SINGAPORE STROKE REHABILITATION GUIDELINE

An Adaptation Of The Australian And New Zealand Living Clinical Guidelines For Stroke Management

MINISTRY OF HEALTH
SINGAPORE

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1. Foreword

Stroke remains one of the leading causes of disability in Singapore, with far-reaching effects on stroke survivors, their families and our healthcare system. Rehabilitation stands at the heart of the recovery journey, helping stroke survivors to restore their independence and dignity, and live well within their communities. Singapore's unique healthcare landscape, multicultural context and diverse service delivery models necessitate evidence-based guidelines tailored to our local context to optimise rehabilitation outcomes for our population.

The Singapore Stroke Rehabilitation Guideline mark an important milestone in our efforts to strengthen stroke rehabilitation care nationally. Developed under the National One-Rehabilitation Framework by the Community Rehabilitation Transformation Workgroup, and using the internationally recognised GRADE methodology endorsed by the Agency for Care Effectiveness (ACE), the guideline is Singapore's first comprehensive, evidence-based stroke rehabilitation guideline that are designed in consultation with stroke survivors, caregivers, and a multidisciplinary team of healthcare professionals.

This guideline serve not merely as a reference, but as a shared foundation for reflection on current practices, opportunities for improvement, and greater consistency in care across the stroke rehabilitation continuum. Their adoption supports the advancement of a more integrated, person-centred, and sustainable rehabilitation ecosystem that delivers quality outcomes for all Singaporeans affected by stroke. I commend all who have worked with dedication to bring this important document to fruition. All healthcare professionals and partners across sectors should aim to adopt and apply this guideline, so that together we may build a sustainable and person-centred rehabilitation system that empowers stroke survivors to live meaningful lives.

Professor Kenneth Mak
Director-General of Health
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2. Executive Summary

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). In line with recommendations from the Guidelines International Network, we used the RIGHT-Ad@pt Checklist (2) to guide our reporting, and the ADAPTE framework (3) to guide our methods. A summary of the recommendations are presented below; the GRADE (**G**rading of **R**ecommendations **A**ssessment, **D**evelopment and **E**valuation) approach (4) has been used to ensure that the strength of recommendations has been made in consideration of 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”. There was a total of 98 rehabilitation-related recommendations extracted from Chapters 4 to 8 of the source guideline. For further details of each recommendation, please refer to Section 6. Guideline Recommendations. In the context of guideline recommendations, **adopted recommendations** refer to source guideline recommendations that are taken as they are in terms of strength and wording, while **adapted recommendations** refer to source guideline recommendations that have been modified (e.g., either in terms of wording or strength of recommendation) to make them more applicable in the new setting/context (5). (There is also ***de novo* recommendations** where recommendations are developed from scratch (5), but we did not have these recommendations in the Singapore Stroke Rehabilitation Guideline.)

A summary of the 98 stroke rehabilitation recommendations, categorised in terms of relevant chapters of the source guideline and strength of recommendations, is presented in Figure 1 and Table 1 in subsequent pages.

Figure 1. Summary chart of the Singapore Stroke Rehabilitation Guideline recommendations (n = 98), categorised as per chapters in source guideline and strength of recommendations

Singapore Stroke Rehabilitation Guideline Recommendations

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Key:
Each number denotes recommendation reference number and strength classifications

Legends:
Green text underlined – Strong For Recommendations
Green text – Weak For Recommendations
Red text underlined – Strong Against Recommendations
Red text –Weak Against Recommendations

Table 1. Summary table of the Singapore Stroke Rehabilitation Guideline recommendations (n = 98) categorised as per chapters in source guideline and strength of recommendations

6.1 Secondary prevention – Lifestyle modifications

Strong For	**Recommendation 1: [Adapted]** 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.

6.2 Rehabilitation

Strong For	**Recommendation 3: [Adopted]** 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).
	Recommendation 5: [Adopted] • 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.
	Recommendation 7: [Adapted] Where appropriate home-based coordinated stroke services are available, early supported discharge services should be offered to stroke survivors with mild to moderate disability.
	Recommendation 9: [Adopted] • 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.
	Recommendation 10: [Adopted] For stroke survivors with reduced strength in their arms or legs, progressive resistance training should be provided to improve strength.
	Recommendation 14: [Adopted] For stroke survivors, rehabilitation should include individually-tailored exercise interventions to improve cardiorespiratory fitness.
	Recommendation 15: [Adopted] For stroke survivors who have difficulty sitting, practising reaching beyond arm's length while sitting with supervision/assistance should be undertaken.

Strong For

Recommendation 16: [Adopted]

For stroke survivors who have difficulty in standing up from a chair, practice of standing up should be undertaken.

Recommendation 17: [Adopted]

For stroke survivors who have difficulty with standing, activities that challenge balance should be provided.

Recommendation 19: [Adopted]

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

Recommendation 22: [Adopted]

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.

Recommendation 30: [Adopted]

- 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.

Recommendation 35: [Adopted]

For stroke survivors with aphasia, early aphasia therapy, starting within the first 4 weeks post stroke should be provided to maximise language recovery.

Recommendation 38: [Adopted]

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.

Recommendation 39: [Adopted]

Communication partner training should be provided to health professionals or volunteers who interact with people with aphasia after stroke.

Recommendation 40: [Adapted]

Communication partner training should be provided to carers or family members of people with aphasia after stroke.

Weak For

Recommendation 4: [Adopted]

For patients with mild and moderate stroke, frequent, short sessions of out-of-bed activity should be provided, but the optimal timing within the 48-hour post-stroke time period is unclear.

Weak For

Recommendation 6: [Adopted]

A minimum of three hours a day of scheduled therapy (occupational therapy and physiotherapy) is recommended, ensuring at least two hours of active task practice occurs during this time.

Recommendation 8: [Adapted]

Home-based rehabilitation may be considered as a preferred model for delivering rehabilitation in the community. Where home rehabilitation is unavailable, stroke survivors requiring rehabilitation should receive centre-based care.

Recommendation 11: [Adopted]

- For stroke survivors with arm weakness, repetitive practice using assistive technology, constraint induced movement therapy (CIMT), and robotics may be used to improve arm strength.
- For stroke survivors with leg weakness, task specific training, repetitive practice using cycling, or electrical stimulation may be used to improve leg strength.

Recommendation 12: [Adopted]

For stroke survivors with reduced strength in their arms or legs (particularly for those with less than antigravity strength), electrical stimulation may be used.

Recommendation 13: [Adapted]

For stroke survivors with sensory loss of the upper limb, sensory-specific training may be provided to improve sensation.

Recommendation 18: [Adopted]

For stroke survivors who have difficulty with standing, one or more of the following interventions may be used in addition to practising tasks that challenge balance:

- Virtual reality training, which may include treadmill training, motion capture or force sensing devices (e.g. Wii Balance Boards)
- Visual or auditory feedback (e.g. force platform biofeedback)
- Electromechanically assisted gait or standing training

Recommendation 20: [Adopted]

For stroke survivors with difficulty walking, one or more of the following interventions may be used in addition to those listed above:

- Virtual reality training
- Electromechanically assisted gait training
- Biofeedback
- Cueing of cadence
- Electrical stimulation

Recommendation 21: [Adopted]

For stroke survivors, individually fitted lower limb orthoses may be used to minimise limitations in walking ability. Improvement in walking will only occur while the orthosis is being worn.

Recommendation 23: [Adopted]

For stroke survivors with at least some voluntary movement of the arm and hand, repetitive task-specific training may be used to improve arm and hand function.

Weak For

Recommendation 24: [Adopted]

For stroke survivors with mild to severe arm weakness, mechanically assisted arm training (e.g. robotics) may be used to improve upper limb function.

Recommendation 25: [Adopted]

Virtual reality and interactive games may be used to improve upper limb function.

Recommendation 26: [Adopted]

For stroke survivors with mild to severe arm or hand weakness, electrical stimulation in conjunction with motor training may be used to improve upper limb function.

Recommendation 27: [Adopted]

For stroke survivors with mild to moderate weakness of their arm, mental practice in conjunction with active motor training may be used to improve arm function.

Recommendation 28: [Adopted]

For stroke survivors with mild to moderate weakness, mirror therapy may be used as an adjunct to routine therapy to improve arm function after stroke.

Recommendation 31: [Adopted]

For stroke survivors, virtual reality technology may be used to improve activities of daily living in addition to usual therapy.

