:** For stroke survivors with aphasia, early aphasia therapy, starting within the first 4 weeks post stroke should be provided to maximise language recovery.	✓	✓	✓
15. [Communication difficulties (Aphasia)] **Recommendation 38:** For stroke survivors with aphasia, speech and language therapy should be provided to improve functional communication, reading comprehension, auditory comprehension, general expressive language and written language.	✓	✓	✓
16. [Communication difficulties (Aphasia)] **Recommendation 39:** Communication partner training should be provided to health professionals or volunteers who interact with people with aphasia after stroke.	✓	✓	✓
17. [Communication difficulties (Aphasia)] **Recommendation 40:** Communication partner training should be provided to carers or family members of people with aphasia after stroke.	✓	✓	✓
18. [Nutrition and hydration (Early hydration)] **Recommendation 51:** All stroke survivors should have their hydration status assessed, monitored, and managed throughout their hospital admission. Where fluid support is required, crystalloid solution (e.g., normal saline) should be used in preference to colloid solutions (e.g., albumin) as the first option to treat or prevent dehydration.	✓		
19. [Nutrition and hydration (Early feeding)] **Recommendation 52:** All patients with stroke should be screened for malnutrition at admission and on an ongoing basis (at least weekly) while in hospital. The screening should preferably be done by trained healthcare professionals with use of a validated nutrition screening tool.	✓		
20. [Nutrition and hydration (Early feeding)] **Recommendation 53:** For patients with stroke whose nutrition status is poor or deteriorating, nutrition supplementation should be offered. Nutrition supplementation can include oral nutritional supplements, food fortification strategies, small frequent meals and/or specialist dietary advice.	✓		
21. [Oral hygiene] **Recommendation 56:** All patients with stroke, particularly those with swallowing difficulties, should have assistance and/or education to maintain good oral and dental (including dentures) hygiene.	✓	✓	✓

[Section of Guidelines] Recommendations rated as "Strong For" (n = 30)	Inpatient	Outpatient	Home-based
22. [Oral hygiene] **Recommendation 57:** Staff and carers of patients with stroke (in hospital, in residential care and home settings) should be trained in assessment and management of oral hygiene.	✓	✓	✓
23. [Falls] **Recommendation 88:** For stroke survivors who are at risk of falling, multifactorial interventions in the community, including an individually prescribed exercise program and advice on safety, should be provided.	✓	✓	✓
24. [Information and Education] **Recommendation 89:** All stroke survivors and their families/carers should be offered information tailored to meet their individual needs using relevant language and communication formats. Information should be provided at different stages in the recovery process. An approach of active engagement with stroke survivors and their families/carers should be used allowing for the provision of material, opportunities for follow-up, clarification, and reinforcement.	✓	✓	✓
25. [Discharge care plans] **Recommendation 90:** Comprehensive discharge care plans that address the specific needs of the stroke survivor should be developed in conjunction with the stroke survivor and carer prior to discharge.	✓	✓	✓
26. [Carer training] **Recommendation 91:** Relevant members of the interdisciplinary team should provide specific and tailored training for carers/family as needed. This training should include, as necessary, personal care techniques, communication strategies, physical handling techniques, information about ongoing prevention and other specific stroke-related problems, safe swallowing and appropriate dietary modifications, and management of behaviours and psychosocial issues.	✓	✓	✓

[Section of Guidelines] Recommendations rated as "Strong For" (n = 30)	Inpatient	Outpatient	Home-based
27. [Community mobility and outdoor travel] **Recommendation 94:** Stroke survivors who have difficulty with outdoor mobility in the community should set individualised goals and get assistance with adaptive equipment, information and referral on to other services. Escorted walking practice may be of benefit to some individuals and if provided, should occur in a variety of community settings and environments, and may also incorporate virtual reality training that mimics community walking.	✓	✓	✓
28. [Return to work] **Recommendation 96:** Stroke survivors who were previously working should be asked if they wish to return to work. Where appropriate, they should be referred to return-to-work programs based in hospitals or social service agencies to receive support in optimising their physical and cognitive function. They should also be encouraged to resume work, either in a full or modified work capacity.	✓	✓	✓
29. [Support (Peer support)] **Recommendation 97:** Stroke survivors and their families/ carers should be given information about the availability of a local stroke support group and/or other sources of peer support before leaving hospital and when back in the community.	✓	✓	✓
30. [Support (Carer support)] **Recommendation 98:** Carers of stroke survivors should be provided with tailored information and support during all stages of the recovery process. This support includes (but is not limited to) information provision and opportunities to talk with relevant health professionals about the stroke, stroke team members and their roles, test or assessment results, intervention plans, discharge planning, community services and appropriate contact details. Support and information provision for carers should occur prior to discharge from hospital and/or in the home and can be delivered face-to-face, via telephone or computer.	✓	✓	✓

Chapter 2: Use Data to Identify Gaps and Track Progress

"If you cannot measure it, you cannot improve it."

Data collection and analysis are central to quality improvement in stroke care, enabling organisations to identify and close the gap between evidence and practice by informing ongoing adjustments and enhancements to care delivery (2). The types of data, uses of data and how to set up and maintain a clinical registry are covered in this chapter.

Types of data

Three types of data are often used.

1. **Clinical outcomes:** Clinical or patient outcomes are measurable changes in a patient's health status, symptoms, ability to function, quality of life, or survival, as a result of healthcare interventions. These outcomes reflect how patients experience care, function, or survive after receiving care and are used to determine the effectiveness of treatments in both clinical practice and research. Examples include walking speed, Functional Ambulation Category, Modified Rankin Scale, Functional Independence Measure, Modified Barthel Index, European Quality of Life – 5 dimensions and 5 level (EQ-5D-5L).

2. **Service outcomes:** Service or process outcomes measure the efficiency and quality of healthcare delivery. These outcomes go beyond simple measures of clinical effectiveness and focus on how care is provided, including the organisation, timeliness, and resource utilisation within the rehabilitation process. Examples include how quickly patients transition from admission to their first rehabilitation session, the length of stay in a rehabilitation centre, or the time between hospital discharge and the first outpatient appointment.

3. **Performance indicators**: Performance indicators are typically a blend of clinical outcomes, reflecting changes in patient health status, and service outcomes, which focus on the efficiency and reliability of care delivery. They frequently measure the proportion of patients who receive guideline-based or evidence-based interventions, as well as the proportion of stroke centres or clinics adhering to specific recommendations or standards within care pathways. To ensure accuracy, each indicator must have a clearly defined numerator, specifying the number of cases meeting a particular criterion, and a denominator that describes the total eligible population being assessed.

Examples of the outcomes relating to a guideline recommendation are described below in Table 2 for illustrative purposes.

Table 2. Examples of data relating to a guideline recommendation

[Section of Guidelines] Recommendation rated as "Strong For"		
[Secondary prevention – Lifestyle modifications] Recommendation 1: Non-pharmacological interventions addressing secondary stroke risk factors should be used for all people with stroke and transient ischemic attack. Such interventions should include multiple components including individual (support and counselling) and organisational approaches (regular reviews by relevant health care professionals) and include exercise training as a component.		
Clinical outcomes	**Service outcomes**	**Performance indicators**
E.g., Blood pressure levels, cholesterol levels, EQ-5D-5L	E.g., Time between hospital discharge and the first outpatient appointment	E.g., Percentage of stroke survivors receiving lifestyle counselling (e.g., smoking cessation, diet, physical activity) within 4 weeks* of discharge. *timeframe may be adapted based on service context.

The data described in this chapter are provided as examples to support local quality improvement. They are not prescriptive. Organisations may develop their own, or adapt them based on service priorities, resources, and context. Where feasible, indicators should follow Specific, Measurable, Achievable, Relevant, and Time-bound (SMART) principles to guide audit and monitoring. A good start is to see if there are baseline data related to stroke rehabilitation that are already collected as part of care. This provides insight into current practice and helps identify areas for improvement. Targets or goals can then be set based on site-specific data, service capacity, and needs. Organisations can then consider setting incremental goals that reflect both ambition and feasibility.

For more information on how to collect the different types of data, readers may refer to the following materials, some of which were previously developed by members of the Community Rehabilitation Transformation Workgroup for the purpose of capturing the current state of rehabilitation in Singapore, and for improving the reliability of outcome measurement.