Recommendation 36: [Adopted]

For stroke survivors in the acute phase (up to six weeks post stroke onset), language therapy sessions (direct time on task) ranging between 30-45 minutes, two-three days per week may be provided from stroke onset to week 6 post stroke, with additional therapy sessions during this acute phase being unlikely to yield any further benefit to language recovery.

Recommendation 37: [Adopted]

For stroke survivors with chronic aphasia (>6 months post stroke onset), intensive aphasia therapy (at least 10 hours/week of therapist led, individual or group therapy for 3 weeks, together with 5 hours or more, per week of self-managed training) may be used to improve aphasia.

Recommendation 41: [Adopted]

For stroke survivors with apraxia of speech, individually tailored interventions incorporating articulatory-kinematic and rate/rhythm approaches may be used. In addition, therapy may incorporate:

- Use of modelling and visual cueing.
- Principles of motor learning to structure practice sessions.
- Prompts for Restructuring Oral Muscular Phonetic Targets (PROMPT) therapy.
- Self-administered computer programs that use multimodal sensory stimulation.
- For functional activities, the use of augmentative and alternative communication modalities such as gesture or speech-generating devices is recommended.

Recommendation 42: [Adopted]

For stroke survivors with dysarthria, interventions tailored to the individual which include speech production tasks that target connected speech may be provided, which may include for example strategies to reduce speaking rate, emphasise articulatory placement or increased loudness (e.g., LSVT®LOUD).

Weak For

Recommendation 43: [Adopted]

For stroke survivors with attention and concentration deficits, cognitive rehabilitation may be used.

Recommendation 44: [Adopted]

For stroke survivors with attention and concentration deficits, exercise training and leisure activities may be provided.

Recommendation 45: [Adopted]

For stroke survivors with memory deficits, cognitive rehabilitation may be used to improve memory function in the short term. Memory rehabilitation strategies may include internal (mental) strategies (e.g. association, mental rehearsal, rhymes) and external compensatory aids (e.g. notebooks, diaries, calendars, alarms, audio recordings, photos, mobile phones).

Recommendation 46: [Adopted]

For stroke survivors with cognitive impairment, meta-cognitive strategy and/or cognitive training may be provided.

Recommendation 47: [Adopted]

For stroke survivors with limb apraxia, interventions such as gesture training, strategy training and/or errorless learning may be provided.

Recommendation 48: [Adopted]

For stroke survivors with symptoms of unilateral neglect, cognitive rehabilitation (e.g. computerised scanning training, pen and paper tasks, visual scanning training, eye patching, mental practice) may be provided.

Recommendation 49: [Adopted]

For stroke survivors with symptoms of unilateral neglect, mirror therapy may be used to improve arm function and ADL performance.

Recommendation 50: [Adopted]

Telehealth services may be used as an alternative approach to delivering rehabilitation, especially for patients who cannot access specialist rehabilitation in the community. It may also be used as an adjunct to in-person therapy. Delivering of specific interventions via telehealth should only be considered for those that have demonstrated benefits.

Strong Against

Recommendation 2: [Adapted]

For stroke survivors, starting intensive out-of-bed activities within 24 hours of stroke onset is not recommended.

Recommendation 29: [Adapted]

Hand and wrist orthoses (splints) should not be used as part of usual care as they have no effect on function, pain or range of movement.

Recommendation 33: [Adopted]

Administration of amphetamines to improve activities of daily living is not recommended.

Weak Against

Recommendation 32: [Adopted]

Acupuncture is not routinely recommended to improve activities of daily living.

Recommendation 34: [Adopted]

Selective serotonin reuptake inhibitors should not be used to reduce disability.

6.3 Managing Complications

Strong For

Recommendation 51: [Adapted]

- 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.

Recommendation 52: [Adapted]

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.

Recommendation 53: [Adapted]

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.

Recommendation 56: [Adopted]

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

Recommendation 57: [Adopted]

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.

Recommendation 88: [Adapted]

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.

Weak For

Recommendation 55: [Adapted]

- For patients with stroke who do not recover a functional swallow, nasogastric tube feeding is the preferred method of feeding in the short term.
- For patients with stroke, the use of intermittent bolus feeding is usually recommended in Singapore. The use of continuous pump feeding may be recommended based on clinical indications.

Recommendation 58: [Adopted]

For patients with stroke, chlorhexidine in combination with oral hygiene instruction, and/or assisted brushing may be used to decrease dental plaque and gingiva bleeding. Caution should be taken, however, for patients with dysphagia.

Weak For

Recommendation 59: [Adopted]

For stroke survivors with upper limb spasticity, Botulinum Toxin A in addition to rehabilitation therapy may be used to reduce spasticity, but is unlikely to improve activity or motor function.

Recommendation 60: [Adopted]

For stroke survivors with lower limb spasticity, Botulinum Toxin A in addition to rehabilitation therapy may be used to reduce spasticity but is unlikely to improve motor function or walking.

Recommendation 62: [Adopted]

For stroke survivors with spasticity, adjunct therapies to Botulinum Toxin A, such as electrical stimulation, casting and taping, may be used.

Recommendation 65: [Adopted]

For stroke survivors at risk of shoulder subluxation, electrical stimulation may be used in the first six months after stroke to prevent or reduce subluxation.

Recommendation 67: [Adopted]

For stroke survivors with shoulder pain, shoulder strapping may be used to reduce pain.

Recommendation 68: [Adopted]

For stroke survivors with shoulder pain, electrical stimulation may be used to manage pain.

Recommendation 69: [Adopted]

For stroke survivors with shoulder pain, shoulder injections (either sub acromial steroid injections for patients with rotator cuff syndrome, or methylprednisolone and bupivacaine for suprascapular nerve block) may be used to reduce pain.

Recommendation 70: [Adopted]

For stroke survivors with shoulder pain and upper limb spasticity, Botulinum Toxin A may be used to reduce pain.

Recommendation 71: [Adopted]

For stroke survivors with shoulder pain, acupuncture in addition to comprehensive rehabilitation may be used to reduce pain.

Recommendation 72: [Adopted]

- All stroke survivors with suspected urinary continence difficulties should be assessed by trained personnel using a structured functional assessment.
- For stroke survivors, a portable bladder ultrasound scan should be used to assist in diagnosis and management of urinary incontinence.

Recommendation 73: [Adapted]

- Stroke survivors in hospital with confirmed continence difficulties, should have a structured continence management plan formulated, documented, implemented and monitored.
- If incontinence persists the stroke survivor should be re-assessed and referred for specialist review once in the community.

Weak For

Recommendation 74: [Adapted]

For stroke survivors with urge incontinence:

- a prompted or scheduled voiding regime program/bladder retraining can be trialled;
- anticholinergic drugs may be considered;
- if continence is unachievable, containment aids can assist with social continence.

Recommendation 75: [Adopted]

- All stroke survivors with suspected faecal continence difficulties should be assessed by trained personnel using a structured functional assessment.
- For stroke survivors with constipation or faecal incontinence, a full assessment (including a rectal examination) should be carried out and appropriate management of constipation, faecal overflow or bowel incontinence established and targeted education provided.

Recommendation 76: [Adopted]

For stroke survivors with bowel dysfunction, bowel habit retraining using type and timing of diet and exploiting the gastro-colic reflex should be used.

Recommendation 77: [Adapted]

For stroke survivors with emotionalism/pathological emotional expression, specialist assessment for diagnostic clarification is recommended, and antidepressant medication such as selective serotonin reuptake inhibitors (SSRIs) or tricyclic antidepressants may be used.

Recommendation 78: [Adapted]

For stroke survivors, antidepressant medication may be used to prevent depression if the benefits of the medication outweigh the risk (e.g., seizures, fractures) and in the absence of contraindications. This can be considered for some stroke survivors at high risk of developing depression (e.g., history of depression, previous stroke, more severe stroke/disability and those with aphasia), or when other preventative non-pharmacological approaches do not work, or are not appropriate.

Recommendation 79: [Adopted]

For stroke survivors, psychological therapies (e.g. problem solving, motivational interviewing) may be used to prevent depression.

Recommendation 80: [Adopted]

For stroke survivors with depression, antidepressants, which includes SSRIs should be considered. There is no clear evidence that particular antidepressants produce greater effects than others and will vary according to the benefit and risk profile of the individual.

Recommendation 81: [Adapted]

For stroke survivors with depression or depressive symptoms, psychological therapy may be considered.

Recommendation 82: [Adopted]

For stroke survivors with depression or depressive symptoms, structured exercise programs, particularly resistance training or programs of high intensity, may be used.

Recommendation 83: [Adapted]

For stroke survivors with depression, non-invasive brain stimulation (repetitive transcranial magnetic stimulation [rTMS]) may be considered as an alternative where services are available, if pharmacotherapy is contraindicated, not tolerated, or failed.

Weak For

Recommendation 84: [Adopted]

For stroke survivors with depression or depressive symptoms, acupuncture may be used.

Recommendation 85: [Adapted]

For stroke survivors who are immobile after an acute ischaemic stroke, low molecular weight heparin in prophylactic doses may be used if the benefits of deep venous thrombosis prophylaxis outweigh the risks and in the absence of contraindications.

Recommendation 86: [Adapted]

For stroke survivors who are immobile after an acute stroke, intermittent pneumatic compression may be used, either as an alternative to low molecular weight heparin or in those with a contraindication to pharmacological deep venous thrombosis prophylaxis (including patients with intracerebral haemorrhage or within 24 hours of thrombolysis).

Strong Against

Recommendation 64: [Adopted]

For stroke survivors at risk of developing contracture who are receiving comprehensive, active therapy the routine use of splints or stretch of the arm or leg muscles is not recommended.

Recommendation 87: [Adopted]

Antithrombotic stockings are not recommended for the prevention of deep venous thrombosis or pulmonary embolism post stroke.

Weak Against

Recommendation 54: [Adopted]

For patients with stroke who are adequately nourished, routine oral nutrition supplements are not recommended.

Recommendation 61: [Adopted]

For stroke survivors with spasticity, acupuncture should not be used for treatment of spasticity in routine practice other than as part of a research study.

Recommendation 63: [Adopted]

For stroke survivors, the routine use of stretch to reduce spasticity is not recommended.

Recommendation 66: [Adopted]

For stroke survivors at risk of shoulder subluxation, shoulder strapping is not recommended to prevent or reduce subluxation.

6.4 Discharge Planning and Transfer of Care

Strong For

Recommendation 89: [Adopted]

- 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.

Strong For

Recommendation 90: [Adopted]

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.

Recommendation 91: [Adapted]

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.

6.5 Community Participation and Long-Term Care

Strong For

Recommendation 94: [Adapted]

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.

Recommendation 96: [Adapted]

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.

Recommendation 97: [Adapted]

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.

Recommendation 98: [Adopted]

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.

Weak For

Recommendation 92: [Adapted]

- Stroke survivors who are cognitively able and their carers should be made aware of the availability of generic self-management programs before discharge from hospital and be supported to access such programs once they have returned to the community.
- Stroke-specific self-management programs may be provided for those who require more specialised programs.
- A collaboratively developed self-management care plan between stroke survivors, caregivers and healthcare professionals may be used to harness and optimise self-management skills.

Weak For

Recommendation 93: [Adopted]

For stroke survivors needing driving rehabilitation, driving simulation may be used. Health professionals using driving simulation need to receive training and education to deliver intervention effectively and appropriately, and mitigate driving simulator sickness.

Recommendation 95: [Adapted]

For stroke survivors, targeted occupational therapy or other programs including leisure therapy may be used to increase participation in leisure activities.

3. List of Tables and Figures

4. Introduction

In Singapore, cardiovascular diseases including stroke are the fourth leading cause of death (5.6% of all deaths) (6), and the biggest contributor to the combined burden of early death and disability (14.2% of total disabilty-adjusted life years (DALYs) (7). From 1990 to 2017, the age-standardised burden of stroke in Singapore declined by over 60% (i.e., 1,672 to 568 age-standardised DALYs per 100,000), indicating some success in preventing and treating cardiovascular diseases. However, cardiovascular diseases including stroke remain the leading cause of DALYs in Singapore due to the population growing and becoming older (7).

Stroke rehabilitation is a large part of the recovery process and commences once the person is medically stable. The Singapore Ministry of Health clinical practice guideline on stroke and transient ischemic attacks was first published in 2011 (8). Of the 40 recommendations, 8 were focused on stroke rehabilitation. Since then, a large volume of stroke rehabilitation research has been published. We now know that starting intensive out-of-bed activities within 24 hours of stroke is harmful and can lead to increased odds of death and disability (9–11), progressive resistance training (defined as a load of 8-12 repetition maximum for at least two sets increased in a progressive manner) improves strength in people with reduced strength in their arms or legs post-stroke (12), and that acupuncture in addition to comprehensive rehabilitation may be used to reduce pain in stroke survivors with shoulder pain (13). In a recent systematic review and synthesis of global stroke guideline on behalf of the World Stroke Organisation, 63 recommendations were focused on stroke rehabilitation (14). These data demonstrate the growth in volume of stroke rehabilitation research, and a need to update stroke rehabilitation recommendations.

Additionally, the Singapore Stroke Rehabilitation Guideline was a system-level solution that came out of the work of the Community Rehabilitation Transformation Workgroup (CRTW). Under the National One Rehabilitation Steering Committee, the CRTW was formed in 2020 to recommend and implement effective rehabilitation care practices and processes to ensure consistent care standards in the community. Using Experience-Based Co-Design (EBCD), the CRTW initiated a national quality improvement project in September 2021. The project, spanning 2.6 years, involved over 80 clients/caregivers and 250 staff from 20 day rehablitation centres (15). The EBCD approach comprised of eight stages:

1) site observations,
2) interviews with clients, caregivers and staff,
3) development of trigger films,
4) feedback event with clients and caregivers,
5) feedback event with staff,
6) joint workshop with clients, caregivers and staff,
7) co-design groups, and
8) celebration event (16).

We supplemented the approach with clinical and organisational surveys, and case note reviews to capture perceived and actual delivery of clinical care for stroke, frailty and hip fracture.

Four main themes emerged from our work: i. best practice care, ii. person-centred care, iii. allied health professional needs, and iv. service design. The project findings revealed that person-centred care was desired but sometimes hindered by scheduling and turnover issues. Care partially aligned with international guidelines, and staff interviews indicated potential for more direct client care and less administration. Three co-design workgroups were formed to develop stroke rehabiltiation clinical practice guideline, a workplace learning framework (17), and community rehabilitation recommendations on referral processing time, appropriate staffing ratios in centres and a service dashboard for agencies to monitor capacity for community service providers.

4.1 Aim

The aim of the Singapore Stroke Rehabilitation Guideline is to provide best practice recommendations that can be used to guide clinicians in making decisions regarding the best rehabilitation care for clients across the continuum of their stroke recovery. Our vision is that all clients with stroke in Singapore would receive best rehabiltiation care* regardless of where they live and where they receive their stroke rehabiltiation in Singapore. The document is intended to be a guide to best practice and we encourage clinicians to use the document in conjunction with clinician expertise and patients' beliefs, values and expectations.

**Best rehabilitation care: defined as care that is evidence-based, person-centred and of value to clients and caregivers in Singapore*

4.2 Source guideline and scope

We refer to the Australian and New Zealand Living Clinical Guidelines for Stroke Management (1) as the "source guideline" in this document. Permission was sought from the Stroke Foundation to adapt the guideline. Specifically, the scope of the Singapore Stroke Rehabilitation Guideline cover the following chapters of the Australian and New Zealand Living Clinical Guidelines for Stroke Management (1):

- Chapter 4. Secondary prevention – Lifestyle modifications
- Chapter 5. Rehabilitation
- Chapter 6. Managing complications
- Chapter 7. Discharge planning and transfer of care
- Chapter 8. Community participation and long-term care

It does not cover the following chapters and topics:

- Chapter 1. Pre-hospital care
- Chapter 2. Early assessment and diagnosis
- Chapter 3. Acute medical and surgical management
- Chapter 4. Secondary prevention – Medication adherence and Surgical intervention
- Subarachnoid haemorrhage
- Childhood stroke
- Primary prevention of Stroke

4.3 Target population, end-users and settings

The Singapore Stroke Rehabilitation Guideline cover care for people with stroke throughout the phases of their recovery. It is intended for use by healthcare professionals, administrators, funders and policy makers who plan, organise and deliver care to people with stroke in the various rehabilitation settings in Singapore. These settings include acute hospitals, community hospitals, day rehabilitation centres, home-based therapy, outpatient clinics and nursing homes.