- **One Rehab outcomes booklet:** Booklet contains psychometric properties of outcome measures used as part of the National One Rehab pilot and guides healthcare professionals in conducting the outcome measures in a standardised manner (4). (See Appendix 1. One Rehab Outcomes Booklet and Appendix 2. National One Rehab framework);
- **Clinical and organisation survey templates:** Survey template is provided that capture the perceived delivery of guideline-based rehabilitation care for stroke, hip fractures and frailty. (See Supporting information 4. Surveys – Clinical and organisational surveys (5), also attached as Appendix 3. Site Self-Audit Tool – Survey template);
- **Case note review templates:** Case note review template is provided that capture the actual delivery of guideline-based rehabilitation care for stroke, hip fractures and frailty. (See Supporting information 5. Case note reviews (5), also attached as Appendix 4. Site Self-Audit Tool – Case note review template);
- **World Stroke Organisation (WSO) Global stroke guidelines and action plan:** A roadmap for quality stroke care: Roadmap implementation guide contains performance indicators for stroke rehabilitation: https://www.world-stroke.org/publications-and-resources/resources/roadmap-to-delivering-quality-stroke-care-resource.
- **Stroke Recovery and Rehabilitation Roundtable (SRRR) consensus papers:** Several consensus-based core recommendations were identified from the Stroke Recovery and Rehabilitation Roundtable taskforce. These included outcome measures of balance and mobility, fatigue and other recommendations (e.g., on pre-clinical recovery research, biomarkers of recovery, intervention development, monitoring and reporting in clinical trials, control intervention design). Readers are encouraged to refer to the full list of publication work by the SRRR if looking to collect outcome measures, particularly for stroke research purposes: https://journals.sagepub.com/page/wso/srrr.
- **International Consortium for Health Outcomes Measurement (ICHOM):** Organisations may opt to adopt internationally available clinical outcomes databases, such as those from the International Consortium for Health Outcomes Measurement (ICHOM): https://www.ichom.org/patient-centered-outcome-measure/stroke/.

Uses of the data

Effective and efficient stroke rehabilitation requires continuous assessment to track a patient's progress and an organisation's quality of care. Data can be used for the following purposes:

- Evaluate progress: Track improvements in mobility and function over time.
- Guide treatment plans: Adjust rehabilitation strategies based on measurable changes.
- Predict independence: Correlate mobility outcomes with real-world activities and social participation
- Enhance communication: Provide clear data to patients, families and healthcare providers
- Track performance trends: Allows benchmarking against best practices/guidelines, or other centres
- Target areas for quality improvement: Promotes transparency and accountability across stroke rehabilitation services

How to set up and maintain a clinical registry

A clinical registry is a systematic collection of clinical data used to track outcomes, improve care quality, and inform evidence-based practice. In stroke rehabilitation, maintaining a well-structured registry can enhance clinical management, facilitate research, and support multidisciplinary collaboration. A registry can be maintained on Excel or other suitable site-owned databases such as REDCap.

In addition to the uses of the data, an advantage of having a clinical registry is that sites have autonomy over their own institutional data for service improvement, and can use the data to facilitate research and innovation at their sites. For a start, a clinical registry may contain the following information in Table 3 below. (Readers may also refer to a systematic review on current national hospital-based stroke registries for the common data to collect to allow comparisons (6).)

Table 3. Examples of data in a clinical registry

Classification of data	Type of data*	Practical Tips
Demographics	Age, sex, stroke type, severity (e.g., NIH Stroke Scale score)	If your site does not have access to stroke severity scores, consider using baseline Modified Barthel Index (MBI) or Functional Independence Measure (FIM) on admission to rehabilitation as a proxy measure of disability.
Medical History	Comorbidities, prior functional status, rehabilitation history	Avoid use of free text as this can be difficult to analyse. Consider coding of functional status using numbers (e.g. 0=dependent, 1=walk with assistance, 2=walk independently). For co-morbidities, consider collecting the presence of significant conditions that affects rehabilitation potential (e.g. diabetes, heart failure, renal failure etc).
Stroke-Specific Clinical Assessments	Presence of post-stroke complications (e.g., spasticity, contractures, secondary stroke prevention strategies)	Code as 0=No and 1=Yes for post-stroke complications to avoid analysing free text.
Rehabilitation Interventions	Types of therapy, frequency, duration	Use the results from the Self-assessment survey and documentation audit to discuss with the team which recommendation the team would like to track. Overcollection of data can result in team fatigue. Thus be judicious and only collect what's needed to answer your service improvement questions.
Outcome Measures	One Rehab Outcome Measures	Where possible use the outcomes that are already being routinely measured in practice. If the team would like to add other outcomes, do get buy-in from all members of the team.
Patient-Reported Outcomes	EQ-5D-5L (One Rehab Outcome Measure)	Where possible use the outcomes that are already being routinely measured in practice.
Follow-Up Data & Long-Term Outcomes	Readmission rates, community reintegration,	If follow-up data is not possible due to organisational nature, admission and discharge data is still sufficient for service improvements.

	employment status, caregiver burden assessment	You may consider collaborations with academic institutions for ethics approval and collection of longer-term data of stroke survivors that have been discharged from your service.

*not an exhaustive list

To maintain the clinical registry and ensure data collection are feasible and of a high standard, it is worthwhile to consider the following tips:

- Standardise the data collection - use validated outcome measures at consistent time points (e.g., baseline, 3 months, 6 months, 1 year post-stroke, or admission and discharge from service).
- Ensure uniform documentation across all clinicians and settings.
- Use Electronic Health Records (EHR) Integration-Implement digital tracking systems to reduce paperwork and improve accessibility.
- Use automated data analysis tools to generate reports.
- Engage the multi-disciplinary rehabilitation team in data entry and review.
- Share registry insights with the healthcare team to improve care coordination.
- Partner with academic institutions to aid the team in analysis and publication if needed.
- Obtain informed consent for data inclusion in research and quality improvement initiatives as required by your institution.
- Comply with data protection regulations.

Chapter 3: Implement Quality Improvement Initiatives

How to start and finish a quality improvement project

1. Engage the Stroke Rehabilitation Team

- Identify key stakeholders, including physicians, allied health professionals, nurses, and administrators, to lead a clinical service improvement project.

2. Establish a Quality Improvement Leadership Structure

- Appoint a QI Team Lead to oversee the initiative and coordinate activities.
- Ensure the team has a clear mandate and protected time to focus on improving stroke rehabilitation services.
- Engage institutional Quality Improvement (QI) departments for access to resources, data, and coaching support. Those in the Intermediate and Long-Term Care (ILTC) sector may refer to the Agency for Integrated Care's QI portal for guidance and tools to initiate QI projects: https://www.aic.sg/partners/initiating-qi-projects
- Use available quality improvement toolkits within your organisation to guide the process.

3. Build Familiarity with the Singapore Stroke Rehabilitation Guideline

- Provide all team members with access to the guidelines.
- Encourage them to review key recommendations related to their practice.
- Discuss how these guidelines align with current clinical workflows and identify gaps.

4. Conduct a Site Self-Audit

- Schedule a meeting to complete a site self-audit.
- The self-audit can include asking team members to complete the clinical and organisation surveys and case note reviews (see supporting information 4 and 5 for templates (5), also attached as Appendix 3. Site Self-Audit Tool – Survey template and Appendix 4. Site Self-Audit Tool – Case note review template).
- Use audit findings to identify areas for improvement and prioritise quality improvement efforts.

5. Use Implementation Toolkit for Specific Recommendations

- Incorporate the implementation tips and resources (in toolkit) to support the adoption of guideline recommendations.
- Tips and resources include practical strategies, checklists and workflow templates.
- Select appropriate tips and resources for specific setting (refer to Table 4 for implementation tips and resources.).

6. Celebrate efforts and success with the completion of Quality Improvement initiatives

- Compare site data with other rehabilitation providers, share best practices and exchange ideas.
- Share your efforts and successes at conferences, webinars for professional associations, and/or presentations to cluster partners.
- Apply for awards. An example is the AIC Community Care Excellence Awards: https://www.aic.sg/partners/community-care-excellence-awards/

Table 4. Implementation tips and resources for guideline recommendations

[Section of Guidelines] Recommendations rated as "Strong For" (n = 30)

1. [Secondary prevention – Lifestyle modifications]

Recommendation 1: Non-pharmacological interventions addressing secondary stroke risk factors should be used for all people with stroke and transient ischemic attack. Such interventions should include multiple components including individual (support and counselling) and organisational approaches (regular reviews by relevant health care professionals) and include exercise training as a component (7–10).