5. Methods

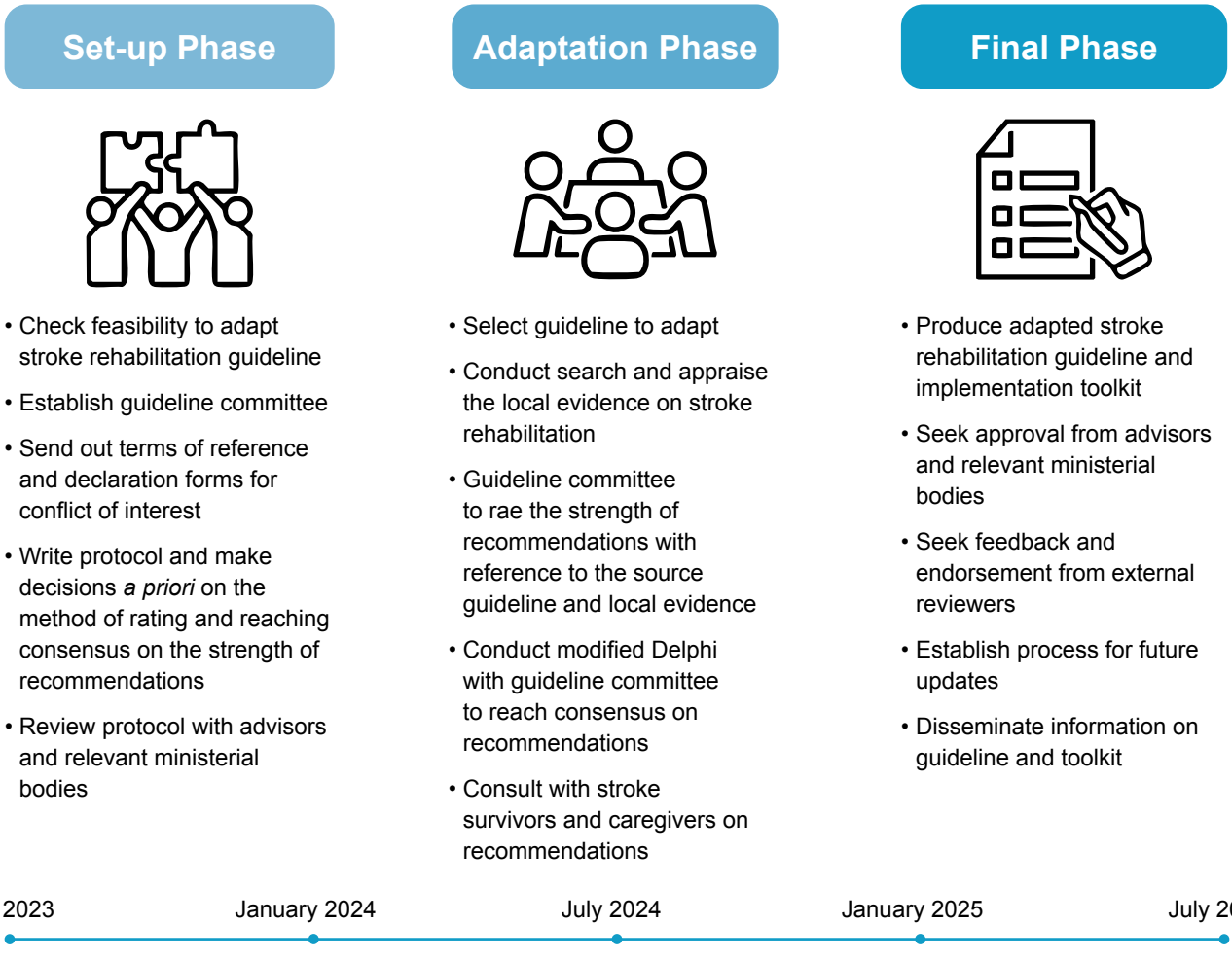
According to the World Health Organisation (WHO), guidelines are systematically developed evidence-based recommendations, or statements that are designed to help end-users make informed decisions on whether to undertake specific care actions such as clinical interventions, diagnostic tests or public health measures with the goal of achieving the best individual or collective health outcomes (https://www.who.int/publications/who-guidelines) (18). However, high quality guidelines are costly to develop and require substantial resources, time and expertise to execute (19). Adaptation of high quality guidelines is a good alternative solution.

Guideline adaptation is "the systematic approach to the endorsement and/or modification of a guideline produced in one cultural and organisational setting for application in a different context.", as defined by the Guidelines International Network (G-I-N) (20). Adaptation of guidelines is necessary as interventions recommended in high quality guidelines in one health setting might be impossible to implement in another health setting due to local contextual factors such as the cost of healthcare, availability and accessibility of healthcare resources and the stakeholders' cultural and ethical values (19, 21, 22). Adaptation of guideline will also limit unnecessary duplication if a relevant high quality guideline is already available (19).

5.1 Adaptation framework and process

In line with recommendations from the Guidelines International Network, we used the RIGHT-Ad@pt Checklist (2) to guide our reporting, and the ADAPTE framework (3) to guide our methods. The ADAPTE process consists of three main phases (3): **i. Set-up phase, ii. Adaptation phase, and iii. Final phase**. Details are provided in Figure 2 and subsequent text.

Figure 2. Summary of the ADAPTE process, associated tasks at each phase and timeline of project



i. Set-up phase

- The leads of CRTW sub-team 1 (KLK and ST) led the project with help from the secretariat team from the Ministry of Health Chief Allied Health Officer's Office (MOH CAHOO). The leads were tasked to develop the adapted guideline which included writing up the protocol, conducting literature reviews, appraising the local evidence, chairing all meetings and discussions, and writing up the first draft of the guideline.
- To form the guideline committee, members were selected based on their expertise in clinical knowledge and implementation processes, and ensured diverse representation from the academic institution (Singapore Institute of Techology), hospitals in the three healthcare clusters and day rehabilitation centres in the community. Guideline committee members included a multidisciplinary team of doctors, dentist, nurses, pharmacists and allied health professionals (including physiotherapists, occupational therapists, speech and language therapists, psychologists, dieticians and social workers). Names, organisations, roles and contributions of each committee member are listed in Section 8 Acknowledgements.
- Prior to commencement of the project, all members were sent an invitation letter that contained the terms of reference, and a declaration form for conflict of interest (Appendix 9.1. Declaration form for conflict of interest). The first meeting provided background information regarding the project, the guideline adaptation plan, and introduced the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach as the systematic and recommended approach used by the source guideline to rate the certainty/quality of evidence, and determine the strength of recommendations (4). The same approach was used in our guideline adaptation. Time was given during the first meeting for guideline committee members to ask questions and do a practice run on the strength rating of a recommedation via a Qualtrics link. The following resources were shared with guideline committee members as an introduction to the GRADE approach (1, 4, 23). Further details on the GRADE approach are provided in Appendix 9.2 GRADE approach.
- The following decisions on the method of rating and reaching consensus on a guideline recommendation were made a priori with the advisors:
  - Guideline committee members were allowed to select and rate the guideline recommendations that they were confident with in terms of knowledge/clinical expertise. This is due to the diversity in the stroke rehabilitation recommendations and the guideline committee. For example, a physiotherapist might not feel as confident or have the expertise to rate guideline recommendations pertaining to speech and language therapy and vice versa.
  - A cut-off of 80% agreement is required to determine consensus on the strength of a recommendation. This means that if only 16 members chose to rate a particular guideline recommendation, at least 13 members must have chosen a specific strength (e.g., "Weak For") for consensus to have been reached on a recommendation.
  - If consensus was not reached within the first two rounds of rating and discussion for a specific recommendation, a decision was to be made by the leads of the CRTW sub-team 1, with a preference to go with the decision of the majority (even if it was less than 80%). Stroke survivors and caregivers were also consulted on these recommendations that did not reach 80% consensus.
- The guideline adaptation protocol was subsequently presented to advisors and relevant ministerial bodies including the MOH Frailty Workgroups, MOH Healthcare Professional Group (HPG)/Agency for Care Effectiveness (ACE).

ii. Adaptation phase

- Our source guideline to adapt was the Australian and New Zealand Living Clinical Guidelines for Stroke Management (https://informme.org.au/guidelines/living-clinical-guidelines-for-stroke-management) (1) due to the following three reasons:

  a) High quality - Source guideline is one of three high quality guideline scoring > 75% across all domains of AGREE-II in a systematic review of clinical practice guideline on rehabilitation after stroke and other acquired brain injuries (24);

  b) Living guideline - Source guideline is a living guideline which mean that guideline recommendations are continually updated when new research are identified and incorporated into evidence summaries, particularly when there is a substantial change in the evidence (1);

  c) Similar healthcare resourcing - Both Australia and Singapore are similar in terms of healthcare resourcing. Both are high income countries, have multidisciplinary teams of healthcare professionals involved in stroke rehabilitation, and have similar rehabilitation settings/facilities/services accessible to stroke survivors throughout their recovery journeys. Few differences exist in that the volume of stroke rehabilitation research published in Singapore is likely to be lesser than Australia due to fewer allied health professionals with research qualifications (e.g., PhD). Singapore also spends less on health (6% of Gross Domestic Product (GDP)) compared to Australia (11% GDP) (25, 26). Albeit the differences, we anticipated that most, or almost all of the guideline recommendations would be applicable in Singapore's healthcare setting.

- To ensure applicability of the source guideline recommendations to the Singapore context, we also considered the local evidence, specifically studies conducted in Singapore which tested the effects of stroke rehabilitation interventions. Methods and results are presented in Appendix 9.3 Summary of local evidence.

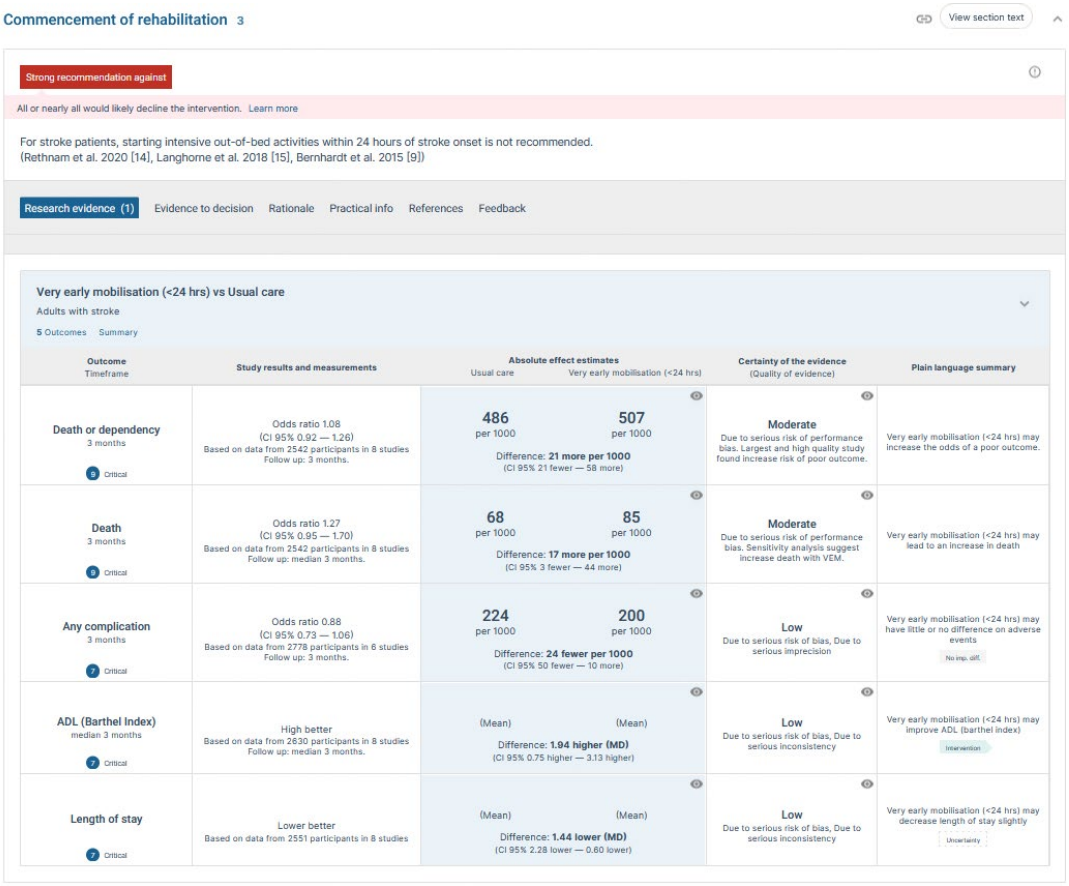
- Guideline committee members then rated and justified the strength of 103 recommendations with reference to the local evidence (Appendix 9.3) and the source guideline. The source guideline was accessed via the MAGICapp platform (https://app.magicapp.org/#/guideline/Kj2R8j) where certainty of evidence are presented in the form of "Summary of Findings" tables, and strength of recommendations are presented as "Strong For", "Weak For", "Strong Against", and/or "Weak Against", and the justification of decision making made explicit with the "Evidence to Decision" framework, increasing its accessibility for use (see examples in Figure 3).

- A modified Delphi approach was used to reach consensus on the strength of recommendations that had less than 80% agreement. Specifically, the approach consisted of two rounds of feedback and discussion where statistics on the differing responses (e.g., proportion (%) of members that rated "Strong For" and "Weak For") and members' justifications for a particular strength were presented and discussed. All responses were kept anonymous, and only known to the leads who chaired the discussion meetings so that the knowledge can be used to facilitate the meetings. In total, nine meetings (of 1.5-2 hour duration) were held with guideline committee members. During these meetings, we also discussed the recommendations that required changes to their wording to be applicable/ relevant in Singapore.

- After the meetings with the guideline committee members, there remained eight recommendations that achieved less than 80% consensus and two recommendations that changed in terms of strength from the source guideline. The leads and the secretariat brought these recommendations to two consultation sessions (four hours in total) with eight stroke survivors and four caregivers from the Singapore National Stroke Association (Figure 4). After background information was provided and the issues surrounding each recommendation was discussed, stroke survivors and caregivers rated on the strength of the recommendations. All of the guideline recommendations were also shared with the stroke survivors and caregivers at the meeting for further comments and queries. (Details of our consensus methods are reported as per recommendations from a review on the use of the Delphi and other consensus group methods in medical education research (27).)

Figure 3. Example of a (A) “Summary of Findings” table and the (B) “Evidence to Decision” framework behind the guideline recommendation on the best time to commence rehabilitation after stroke. (Taken from source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/nyGJ2j)

(A) “Summary of Findings” Table



Commencement of rehabilitation 3

View section text

Strong recommendation against

All or nearly all would likely decline the intervention. Learn more

For stroke patients, starting intensive out-of-bed activities within 24 hours of stroke onset is not recommended.
(Rethnam et al. 2020 [14], Langhorne et al. 2018 [15], Bernhardt et al. 2015 [9])

Research evidence (1) | Evidence to decision | Rationale | Practical info | References | Feedback