Implementation tips and resources

a) Encourage stroke survivors to use the Stroke Buddy app (https://www.nni.com.sg/patient-care/stroke-buddy) for guidance and support. The app includes:

- Exercise & Wellness Guide – helps improve strength, mobility, and reduce stress
- Blood Pressure Tracker – monitors and records BP readings
- Medication Reminders – ensures timely medication intake
- Care Tips – provides guidance on managing stroke complications and more

b) Use the Post-Stroke Checklist (Appendix 5. Post-Stroke Checklist) to identify if stroke survivors have been referred for risk factor assessment and treatment. In some cases, it can also help to identify certain barriers to lifestyle modifications (e.g., spasticity limiting stroke survivor's ability to engage in physical activity).

c) Refer to educational materials on Stroke Hub (https://www.healthhub.sg/programmes/strokehub) for accurate and locally relevant content. These resources include:

- Stroke Booklet – essential information for stroke survivors and caregivers
- Stroke Log – a tool for tracking recovery progress
- Factsheets – key educational content to support learning for stroke survivors
- Educational videos – key educational content to support learning on stroke risk factors for stroke survivors

d) Non-pharmacological interventions often include education (written/verbal), counselling, and supervised/active exercise (aerobic or mixed aerobic/strengthening) as components. Counselling should be supportive, non-judgemental and collaborative, where the clinician and patient enter into a mutual relationship to encourage the patient to undertake health behaviour change. Counselling includes (but is not limited to) identifying barriers, setting goals and priorities, creating action plans or strategies to change, and self-monitoring activities. For more details and access to decision aids, see "Practical info" and "Decision aids" tabs in Chapter 4 of source guideline: https://app.magicapp.org/#/guideline/8L0RME/section/EdVPML.

Sources:

i. Stroke Services Improvement Team, Ministry of Health, Singapore; National Neuroscience Institute, Singapore.

ii. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 4 of 8: Secondary prevention - Lifestyle modifications.

2. [Commencement of Rehabilitation]

Recommendation 3: All stroke survivors should commence mobilisation (out-of-bed activity) within 48 hours of stroke onset unless otherwise contraindicated (e.g. receiving end-of-life care) (11, 12).

Implementation tips and resources

a) Prioritise frequency over duration. As stroke survivors build tolerance, it is better to increase the number of mobilisation sessions rather than the length of each mobilisation session. Stroke survivors with a baseline NIHSS scores of 5 and 6 have higher odds of a favorable outcome when they are mobilised more than once

per day but spend less than 13.5 minutes per day in out-of-bed activities (13).

b) Caution with stroke survivors who are older (>76 years old) and have more severe strokes (NIHSS >7).

c) If a stroke survivor can move independently, bed rest should not be routine. For stroke survivors with difficulty moving, a trained healthcare professional should assess the most appropriate and safest method in assisting transfers and out-of-bed activity. This assessment should take place preferably within 24 hours of stroke onset. For more details, see "Practical info" tab in Chapter 5 of source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/nyGJ2j.

Sources:

i. Stroke Services Improvement Team, Ministry of Health, Singapore; National Neuroscience Institute, Singapore.

ii. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 5 of 8: Rehabilitation.

3. [Amount of Rehabilitation]

Recommendation 5: For stroke survivors, rehabilitation should be structured to provide as much scheduled therapy (occupational therapy and physiotherapy) as possible (14–16). For stroke survivors, group circuit class therapy should be used to increase scheduled therapy time (17).

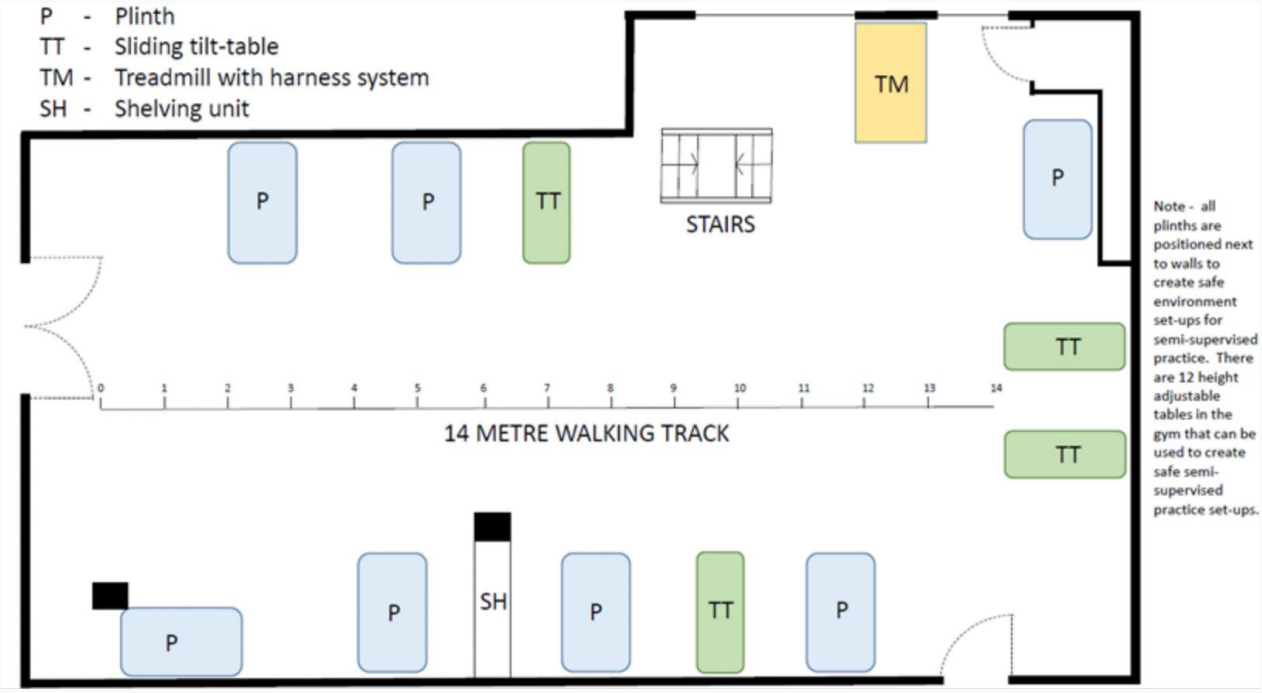
Implementation tips and resources

a) To increase the amount of rehabilitation, stroke survivors should be encouraged to continue with active task practice outside of scheduled therapy sessions. This means that in addition to one-on-one practice (with therapist), rehabilitation should also include

- Semi-supervised practice (with family/carers), and
- Self-directed independent practice (with self).

b) Semi-supervised practice requires a safe environment to be set up and feedback to be provided in order to ensure safety and quality of movement. Below are examples of gym set-up and exercise set-up where large amounts of semi-supervised practice was undertaken (18).

Gym set-up for semi-supervised practice (18)



Exercise set-up for semi-supervised practice (18)

Step-up exercise

Environment set-up for safety:

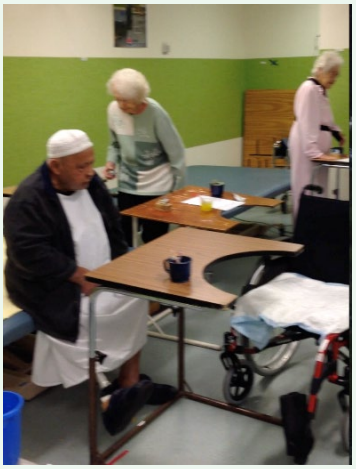
- Wall on unaffected side
- Height adjustable table in front
- Chair on affected side
- Plinth behind

Environment set-up for quality:

- Block to prevent external rotation of right leg.
- Tape on block in front to guide placement of left foot

Note - Counter in left hand to count repetitions of practice.

Sit to stand and standing exercises



Environment set-up for safety:

Man with hat practising sit to stand:

- Height adjustable table in front

Woman in green pullover practising stepping exercise:

- Height adjustable tables on either side
- Plinth behind

Woman in pink nightgown practising standing exercise:

- Height adjustable table in front
- Wall on left side
- Plinth behind

Note – all stroke survivors have counters to count repetitions of practice.

Group circuit class - Balance class

Environment set-up for safety:

- Height adjustable tables in front and to the side
- Plinths behind and to the side
- Walls behind and to the side

Environment set-up for quality:

- Wall behind as cue to maintain hip extension in standing

Note – all stroke survivors have counters to count repetitions of practice

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c) To increase the amount of self-directed independent practice, refer to the following resources:

- Physiotherapy Exercises website (www.physiotherapyexercises.com) – resource to create customised exercise programs with clear instructions and illustrations for independent practice. See examples of exercise sheets in Appendices: Appendix 7. Sample of Sitting Balance Exercises, Appendix 8. Sample of Sit to Stand Exercises, and Appendix 9. Sample of Standing Exercises.
- Graded Repetitive Arm Supplementary Program (GRASP) manual (https://neurorehab.med.ubc.ca/grasp/) – intervention manual previously tested in trials on upper limb exercise programs (19, 20).

d) Group circuit class is another option to increase the amount of rehabilitation where exercise stations are set up and stroke survivors spend a short amount of time at each station (e.g., 10 mins) before rotating to the next station. Class usually takes 1–2 hours. For further details on how to run a group circuit class, refer to Appendix 6. Circuit Class Manual which contains the intervention manual previously tested in trials on circuit class therapy (21, 22). For more details, see "Practical info" and "Decision aids" tabs in Chapter 5 of source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/j94ANE.