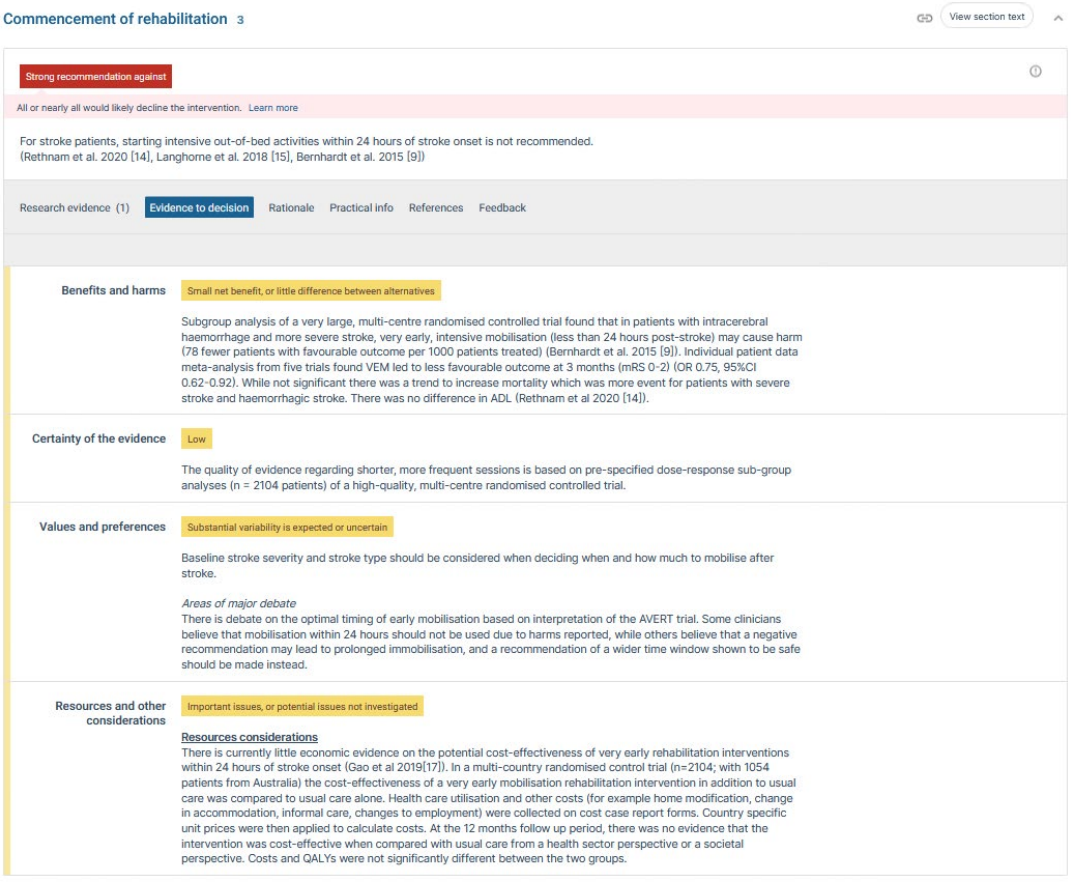
Very early mobilisation (<24 hrs) vs Usual care

Adults with stroke

5 Outcomes Summary

Outcome Timeframe	Study results and measurements	Absolute effect estimates Usual care	 Very early mobilisation (<24 hrs)	Certainty of the evidence (Quality of evidence)	Plain language summary
Death or dependency 3 months 9 Critical	Odds ratio 1.08 (CI 95% 0.92 — 1.26) Based on data from 2542 participants in 8 studies Follow up: 3 months.	486 per 1000	507 per 1000 Difference: **21 more per 1000** (CI 95% 21 fewer — 58 more)	Moderate Due to serious risk of performance bias. Largest and high quality study found increase risk of poor outcome.	Very early mobilisation (<24 hrs) may increase the odds of a poor outcome.
Death 3 months 9 Critical	Odds ratio 1.27 (CI 95% 0.95 — 1.70) Based on data from 2542 participants in 8 studies Follow up: median 3 months.	68 per 1000	85 per 1000 Difference: **17 more per 1000** (CI 95% 3 fewer — 44 more)	Moderate Due to serious risk of performance bias. Sensitivity analysis suggest increase death with VEM.	Very early mobilisation (<24 hrs) may lead to an increase in death
Any complication 3 months 7 Critical	Odds ratio 0.88 (CI 95% 0.73 — 1.06) Based on data from 2778 participants in 6 studies Follow up: 3 months.	224 per 1000	200 per 1000 Difference: **24 fewer per 1000** (CI 95% 50 fewer — 10 more)	Low Due to serious risk of bias, Due to serious imprecision	Very early mobilisation (<24 hrs) may have little or no difference on adverse events No imp. diff.
ADL (Barthel Index) median 3 months 7 Critical	High better Based on data from 2630 participants in 8 studies Follow up: median 3 months.	(Mean)	(Mean) Difference: **1.94 higher (MD)** (CI 95% 0.75 higher — 3.13 higher)	Low Due to serious risk of bias, Due to serious inconsistency	Very early mobilisation (<24 hrs) may improve ADL (barthel index) Intervention
Length of stay 7 Critical	Lower better Based on data from 2551 participants in 8 studies	(Mean)	(Mean) Difference: **1.44 lower (MD)** (CI 95% 2.28 lower — 0.60 lower)	Low Due to serious risk of bias, Due to serious inconsistency	Very early mobilisation (<24 hrs) may decrease length of stay slightly Uncertainty

(B) “Evidence to Decision” framework



Commencement of rehabilitation 3

View section text

Strong recommendation against

All or nearly all would likely decline the intervention. Learn more

For stroke patients, starting intensive out-of-bed activities within 24 hours of stroke onset is not recommended.
(Rethnam et al. 2020 [14], Langhorne et al. 2018 [15], Bernhardt et al. 2015 [9])

Research evidence (1) | Evidence to decision | Rationale | Practical info | References | Feedback

Benefits and harms

Small net benefit, or little difference between alternatives

Subgroup analysis of a very large, multi-centre randomised controlled trial found that in patients with intracerebral haemorrhage and more severe stroke, very early, intensive mobilisation (less than 24 hours post-stroke) may cause harm (78 fewer patients with favourable outcome per 1000 patients treated) (Bernhardt et al. 2015 [9]). Individual patient data meta-analysis from five trials found VEM led to less favourable outcome at 3 months (mRS 0-2) (OR 0.75, 95%CI 0.62-0.92). While not significant there was a trend to increase mortality which was more event for patients with severe stroke and haemorrhagic stroke. There was no difference in ADL (Rethnam et al 2020 [14]).

Certainty of the evidence

Low

The quality of evidence regarding shorter, more frequent sessions is based on pre-specified dose-response sub-group analyses (n = 2104 patients) of a high-quality, multi-centre randomised controlled trial.

Values and preferences

Substantial variability is expected or uncertain

Baseline stroke severity and stroke type should be considered when deciding when and how much to mobilise after stroke.

Areas of major debate
There is debate on the optimal timing of early mobilisation based on interpretation of the AVERT trial. Some clinicians believe that mobilisation within 24 hours should not be used due to harms reported, while others believe that a negative recommendation may lead to prolonged immobilisation, and a recommendation of a wider time window shown to be safe should be made instead.

Resources and other considerations

Important issues, or potential issues not investigated

Resources considerations
There is currently little economic evidence on the potential cost-effectiveness of very early rehabilitation interventions within 24 hours of stroke onset (Gao et al 2019[17]). In a multi-country randomised control trial (n=2104; with 1054 patients from Australia) the cost-effectiveness of a very early mobilisation rehabilitation intervention in addition to usual care was compared to usual care alone. Health care utilisation and other costs (for example home modification, change in accommodation, informal care, changes to employment) were collected on cost case report forms. Country specific unit prices were then applied to calculate costs. At the 12 months follow up period, there was no evidence that the intervention was cost-effective when compared with usual care from a health sector perspective or a societal perspective. Costs and QALYs were not significantly different between the two groups.

iii. Final phase

- Our final adapted guideline has 49 clinical questions and 98 guideline recommendations. Leads wrote the first draft of the Singapore Stroke Rehabilitation Guideline and the implementation toolkit.
- Endorsement for the guideline was sought from advisors and relevant ministerial bodies including from Director-General of Health (DGH) and National One Rehabilitation Steering Committee (NORSC)
- Methods were reviewed and endorsed by the Evidence to Practice Office (ETPO), from Agency for Care Effectiveness (ACE), Ministry of Health Singapore.
- Consultation and alignment were sought from relevant ministerial workgroups including MOH Frailty Workgroup MOH Divisions, MOH Chief Offices and other stakeholders including:
  - Chairman of Medical Boards (DGH-CMB)
  - National One Rehabilitation Steering Committee (NORSC)
  - Agency for Care Effectiveness (ACE), Ministry of Health (MOH)
  - MOH Frailty Workgroup
  - MOH Divisions
  - MOH Chief Offices - Chief Dental Officer, Chief Nursing Officer, Chief Pharmacist
  - 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)
  - Academy of Medicine, Singapore, along with the Colleges and Chapters for their feedback on the guideline:
    - Chapter of Family Medicine Physicians
    - 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
  - Dr Davide de Sousa (Senior Physiotherapist, Northern Sydney Local Health District, NSW Government) who provided advice regarding the recommendation on strength training.
- Future updates will be considered minimally once every five years to maintain validity, as per Agency for Care Effectiveness' requirements for guideline review. The need for guideline review or update will be determined in due time, with considerations of emerging evidence, clinical needs and scope of review. Interim feedback will be collated by MOH CAHOO for consideration during the next review.
- Following the publication of the guideline and toolkit, the guideline and toolkit will be uploaded onto the Agency for Care Effectiveness (ACE) website (https://www.ace-hta.gov.sg/healthcare-professionals/ace-repository-for-clinical-guidelines/) and disseminated to all registered doctors and pharmacists in Singapore via the mailing list extracted from the MOH Alert System; nurse leaders, allied health professionals and other relevant healthcare partners via the ACE mailing list. Further dissemination and promotion activities will be conducted through several channels as well (e.g., ACE LinkedIn, and ACE Insights newsletter). This ensures that the guideline and toolkit reach a wide audience across primary, community, and tertiary care settings.

5.2 Funding, declaration and management of interest

Funding for this work (in terms of manpower) was supported by the Ministry of Health, Singapore. The CRTW sub-team 1/guideline committee retained complete editorial independence over the guideline adaptation process and content. The guideline committee acknowledged and appreciated the support provided by the Chief Allied Health Officer's Office, Ministry of Health, without which this guideline would not have been possible.

All guideline committee members involved in the development and review of this guideline were required formally to declare any actual or potential conflicts of interest prior to participation (Appendix 9.1. Declaration form for conflict of interest). These declarations were reviewed by the leads of the CRTW sub-team 1 and the secretariat team to assess their potential impact. If potential impact was identified and conflict of interest deemed significant, the guideline committee member was recused from rating the strength and/or commenting on the wording of the relevant recommendation(s). If one of the leads declared conflict of interest pertaining to specific recommendation(s), the other lead or a guideline committee member would chair the segment of the meeting pertaining to the recommendation(s). No significant conflicts of interest were declared from the guideline committee members.

5.3 Key questions

Questions are drawn from the clinical questions listed in the relevant chapters of the Australian and New Zealand Living Clinical Guidelines for Stroke Management (referred to as source guideline). Current guideline recommendations are numbered as per the current document. Clinical questions that did not have guideline recommendations (e.g., due to limited or poor quality evidence) and only had "practice statements" corresponding to "consensus-based recommendations" were not included. They are also discussed in Section 7.3 Challenges and suggestions for further research. Readers can refer to the living source guideline for more information on consensus-based recommendations: https://informme.org.au/guidelines/living-clinical-guidelines-for-stroke-management.

Table 2. Clinical questions

Current guideline: 6.1. Secondary prevention – Lifestyle modifications **Source guideline:** Chapter 4. Secondary prevention – Lifestyle modifications
1. What non-pharmacological interventions reduce risk factors for recurrent stroke?
Current guideline: 6.2. Rehabilitation **Source guideline:** Chapter 5. Rehabilitation
2. When is the best time to start out of bed activities?
3. What is the best amount of therapy to improve movement ability in the acute period (0 to 7 days), subacute period (>7 days to 6 months) and chronic period (>6 months)?*
4. Does access to early supported discharge services improve outcomes for people with stroke?
5. Is home based rehabilitation more effective than hospital based care in reducing mortality and increasing independence amongst stroke survivors?
6. Does patient-centred goal setting improve patient outcomes?
7. What interventions for strength improve outcomes for stroke survivors?
8. What interventions increase sensation in stroke survivors?
9. What interventions to improve cardiovascular fitness improve outcomes for people with stroke?
10. What task-specific training improves outcomes for stroke survivors who have difficulties sitting?
11. What task-specific training improves outcomes for stroke survivors who have difficulties standing up?
12. What task-specific training improves outcomes for stroke survivors who have difficulties standing?
13. What interventions improve walking ability in stroke survivors?
14. What interventions improve upper limb activity in stroke survivors who have difficulty using their upper limbs?

15. What interventions improve activities of daily living in patients with stroke?
16. When is the best time to start communication training?
17. What is the best amount of therapy to improve communication in the acute period (0 to 7 days), subacute period (>7 days to 6 months) and chronic period (> 6 months)?*
18. What interventions improve outcomes for patients with aphasia?
19. What interventions improve outcomes for people with apraxia of speech?
20. What interventions improve outcomes for people with dysarthria?
21. What interventions improve outcomes in stroke survivors with attention and concentration deficits?
22. What interventions improve outcomes in stroke survivors with memory difficulties?
23. What interventions to initiate everyday activities in stroke survivors improve impaired executive functioning?
24. What interventions improve outcomes for stroke survivors with limb apraxia?
25. What interventions improve the outcome of stroke survivors with unilateral spatial neglect?
26. Does the use of telehealth improve outcomes for patients with subacute stroke?

Current guideline: 6.3. Managing complications
Source guideline: Chapter 6. Managing complications

27. Do early means of hydration improve outcomes in acute stroke?
28. Do early means of feeding improve outcomes in acute stroke?
29. Do interventions to maintain good oral hygiene improve outcomes in people with acute stroke?
30. What interventions to reduce spasticity improve the outcomes for patients with spasticity?
31. What interventions to reduce contracture improve outcomes for people with stroke?
32. What interventions to prevent or treat shoulder subluxation improve outcomes for people with stroke?
33. What interventions to prevent or treat shoulder pain improve outcomes for people with stroke?
34. What interventions improve outcomes in stroke survivors with bladder and/or bowel problems?*
35. What interventions should be undertaken to reduce emotional distress/emotionalism/emotional lability?
36. What interventions prevent depression and/or anxiety?
37. What interventions manage depression and/or anxiety?
38. What interventions prevent deep venous thrombosis/pulmonary embolism in stroke survivors?
39. What interventions are effective in preventing or reducing falls for stroke survivors?

Current guideline: 6.4. Discharge planning and transfer of care
Source guideline: Chapter 7. Discharge planning and transfer of care

40. Does the provision of information and or education improve outcomes after stroke?
41. Does the use of discharge care plans improve outcomes after stroke?
42. Does the provision of training for carers improve outcomes after stroke?

Current guideline: Chapter 8. Community participation and long-term care
Source guideline: 6.5. Community participation and long-term care

43. Do self-management programs improve outcomes in stroke survivors once they return to the community?
44. Do driver retraining interventions improve a stroke survivors' ability to return to driving?
45. What interventions improve stroke survivor's ability to access community transport?
46. What interventions increase participation of stroke survivors in leisure and/or vocational activities?
47. What interventions improve a stroke survivors' ability to return to work?
48. Does peer support improve the outcomes of stroke survivors?
49. Do interventions to support carers improve outcomes for stroke survivors?

*Clinical question has been reworded and differ slightly from the original clinical question in source guideline.

6. Guideline Recommendations

In total, there were 49 clinical questions and 103 guideline recommendations reviewed from the source guideline. Differences between the source guideline and our guideline are presented in Appendix 9.4 Differences between source guideline and adapted guideline. Key results are presented as follows:

- Of the 103 recommendations, 71 were adopted, 27 were adapted (20 changed in terms of wording, 2 changed in terms of strength and 5 changed in terms of wording and strength of recommendation), and 5 were removed (justification provided in Appendix 9.4 Differences between source guideline and adapted guideline). A summary table of the recommendations with strength changes is available in **Table 3** below.
- Of the 98 adopted or adapted recommendations, 30 were rated "Strong For", 57 "Weak For", 5 "Strong Against", and 6 "Weak Against".
- There were 23 recommendations that did not reach consensus in the initial round of rating. Of the 23 recommendations, 17 reached consensus after the second round of rating (and discussion) and 6 did not reach consensus. In total, 10 recommendations were discussed in depth at the consultation sessions with stroke survivors and caregivers, as the recommendations either did not reach consensus or differed in terms of recommendation strength from the source guideline.

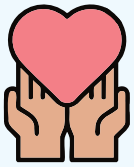
Recommendations were presented in response to the clinical questions, and included the following information as per the RIGHT-Ad@pt checklist (2): whether recommendation was adopted or adapted, strength of recommendation, link to the source guideline where the certainty of evidence and the Evidence to Decision (EtD) framework were presented, summary of the local evidence (if available), and the differences between recommendation in the current guideline and the source guideline.

Table 3. Summary of recommendations with strength adapted from 'weak for' to 'strong for'

All 7 recommendations with strength changes were adapted from 'weak for' to 'strong for' based on local clinical context and expert consensus. These recommendations with strength changes have been highlighted below.