Sources:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 5 of 8: Rehabilitation.

ii. Dorsch S, Weeks K, King L, Polman E. In inpatient rehabilitation, large amounts of practice can occur safely without direct therapist supervision: an observational study. Journal of Physiotherapy. 2019;65(1): 23-27.

4. [Early supported discharge services]

Recommendation 7: Where appropriate home-based coordinated stroke services are available, early supported discharge services should be offered to stroke survivors with mild to moderate disability (23).

Implementation tips and resources

To work effectively, early supported discharge services must have similar elements to those of organised stroke teams. Early supported discharge teams should comprise of multidisciplinary professionals and staffing levels should be determined based on local context and service needs (23).

a) A proportion of stroke survivors (15%) are eligible for the early supported discharge services based on a mix of criteria (23):

- Physical function: Barthel Index (BI) score of 16 to 19
- Cognitive function: Mini-Mental State Examination (MMSE) score > 23
- Caregiver support
  Suitability of the home environment, and/or
- Proximity to the hospital.

Special considerations might need to be given to younger stroke survivors (< 65 years) who might have less physical disability but higher cognitive challenges, and who might need tailored rehabilitation to address return to work, parenting and psychosocial issues, and who often miss out on rehabilitation services within 3 months of stroke (24).

b) Service Duration: 4-5 weeks is recommended to be effective (25). Do interpret and adapt the numbers provided with consideration for the local context. For more details, see "Practical info" tab in Chapter 5 of source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/j9qgRj.

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 5 of 8: Rehabilitation.

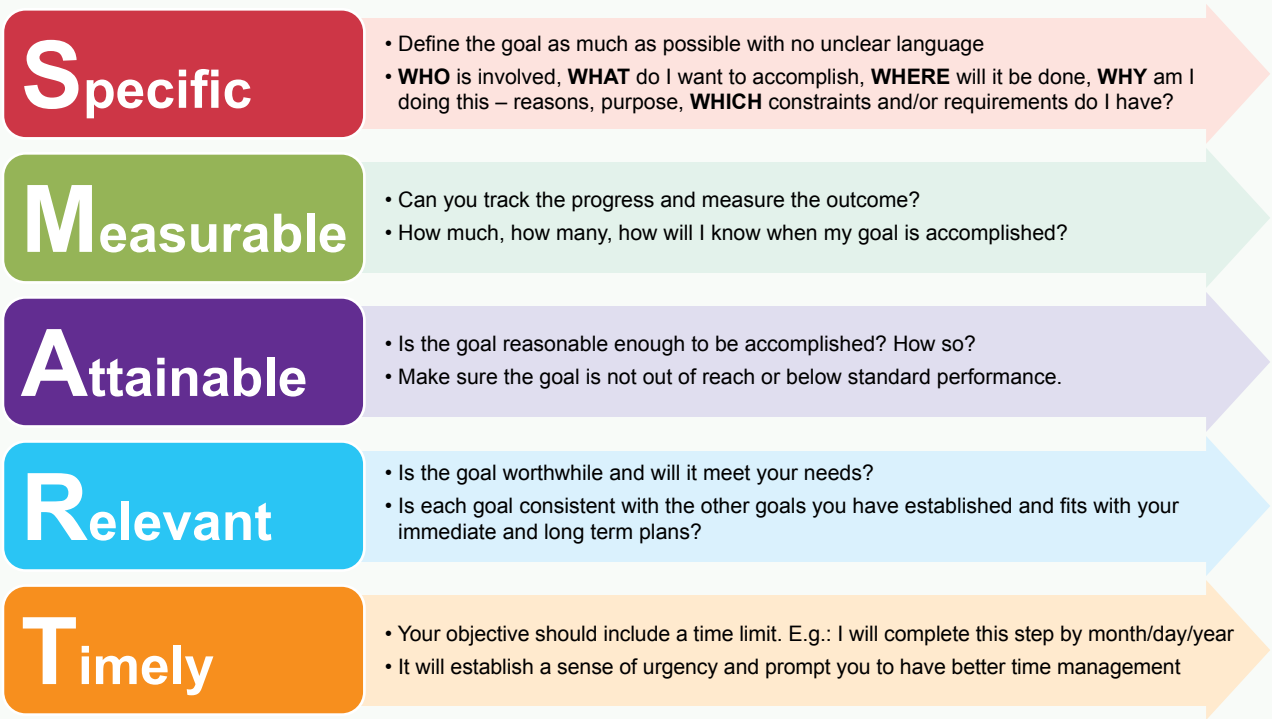
5. [Goal setting]

Recommendation 9: Health professionals should initiate the process of setting goals, and involve stroke survivors and their families and carers throughout the process. Goals for recovery should be client-centred, clearly communicated and documented so that both the stroke survivor (and their families/carers) and other members of the rehabilitation team are aware of goals set (26, 27). Goals should be set in collaboration with the stroke survivor and their family/carer (unless they choose not to participate) and should be well-defined, specific and challenging. They should be reviewed and updated regularly (26, 27).

Implementation tips and resources

a) Refer to the SMART principles – a useful tool for goal setting. Goal setting is facilitated by

- Tailoring the process to individual stroke survivor's needs and preferences
- Using structured processes, tools and resources
- Ensuring early, effective and frequent communication between staff and stroke survivors.



b) A learning resource is also available on the InformMe website if clinicians wish to learn more about goal setting: https://informme.org.au/learning-modules/9-chronic-stroke-review-tool-goal-setting. For more details, see "Practical info" tab in Chapter 5 of source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/j7pl6L.

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 5 of 8: Rehabilitation.

6. [Sensorimotor impairments (Weakness)]

Recommendation 10: For stroke survivors with reduced strength in their arms or legs, progressive resistance training should be provided to improve strength (28).

Implementation tips and resources

a) Many strengthening interventions used in clinical settings and research do not meet the criteria for Progressive Resistance Training (PRT) as defined by the American College of Sports Medicine (ACSM). According to ACSM, PRT should:

- Use a load of 8–12 repetition maximum (RM) (i.e., the heaviest weight a person can lift no more than 8–12 times before fatigue).
- Be performed for at least two sets, with progressively increasing loads to ensure continued strength gains.

b) PRT requires a minimum strength level (greater than anti-gravity strength) to lift high external resistance. Some stroke survivors may not initially have the strength for PRT and will require alternative strengthening approaches before progressing (e.g., reducing moment arm, reducing the weight of gravity on limbs, reducing friction, and use of electrical stimulation).

c) Provide clear, pictorial instructions for stroke survivors performing exercises outside therapy, including equipment use and safety precautions. Use www.physiotherapyexercises.com to develop an exercise logbook which will also allow visual tracking of progress to enhance motivation.

d) Monitor post-stroke fatigue and pain, adjusting the intensity and frequency as needed to avoid overexertion. For more details, see "Practical info" tab in Chapter 5 of source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/jxyQAL.

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 5 of 8: Rehabilitation.

7. [Sensorimotor impairments (Loss of cardiorespiratory fitness)]

Recommendation 14: For stroke survivors, rehabilitation should include individually-tailored exercise interventions to improve cardiorespiratory fitness (29).

Implementation tips and resources

Clinicians can refer to the Stroke Aerobic Exercise Implementation Toolkit (START) (https://kite-uhn.com/START) for aerobic exercise guidelines, including submaximal exercise testing. However, as it is Canada-based, local resources should be considered for contextualisation. Local training courses on clinical exercise testing and prescription are available, and several healthcare institutions have developed exercise testing protocols for stroke survivors. Clinicians may reach out to training providers or other institutions for further information on available resources and safety guidelines.

a) Pre-exercise evaluation: All people after stroke should undergo a pre-exercise evaluation to minimise the potential for adverse events before commencing on a physical activity program (30). This includes a medical and physical examination to identify co-morbidities that may be precautions or contraindications to exercise (31). A graded exercise test with ECG monitoring may be included as part of the pre-exercise evaluation (30).

b) Aerobic exercise prescription: Once medically stable, a personalised program can be prescribed (30).

- Mode: Large muscle activities (e.g., walking, arm or leg ergometry, functional activities)
- Frequency: 3–5 days/week
- Duration: 20–60 min/session (or multiple 10-min sessions) + 5-10 min warm-up and cool-down
- Intensity: 40–70% VO_2 reserve or HR reserve; 55–80% HRmax; RPE 11–14 (6-20 scale).

- Exercise should be tailored to the individual's recovery stage, tolerance, environment, available social support, physical activity preferences, impairments, activity limitations and participation restrictions. For more details, see "Practical info" tab in Chapter 5 of source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/jxyQAL.

c) Evidence-based group exercise programs that can be considered for implementation in the community:

- Fitness and Mobility Exercise Program (FAME): https://fameexercise.com/at-home/
- Together in Movement and Exercise (TIMETM): https://www.uhn.ca/TorontoRehab/TIME

d) Barriers and enablers to physical activity/exercise post-stroke: Stroke survivors face barriers to physical activity, including lack of knowledge and skills, limited access to suitable facilities and equipment, and fear of injury or the unknown. While some feel confident, most require guidance on exercise types, intensity, and adaptations. Environmental challenges, such as inaccessible public fitness spaces and lack of skilled support, further limit participation. However, group-based activities and social support can enhance motivation, confidence, and adherence. Clinicians should provide clear guidance, improve access to adaptive resources, address psychological barriers, and promote social engagement to support long-term physical activity participation (32–34).

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 5 of 8: Rehabilitation.

8. [Activity limitations (Sitting)]

Recommendation 15: For stroke survivors who have difficulty sitting, practising reaching beyond arm's length while sitting with supervision/assistance should be undertaken (15).

Implementation tips and resources

a) A sample exercise sheet containing part-task and whole-task practice of sitting is available as Appendix 7. Sample of Sitting Balance Exercises. (Exercise sheet was generated from website: www.physiotherapyexercises.com.)

b) In addition to one-on-one practice, aim to always incorporate semi-supervised and independent practice in training of sitting.

c) Additional tips are provided in the source guidelines:

- Give clear instructions on exercise, progression, amount of practice and goals.
- When setting up semi-supervised and/or independent practice, ensure environment set-up is safe and structured, i.e., feedback on performance and results can be provided (e.g., visual feedback via seeing weight on weighing scales, auditory feedback via sound on lower limb load monitor, counter, stopwatch). For more details, see "Practical info" tab in Chapter 5 of source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/j7QAvn.

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 5 of 8: Rehabilitation.

9. [Activity limitations (Standing up)]

Recommendation 16: For stroke survivors who have difficulty in standing up from a chair, practice of standing up should be undertaken (35, 36).

Implementation tips and resources

a) A sample exercise sheet containing part-task and whole-task practice of standing up is available as Appendix 8. Sample of Sit to Stand Exercises. (Exercise sheet was generated from website: www.physiotherapyexercises.com.)

b) Repetitive sit-to-stand training is effective in improving sit-to-stand performance and can be incorporated into broader exercise programs or enhanced with biofeedback devices (36). Studies primarily focus on individuals who can already stand independently, measuring time to stand and weight distribution on the affected limb. While optimal duration and intensity remain unclear, typical protocols involve 30–60 minutes of training, 3–5 times per week, for 2–4 weeks.

c) For stroke survivors who cannot stand up independently, alternative strategies include the following (37):

- Squats on a sliding or fixed tilt table
- Reaching tasks in sitting, emphasising weight-bearing on the affected leg.

d) To progress training and increase challenge, consider the following (37):

- Increase number and speed of repetitions
- Lower the height of the sitting surface
- Place affected foot further behind to load the affected leg
- Introduce unstable surfaces under the feet (e.g., foam)

e) To enhance motivation, movement quality, and safety during training, consider the following (37):

- Perform training independently or in a group setting
- Provide visual targets (e.g., for shoulder or leg position)
- Use an external device for visual or auditory feedback (e.g., on lateral symmetry)
- Monitor or count repetitions
- Provide hands-on or verbal feedback on quality of movement
- Have wall support on the unaffected side for safety and spatial awareness
- Set up the environment safely for those fearful of falling For more details, see “Practical info” tab in Chapter 5 of source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/jzroXj.

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 5 of 8: Rehabilitation.

10. [Activity limitations (Standing)]

Recommendation 17: For stroke survivors who have difficulty with standing, activities that challenge balance should be provided (35, 38, 39).

Implementation tips and resources

a) A sample exercise sheet containing part-task and whole-task practice of standing up is available as Appendix 9. Sample of Standing Exercises. (Exercise sheet was generated from website: www.physiotherapyexercises.com.)

b) Balance training should incorporate functional tasks, weight-shifting in standing, and walking exercises that

challenge balance. Additional approaches, such as virtual reality training and Tai Chi, can be effective if they are active, performed in standing, and sufficiently challenge the balance system. Whenever possible, exercises should be done without hand support, while ensuring safety and fall prevention at all times. Although adverse events are rare, fall risks should always be minimised during balance training. For more details, see “Practical info” and “Decision aids” tabs in Chapter 5 of source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/noqVGj.

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 5 of 8: Rehabilitation.

11. [Activity limitations (Walking)]

Recommendation 19: Stroke survivors with difficulty walking should be given the opportunity to undertake tailored repetitive practice of walking (or components of walking) as much as possible (35). The following modalities may be used:

- Circuit class therapy (with a focus on overground walking practice) (40)
- Treadmill training with or without body weight support (41, 42)

Implementation tips and resources

a) Body weight supported treadmill training, electromechanical gait training and robotic-assisted gait training serve as valuable adjuncts to overground gait training, particularly for stroke survivors who are unable to walk independently. These devices provide automated and repetitive gait cycles, facilitating early and intensive walking practice.

b) To enhance implementation, consider the following:

- Ensure appropriate selection of stroke survivors: While electromechanical gait training benefits non-ambulatory stroke survivors, treadmill-based training or wearable motion sensors may be more suitable for those with some walking ability.
- Leverage data tracking: Most devices provide quantifiable metrics on step count, symmetry, and weight distribution, allowing for personalised progression.
- Promote accessibility and training: Clinicians should receive specialised training to optimise device use.

c) When using technology to enhance walking practice, safety, exercise tolerance, and functional goals should remain central to rehabilitation planning. Also refer to Appendix 6. Circuit Class Manual on how to conduct circuit class therapy. For more details, see “Practical info” and “Decision aids” tabs in Chapter 5 of source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/Eglqdj.

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 5 of 8: Rehabilitation.

12. [Activity limitations (Arm activity)]

Recommendation 22: For stroke survivors with some active wrist and finger extension, intensive constraint-induced movement therapy (minimum 2 hours of active therapy per day for 2 weeks, plus restraint for at least 6 hours a day) should be provided to improve arm and hand use (43).

Implementation tips and resources

a) Most studies on constraint-induced movement therapy (CIMT) involve participants who have some active wrist and finger extension, minimal pain or spasticity, full joint range of motion, no significant cognitive deficits, no walking balance issues, and reduced arm use in daily activities.

b) Typically, studies include at least two weeks of:

- Intensive, supervised task practice with the affected hand (2–5 hours/day, 5 days/week).

- A transfer package with structured home exercises.
- Restraint of the unaffected hand using a mitt or sling (at least 6 hours/day).

c) Most research have focused on chronic stroke survivors living in the community, with fewer trials conducted during the early inpatient phase. For more details, see "Practical info" tab in Chapter 5 of source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/nyGJPj.

d) The following resources may be useful for implementation and were developed as part of the ACTIveARM project (44–46):

- CIMT: An introduction to shaping: https://youtu.be/liOyY5kr0h4?si=iZhEIXS_RoIR3oMq
- CIMT: An introduction to shaping 2: https://youtu.be/_evKkyDFEmQ?si=e_2OPmewW_d4CtdX
- An introduction to the Motor Activity Log (MAL): https://youtu.be/H0KRUg2Hgxs?si=MG1Tx90D0qVTLI4V
- Delivery of CIMT via telehealth: www.telecimt.com

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 5 of 8: Rehabilitation.

13. [Participation restrictions (Activities of daily living)]

Recommendation 30: Community-dwelling stroke survivors who have difficulties performing daily activities should be assessed by a trained clinician (47).

Community-dwelling stroke survivors with confirmed difficulties in personal or extended activities of daily living should have specific therapy from a trained clinician (e.g. task-specific practice and training in the use of appropriate aids) to address these issues (47).

Implementation tips and resources

a) Tailored activities of daily living (ADL) training should be provided at home to stroke survivors with ADL difficulties, as part of routine therapy. Intervention and therapy sessions may focus on personal ADL (dressing, bathing) or extended ADL (cooking, laundry tasks). Ensure all sessions engage the stroke survivor in the process and respect their dignity. For more details, see "Practical info" tab in Chapter 5 of source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/EaYKGE.

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 5 of 8: Rehabilitation.

14. [Communication difficulties (Aphasia)]

Recommendation 35: For stroke survivors with aphasia, early aphasia therapy, starting within the first 4 weeks post stroke should be provided to maximise language recovery (48).

Implementation tips and resources

a) For structured, evidence-based guidance on aphasia management, clinicians can refer to the following resources to enhance clinicians' knowledge and skills in delivering person-centred, evidence-based care for individuals with aphasia:

- Australian Aphasia Rehabilitation Pathway (AARP): https://www.aphasiapathway.com.au/
- Aphasia Institute: https://www.aphasia.ca/

For more details, see "Practical info" and "Decision aids" tabs in Chapter 5 of source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/jmqavj.

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 5 of 8: Rehabilitation.

15. [Communication difficulties (Aphasia)]

Recommendation 38: For stroke survivors with aphasia, speech and language therapy should be provided to improve functional communication, reading comprehension, auditory comprehension, general expressive language and written language (48, 49).

Implementation tips and resources

a) Early intervention should be offered where feasible, however, individual factors including concurrent illness and issues with engaging in rehabilitation must be considered (48). For more details, see "Practical info" and "Decision aids" tabs in Chapter 5 of source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/jmqavj.

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 5 of 8: Rehabilitation.

16. [Communication difficulties (Aphasia)]

Recommendation 39: Communication partner training should be provided to health professionals or volunteers who interact with people with aphasia after stroke (50–52).

Implementation tips and resources

a) Current Communication Partner Training (CPT) Practices: An Australian survey of 122 speech pathologists (53) found that 66% of clinicians train unfamiliar communication partners (CPs), such as healthcare providers, with 95% focusing on aphasia. However, only 13% used published evidence-based programs, and none strictly follow manualised protocols.

Typical CPT delivery:

- One to two sessions
- 30–60 minutes of informal, face-to-face education and skills training
- Usually provided upon request

Common training approaches:

- Educational methods (92%)
- Skills training (80%)

Most frequently trained CPs:

- Nurses (85.3%)
- Allied health professionals (82.7%)
- Others: doctors, volunteers, food service staff, administrative staff, patient service assistants, paid carers, and students

No single CPT program or delivery method has proven superior. Studies found:

- E-learning vs. face-to-face CPT: No difference in improving healthcare professionals' confidence and knowledge of aphasia (54).
- Face-to-face vs. telehealth/e-learning CPT: No significant differences in efficacy (52, 55, 56).

b) An implementation study (57) found better results when CPT interventions were tailored to the local healthcare setting. Key strategies for success include:

- Audit and feedback
- Physical resources

- Educational lectures
- Interaction with people with aphasia

c) Additional considerations: Incorporating augmentative and alternative communication (AAC) tools may further support CPT (58).

For more details, see “Practical info” and “Decision aids” tabs in Chapter 5 of source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/jmqavj.

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 5 of 8: Rehabilitation.

17. [Communication difficulties (Aphasia)]

Recommendation 40: Communication partner training should be provided to carers or family members of people with aphasia after stroke (50, 59).

Implementation tips and resources

a) When a stroke survivor is diagnosed with aphasia, clinicians should:

- Document the provisional diagnosis.
- Communicate effectively: Explain the impairment to the stroke survivor, family, carers, and healthcare team, and teach strategies to enhance communication.
- Set and implement therapy goals: Collaborate with the stroke survivor and their carers to develop a tailored intervention plan.
- Monitor progress: Regularly reassess and adjust goals and treatment plans as needed.
- Use alternative communication methods: Incorporate gestures, drawing, writing, or augmentative and alternative communication (AAC) devices where appropriate.
- Provide accessible written information: Ensure health, aphasia, and community support resources are available in an aphasia-friendly format.
- Monitor mental health: Stroke survivors with chronic aphasia should have their mood regularly assessed.
- Address environmental barriers: Improve communication access by training partners, increasing aphasia awareness, and promoting inclusive communication practices. Culturally and linguistically diverse stroke survivors may require support from trained healthcare interpreters.
- Assess impact on daily life: Consider how aphasia affects relationships, work, leisure, and overall quality of life from early recovery through long-term management.

For more details, see “Practical info” and “Decision aids” tabs in Chapter 5 of source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/jmqavj.

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 5 of 8: Rehabilitation.

18. [Nutrition and hydration (Early hydration)]

Recommendation 51: All stroke survivors should have their hydration status assessed, monitored, and managed throughout their hospital admission.

Where fluid support is required, crystalloid solution (e.g., normal saline) should be used in preference to colloid solutions (e.g., albumin) as the first option to treat or prevent dehydration (60).

Implementation tips and resources

a) Currently, there is no clear evidence on the optimal volume, duration, or route for administering parenteral

fluids in adults with acute stroke.

b) For stroke survivors who require additional hydration but are unable to swallow, fluids can be provided via:

- Intravenous (IV)
- Subcutaneous
- Enteral routes (nasogastric (NG) tube or percutaneous endoscopic gastrostomy (PEG))

Preferred method: NG tube is typically the first choice. However, some studies suggest that oro-oesophageal feeding tubes may be as effective, if not superior, to NG tubes (61). Further large-scale, high-quality studies are needed.

c) Stroke survivors are at risk of both malnutrition and dehydration. While texture-modified diets and thickened liquids are often used to reduce aspiration and choking risk, they are also associated with higher risks of malnutrition and dehydration (62, 63). Careful monitoring and individualised nutritional strategies are essential. For patients on modified diet, compliance to the recommended International Dysphagia Diet Standardisation Initiative (IDDSI) framework levels is also crucial. For more details, see "Practical info" tab in Chapter 6 of source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/LG3k0L

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 6 of 8: Managing complications.

19. [Nutrition and hydration (Early feeding)]

Recommendation 52: All patients with stroke should be screened for malnutrition at admission and on an ongoing basis (at least weekly) while in hospital (64). The screening should preferably be done by trained healthcare professionals with use of a validated nutrition screening tool.

Implementation tips and resources

a) Routine screening for malnutrition is resource intensive. When considering malnutrition screening, the tool should be validated, simple to use, and able to be performed by support staff (such as nursing staff or allied health assistants).

b) There is no universally accepted gold standard screening tool for use in stroke populations. Several validated screening tools have been used in literature such as the Malnutrition Screening Tool (MST), the Malnutrition Universal Screening Tool (MUST), the Controlling Nutritional Status (CONUT) screening tool, the Mini-Nutritional Assessment (MNS) and MNA-Short Form. There is no one measurement tool recommended over another.

For more details, see "Practical info" tab in Chapter 6 of source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/jNVXyj.

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 6 of 8: Managing complications.

20. [Nutrition and hydration (Early feeding)]

Recommendation 53: For patients with stroke whose nutrition status is poor or deteriorating, nutrition supplementation should be offered (64, 65). Nutrition supplementation can include oral nutritional supplements, food fortification strategies, small frequent meals and/or specialist dietary advice.

Implementation tips and resources

a) With a wide variety of supplements available and methods of nutrition support (for example food fortification, small frequent meals and oral sip supplements), individual preference can be catered for to maximise uptake and allow for variability.

For more details, see “Practical info” tab in Chapter 6 of source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/jNVXyj.

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 6 of 8: Managing complications.

21. [Oral hygiene]

Recommendation 56: All patients with stroke, particularly those with swallowing difficulties, should have assistance and/or education to maintain good oral and dental (including dentures) hygiene (66).

Implementation tips and resources

a) Where possible, obtain the history from the stroke survivor or family, so that a baseline of personal oral health can be taken into consideration.

For more details, see “Practical info” tab in Chapter 6 of source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/jlVP3n.

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 6 of 8: Managing complications.

22. [Oral hygiene]

Recommendation 57: Staff and carers of patients with stroke (in hospital, in residential care and home settings) should be trained in assessment and management of oral hygiene (66).

Implementation tips and resources

a) Staff and carers of stroke survivors (in hospital, in residential care and home settings) should be trained in assessment and management of oral hygiene.

For more details, see “Practical info” tab in Chapter 6 of source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/jlVP3n.

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 6 of 8: Managing complications.

23. [Falls]

Recommendation 88: For stroke survivors who are at risk of falling, multifactorial interventions in the community, including an individually prescribed exercise program and advice on safety, should be provided (67, 68).

Implementation tips and resources

a) For stroke survivors who are at risk of falling, multifactorial interventions in the community, including an individually prescribed exercise program and advice on safety, should be provided.

For more details, see “Practical info” tab in Chapter 6 of source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/jWRN8E.

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 6 of 8: Managing complications.

24. [Information and Education]

Recommendation 89: All stroke survivors and their families/carers should be offered information tailored to meet their individual needs using relevant language and communication formats (69).

Information should be provided at different stages in the recovery process (69). An approach of active engagement with stroke survivors and their families/carers should be used allowing for the provision of material, opportunities for follow-up, clarification, and reinforcement (69).

Implementation tips and resources

a) Stroke survivors and their carer/s should be informed about the way the health system works, including how and when different services are accessed. For more details, see "Practical info" tab in Chapter 7 of source guideline: https://app.magicapp.org/#/guideline/VLpK8j/section/j9074E.

b) Encourage stroke survivors to use the Stroke Buddy app (https://www.nni.com.sg/patient-care/stroke-buddy) for guidance and support. The app includes:

- Exercise & Wellness Guide – helps improve strength, mobility, and reduce stress
- Blood Pressure Tracker – monitors and records BP readings
- Medication Reminders – ensures timely medication intake
- Care Tips – provides guidance on managing stroke complications and more

c) Refer to educational materials on Stroke Hub (https://www.healthhub.sg/programmes/strokehub) for accurate and locally relevant content. These resources include:

- Stroke Booklet – essential information for stroke survivors and caregivers
- Stroke Log – a tool for tracking recovery progress
- Factsheets – key educational content to support learning for stroke survivors
- Educational videos – key educational content to support learning on stroke risk factors for stroke survivors

d) Provide information and/or refer to Stroke Support Organisations for befriending services:

- Singapore National Stroke Association: https://www.snsasg.org/
- Stroke Support Station: https://www.s3.org.sg/

Source:

i. Stroke Services Improvement Team, Ministry of Health, Singapore; National Neuroscience Institute, Singapore.

ii. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 7 of 8: Discharge planning and transfer of care.

25. [Discharge care plans]

Recommendation 90: Comprehensive discharge care plans that address the specific needs of the stroke survivor should be developed in conjunction with the stroke survivor and carer prior to discharge (70, 71).

Implementation tips and resources

a) Effective discharge planning is essential for successful community reintegration and the efficient use of hospital resources. Key considerations for discharge planning:

- Younger stroke survivors (<65 years) may require residential care post-discharge, which poses unique challenges.
- In-patient rehabilitation is ideal, but may not always be available, especially in certain geographic areas.
- Alternative discharge destinations must be carefully planned to ensure stroke survivors have appropriate accommodation and access to necessary services.

b) Discharge planning requires clear and coordinated communication among:

- Healthcare teams (e.g., hospital staff, rehabilitation specialists)
- Stroke survivors and their families/carers
- Community service providers, including general practitioners

c) Essential elements of discharge planning:

- Team meetings – To align care plans and ensure continuity.
- Family meetings – To involve carers in decision-making.
- Information & education – To provide clear guidance on post-discharge care.
- Post-discharge support – To ensure ongoing rehabilitation, medical follow-up, and access to community services.

d) A well-structured discharge plan helps optimise recovery, reduce hospital readmissions, and improve quality of life for stroke survivors. For more details, see "Practical info" tab in Chapter 7 of source guideline: https://app.magicapp.org/#/guideline/VLpK8j/section/jxyRyL.

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 7 of 8: Discharge planning and transfer of care.

26. [Carer training]

Recommendation 91: Relevant members of the interdisciplinary team should provide specific and tailored training for carers/family as needed. This training should include, as necessary, personal care techniques, communication strategies, physical handling techniques, information about ongoing prevention and other specific stroke-related problems, safe swallowing and appropriate dietary modifications, and management of behaviours and psychosocial issues (72).

Implementation tips and resources

a) Training should be personalised to meet the specific needs of stroke survivors and their families/carers. Carer training should include:

- Tailored information delivery: A combination of written materials, practical demonstrations, and hands-on practice with feedback can enhance learning.
- Daily living and rehabilitation strategies: Practical guidance on everyday activities and ongoing rehabilitation should be clearly documented for consistency among all carers.
- Emotional and psychological support: Training should include advice on coping with emotional challenges such as depression and stress management for both the stroke survivor and their carers. For more details, see "Practical info" tab in Chapter 8 of source guideline: https://app.magicapp.org/#/guideline/VLpK8j/section/noqagj.

b) Additional resources that carers might find useful include

- Caregiver support groups

  Singapore National Stroke Association: https://www.snsasg.org/

  Stroke Support Station: https://s3.org.sg/our-services/care-and-support/
- Resources from Stroke Support Station: https://s3.org.sg/useful-resources/
- Educational materials on Stroke Hub: https://www.healthhub.sg/programmes/strokehub

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 7 of 8: Discharge planning and transfer of care.

27. [Community mobility and outdoor travel]

Recommendation 94: Stroke survivors who have difficulty with outdoor mobility in the community should set individualised goals and get assistance with adaptive equipment, information and referral on to other services. Escorted walking practice may be of benefit to some individuals and if provided, should occur in a variety of community settings and environments, and may also incorporate virtual reality training that mimics community walking (73, 74).

Implementation tips and resources

a) Each stroke survivor's rehabilitation plan should include community mobility and travel training tailored to their individual needs and abilities. Practical information on local transport options/alternatives should be provided including access to bus and/or train timetables. Using tools like diaries or apps to record outings can be explored. It can also be helpful to practise public transport related activities with stroke survivor (e.g., getting on and off the bus, asking for a seat).

   For more details, see "Practical info" tab in Chapter 8 of source guideline: https://app.magicapp.org/#/guideline/6nYJxE/section/jX2mWn.

b) In Singapore, bus and train timetables can be accessed via the MyTransport app for information on train operating times, station exits, public bus services and bus arrival times (https://www.lta.gov.sg/content/ltagov/en/getting_around/public_transport/plan_your_journey.html). Stroke survivors can also be referred to the Public Bus Confidence Course (https://www.towertransit.sg/commuter/pbcc) designed to help people with mobility challenges regain their confidence to travel on public buses.

c) There are also specially designed cards and lanyards that help identify commuters with medical conditions that require a seat on public transport. The "May I Have a Seat Please" initiative by the Caring SG Commuters Committee was started to make it easier for commuters in need to ask for help. The cards are available at the Singapore National Stroke Association or directly from Caring SG Commuters (https://www.caringcommuters.gov.sg/).

Source:

i. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 8 of 8: Community participation and long-term care.

28. [Return to work]

Recommendation 96: Stroke survivors who were previously working should be asked if they wish to return to work. Where appropriate, they should be referred to return-to-work programs based in hospitals or social service agencies to receive support in optimising their physical and cognitive function. They should also be encouraged to resume work, either in a full or modified work capacity (75).

Implementation tips and resources

a) If stroke survivors are able to return to their pre-stroke job roles, they can be referred to Return-to-Work programmes available at public hospitals in Singapore to support stroke survivors in transitioning back to the workforce as required.

b) If stroke survivors need rehabilitation to return to work, they can be referred to social service agencies which runs return to work programmes:

   - ABLE (Return-to-Work programme: https://able-sg.org/our-services/return-to-work/)
   - SG Enable (Hospital-to-Work programme: https://www.enablingguide.sg/im-looking-for-disability-support/training-employment/hospital-to-work-(h2w)-programme)
   - SPD (Transition to Employment Programme: https://www.spd.org.sg/unlabel/transition-to-employment/)

   For more details, see information and resources provided on Stroke Hub: https://www.healthhub.sg/health-conditions/stroke_returning_to_work.

c) Return to work planning for stroke survivors should be done in collaboration with stroke survivors and tailored to their work and personal needs. Planning should also address any pressures they may face influencing their decision to return to work (e.g., financial concerns). Comprehensive assessments of abilities and work demands should be undertaken, along with a gradual and flexible approach to help ease the transition. Ongoing support from rehabilitation professionals and workplace education can also help to ensure stroke survivors' rights and needs are met as they reintegrate into employment. For more details, see "Practical info" tab in Chapter 8 of source guideline: https://app.magicapp.org/#/guideline/6nYJxE/section/LrPpwE.

Source:

i. Stroke Services Improvement Team, Ministry of Health, Singapore; National Neuroscience Institute, Singapore.

ii. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 8 of 8: Return to work.

29. [Support (Peer support)]

Recommendation 97: Stroke survivors and their families/carers should be given information about the availability of a local stroke support group and/or other sources of peer support before leaving hospital and when back in the community (76).

Implementation tips and resources

a) Provide information and/or refer to Stroke Support Organisations for befriending services:

- Singapore National Stroke Association: https://www.snsasg.org/
- Stroke Support Station: https://www.s3.org.sg/

b) Ensure that the information provided takes into account any special needs or abilities related to language and/or comprehension.

c) Stroke survivors and carers should have an opportunity early during inpatient rehabilitation to meet with a peer volunteer with a similar background and experiences. A peer support group could also be provided or recommended post-discharge. Telephone contact with a peer is another alternative post-discharge. Note that not all stroke survivors or carers will want a peer support visit or to attend a support group, however, it can be helpful to offer these supports to people at different stages, as peoples' circumstances, and their desire for involvement, can change. For more details, see "Practical info" tab in Chapter 8 of source guideline: https://app.magicapp.org/#/guideline/6nYJxE/section/EvbxGE.

Sources:

i. Stroke Services Improvement Team, Ministry of Health, Singapore; National Neuroscience Institute, Singapore.

ii. Australian and New Zealand Living Clinical Guidelines for Stroke Management - Chapter 8 of 8: Community participation and long-term care.

30. [Support (Carer support)]

Recommendation 98: Carers of stroke survivors should be provided with tailored information and support during all stages of the recovery process. This support includes (but is not limited to) information provision and opportunities to talk with relevant health professionals about the stroke, stroke team members and their roles, test or assessment results, intervention plans, discharge planning, community services and appropriate contact details. Support and information provision for carers should occur prior to discharge from hospital and/or in the home and can be delivered face-to-face, via telephone or computer (77, 78).

Implementation tips and resources

a) Refer to **educational materials on Stroke Hub** (https://www.healthhub.sg/programmes/strokehub) for accurate and locally relevant content. These resources include:

   a. Stroke Booklet – essential information for stroke survivors and caregivers

   b. Stroke Log – a tool for tracking recovery progress

   c. Factsheets – key educational content to support learning for stroke survivors

   d. Educational videos – key educational content to support learning on stroke risk factors for stroke survivors

b) Provide information and/or refer to Stroke Support Organisations for carer support:

   a.Singapore National Stroke Association: https://www.snsasg.org/

   b.Stroke Support Station: https://www.s3.org.sg/

c) Ensure that the information provided takes into account any special needs or abilities related to language and/or comprehension.

Sources:

i. Stroke Services Improvement Team, Ministry of Health, Singapore; National Neuroscience Institute, Singapore.

Conclusion

This implementation toolkit brings together clear, actionable recommendations for stroke rehabilitation, practical guidance on using data to identify gaps and monitor improvements, and a curated set of tips and resources for successfully launching and sustaining quality improvement projects. By focusing on evidence-based practices and leveraging on data, stroke rehabilitation teams can systematically enhance care delivery, close the gap between guidelines and real-world practice, and make meaningful strides in patient outcomes.

As the quality improvement journey continues, remember that each effort, no matter how small, contributes to better care, empowered teams, and improved lives for stroke survivors. With commitment, collaboration, and a data-driven mindset, transformative change is within reach. Together, continued progress and innovation will ensure that every stroke survivor receives the best possible rehabilitation and support for recovery to live their best lives after stroke.

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	Name	Organisation	Role	Contribution
Advisors	Adjunct Professor Susan Niam	Chief Allied Health Officer's Office, Ministry of Health	Chief Allied Heath Officer; Advisor for CRTW CORE team	Provided advice and consultation based on expertise and understanding of Singapore's rehabilitation landscape.
	Associate Professor Ng Yee Sien	1. Ministry of Health 2. Part Time Professional Scheme, Ministry of Health	1. Advisor for CRTW CORE team 2. Consultant in Rehabilitation	Provided advice and consultation based on expertise and understanding of Singapore's rehabilitation landscape.
	Associate Professor Elizabeth Lynch	Caring Futures Institute, College of Nursing and Health Sciences, Flinders University	Matthew Flinders Research Fellow	Provided advice and consultation based on expertise in stroke guidelines and implementation of stroke guideline recommendations.
	Dr Janine Margarita Dizon	Aged Care Research & Industry Innovation Australia (ARIIA), Flinders University	Research Fellow	Provided advice and consultation based on expertise in guidelines development and adaptation.
Guideline committee members	Associate Professor Kwah Li Khim	1. Chief Allied Health Officer's Office, Office of the Director General of Health Singapore 2. Health and Social Sciences Cluster, Singapore Institute of Technology	1. Co-Lead of CRTW sub-team 1. Clinical Practice Guidelines, Senior Principal Project Administrator 2. Director of Programmes, Physiotherapist	Developed methods, conducted literature reviews, appraised local evidence, rated the strength of most recommendations and input into the wording, chaired all meetings and consultations, and wrote first draft of the guidelines.
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	Name	Organisation	Role	Contribution
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	Ms Goh Shi Min	Stroke Support Station (S3)	Principal Physiotherapist	Rated the strength of most recommendations and input into the wording (across 4–6 meetings), and reviewed final draft of guidelines and implementation toolkit.
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	Name	Organisation	Role	Contribution
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	Ms Shirlene Leow	Singapore General Hospital	Senior Pharmacist	Rated the strength of some recommendations (in area of expertise) and input into the wording (across 1–3 meetings), and reviewed

	Name	Organisation	Role	Contribution
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Advisors	Adjunct Professor Susan Niam	Chief Allied Health Officer's Office, Ministry of Health	Chief Allied Heath Officer; Advisor for CRTW CORE team	Provided advice and consultation based on expertise and understanding of Singapore's rehabilitation landscape.
	Associate Professor Ng Yee Sien	1. Ministry of Health 2. Part Time Professional Scheme, Ministry of Health	1. Advisor for CRTW CORE team 2. Consultant in Rehabilitation	Provided advice and consultation based on expertise and understanding of Singapore's rehabilitation landscape.
	Associate Professor Elizabeth Lynch	Caring Futures Institute, College of Nursing and Health Sciences, Flinders University	Matthew Flinders Research Fellow	Provided advice and consultation based on expertise in stroke guidelines and implementation of stroke guideline recommendations.
	Dr Janine Margarita Dizon	Aged Care Research & Industry Innovation Australia (ARIIA), Flinders University	Research Fellow	Provided advice and consultation based on expertise in guidelines development and adaptation.
Secretariat	Ms Jamie Kok Jian Min	Chief Allied Health Officer's Office, Office of the Director General of Health Singapore	Manager	Co-ordinated and supported meetings, summarised meeting minutes, and collated all feedback and responses.
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	Ms Joanne Lam	Chief Allied Health Officer's Office, Ministry of Health Singapore	Manager	Co-ordinated and supported meetings, summarised meeting minutes, and collated all feedback and responses.

	Name	Organisation	Role	Contribution
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- MOH Frailty Workgroup
- MOH Divisions
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- Chief Allied Health Officer's Office (CAHOO)
- Allied Health Professional (AHP) Panels – Chairs, Co-Chairs and Members; Panels include
  a) Physiotherapy
  b) Occupational Therapy
  c) Speech Therapy
  d) Dietetics and Nutrition
  e) Medical Social Workers
  f) Psychology
- Ministry of Social and Family Development
- Community Rehabilitation Transformation Workgroup (CRTW)
- Guideline committee members/CRTW sub-team 1 members comprising of neurologists, rehabilitation physicians, dentist, nurses, pharmacists, rehabilitation heads and allied health professionals including physiotherapists, occupational therapists, speech therapists, dieticians, social workers, and psychologists
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  - Chapter of Intensivists
  - Chapter of Pain Medicine Physicians
  - College of Physicians, Singapore
- Chapter of General Physicians
- Chapter of Neurologists
- Chapter of Rehabilitation Physicians
  - College of Public Health and Occupational Physicians
  - College of Psychiatrists
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Appendices

Appendix number and title of document	Links
Appendix 1. One Rehab Outcomes Booklet	Link
Appendix 2. National One Rehab Framework	Link
Appendix 3. Site Self-Audit Tool – Survey template	Link
Appendix 4. Site Self-Audit Tool – Case note review template	Link
Appendix 5. Post-Stroke Checklist	Link
Appendix 6. Circuit Class Manual	Link
Appendix 7. Sample of Sitting Balance Exercises	Link
Appendix 8. Sample of Sit to Stand Exercises	Link
Appendix 9. Sample of Standing Exercises	Link

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