Recommendations with strength adapted from 'Weak for' to 'Strong for'	
6.1 Secondary prevention – Lifestyle modifications 	**Recommendation 1 – Secondary stroke risk factors** 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.
6.2 Rehabilitation 	**Recommendation 40 – Aphasia Rehabilitation** Communication partner training should be provided to carers or family members of people with aphasia after stroke.
6.3 Managing Complications 	**Recommendation 88 – Falls prevention** 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.

6.4 Discharge Planning and Transfer of Care



Recommendation 91 – Carer Training

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.

6.5 Community Participation and Long-Term Care

Recommendation 94 – Outdoor Mobility

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.

Recommendation 96 – Return to Work

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.

Recommendation 97 – Support group

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.

6.1 Secondary prevention – Lifestyle modifications

Source guideline: Chapter 4. Secondary prevention – Lifestyle modifications

1. What non-pharmacological interventions reduce risk factors for recurrent stroke?

Recommendation 1: [Adapted]

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. (28–31)

Strong For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/8L0RME/section/EdVPML
- Local evidence: None.
- Recommendation adapted. Three changes were made:

a) Strength of recommendation was changed from "Weak For" (in source guideline) to "Strong For" (in current guideline). This was supported by 15/17 (88%) guideline committee members and 11/12 (92%) stroke survivors and caregivers. Reasons include alignment with HealthierSG and the emphasis on preventative health strategies in Singapore (32, 33). Based on the EtD framework, there was moderate certainty evidence in reducing some risk factors for stroke (particularly lower blood pressure). Although the benefits of interventions addressing secondary stroke risk factors were small (i.e., little or no difference in outcomes), harm was unlikely and no adverse events were reported in current studies. None of the stroke survivors and caregivers wanted a subsequent stroke to occur. Thus it was deemed that most clients would want the recommended intervention, and should receive the recommended intervention. Stroke survivors and caregivers also shared about receiving similar interventions from their family general practitioner, indicating that some elements are already incorporated into usual care. Guideline committee members proposed for further details (e.g., advice on intensity of physical activity) to be included in the implementation toolkit to aid translation of guideline to practice.

b) Wording of recommendation was changed from *"may be used"* (source guideline) to *"should be used"* (current guideline) to reflect the strength of recommendation.

c) Additional text "Non-pharmacological" was added to the front of the text to indicate that the recommendation applied to interventions other than medications. The change was made due to stakeholder feedback that the recommendation might not fall under the domain of stroke rehabilitation. By specifying "non-pharmacological" interventions, the recommendation covers interventions that are often delivered by nurses and allied health professionals as part of stroke rehabilitation (e.g., support and counselling for medication adherence, smoking cessation, physical activity and dietary modifications).

6.2 Rehabilitation

Source guideline: Chapter 5. Rehabilitation

6.2 i. Commencement of rehabilitation

2. When is the best time to start out of bed activities?

Recommendation 2: [Adapted] For stroke survivors, starting intensive out-of-bed activities within 24 hours of stroke onset is not recommended. (9, 11, 34)	**Strong Against**
Recommendation 3: [Adapted] 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). (9, 35)	**Strong For**
Recommendation 4: [Adopted] For patients with mild and moderate stroke, frequent, short sessions of out-of-bed activity should be provided, but the optimal timing within the 48-hour post-stroke time period is unclear. (9)	**Weak For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/nyGJ2j
- Local evidence: None.
- Recommendations 2 and 3 adapted. The same change was made in both recommendations. Words “stroke survivors” (current guideline) replace the words “stroke patients” (source guideline) to align with the use of person-first language.

6.2 ii. Amount of rehabilitation

3. What is the best amount of therapy to improve movement ability in the acute period (0 to 7 days), subacute period (>7 days to 6 months) and chronic period (>6 months)?*

Recommendation 5: [Adopted] • For stroke survivors, rehabilitation should be structured to provide as much scheduled therapy (occupational therapy and physiotherapy) as possible. (36–38) • For stroke survivors, group circuit class therapy should be used to increase scheduled therapy time. (39)	**Strong For**
Recommendation 6: [Adopted] A minimum of three hours a day of scheduled therapy (occupational therapy and physiotherapy) is recommended, ensuring at least two hours of active task practice occurs during this time. (36, 38)	**Weak For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/j94ANE
- Local evidence: None.
- Recommendations adopted. No changes were made.

6.2 iii. Early supported discharge services

4. Does access to early supported discharge services improve outcomes for people with stroke?

Recommendation 7: [Adapted]

Where appropriate home-based coordinated stroke services are available, early supported discharge services should be offered to stroke survivors with mild to moderate disability. (40)

Strong For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/j9qgRj
- Local evidence: None.
- Recommendation adapted. One change was made: words “stroke survivors” (current guideline) replace the words “stroke patients” (source guideline) to align with the use of person-first language.

6.2 iv. Home-based rehabilitation

5. Is home based rehabilitation more effective than hospital based care in reducing mortality and increasing independence amongst stroke survivors?

Recommendation 8: [Adapted]

Home-based rehabilitation may be considered as a preferred model for delivering rehabilitation in the community. Where home rehabilitation is unavailable, stroke survivors requiring rehabilitation should receive centre-based care. (41, 42)

Weak For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/j1qOXj
- Local evidence: None.
- Recommendation adapted. One change was made: words “stroke survivors” (current guideline) replace the words “stroke patients” (source guideline) to align with the use of person-first language.

6.2 v. Goal setting

6. Does patient-centred goal setting improve patient outcomes?

Recommendation 9: [Adopted]

- 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. (43, 44)
- 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. (43, 44)

Strong For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/j7pl6L
- Local evidence: None.
- Recommendation adopted. No changes were made.

6.2 vi. Sensorimotor impairments (Weakness, Loss of sensation, Loss of cardiorespiratory fitness)

7. What interventions for strength improve outcomes for stroke survivors?

Recommendation 10: [Adopted] For stroke survivors with reduced strength in their arms or legs, progressive resistance training should be provided to improve strength. (12)	**Strong For**
Recommendation 11: [Adopted] • For stroke survivors with arm weakness, repetitive practice using assistive technology, constraint induced movement therapy (CIMT), and robotics may be used to improve arm strength. (45) • For stroke survivors with leg weakness, task specific training, repetitive practice using cycling, or electrical stimulation may be used to improve leg strength. (45)	**Weak For**
Recommendation 12: [Adopted] For stroke survivors with reduced strength in their arms or legs (particularly for those with less than antigravity strength), electrical stimulation may be used. (45, 46)	**Weak For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/LrwOWn
- Local evidence: None.
- Recommendation adopted. No changes were made.

8. What interventions increase sensation in stroke survivors?

Recommendation 13: [Adapted] For stroke survivors with sensory loss of the upper limb, sensory-specific training may be provided to improve sensation. (47–49)	**Weak For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/nyQ5Yn
- Local evidence: None.
- Recommendation adapted. One change was made: wording of recommendation was changed in that the words “to improve sensation” were added to reflect clarity on the outcome measurement.

9. What interventions to improve cardiovascular fitness improve outcomes for people with stroke?

Recommendation 14: [Adopted] For stroke survivors, rehabilitation should include individually-tailored exercise interventions to improve cardiorespiratory fitness. (50)	**Strong For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/jxyQAL
- Local evidence: None.
- Recommendation adopted. No changes were made.

6.2 vii. Activity limitations (Sitting, Standing up, Standing, Walking, Arm activity)

10. What task-specific training improves outcomes for stroke survivors who have difficulties sitting?

Recommendation 15: [Adopted]

For stroke survivors who have difficulty sitting, practising reaching beyond arm's length while sitting with supervision/assistance should be undertaken. (37)

Strong For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/j7QAvn
- Local evidence: None.
- Recommendation adopted. No changes were made.

11. What task-specific training improves outcomes for stroke survivors who have difficulties standing up?

Recommendation 16: [Adopted]

For stroke survivors who have difficulty in standing up from a chair, practice of standing up should be undertaken. (51, 52)

Strong For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/jzroXj
- Local evidence: None. (Did not consider Timed-Up and Go as an outcome measure of standing up.)
- Recommendation adopted. No changes were made.

12. What task-specific training improves outcomes for stroke survivors who have difficulties standing?

Recommendation 17: [Adopted]

For stroke survivors who have difficulty with standing, activities that challenge balance should be provided. (51, 53, 54)

Strong For

Recommendation 18: [Adopted]

For stroke survivors who have difficulty with standing, one or more of the following interventions may be used in addition to practising tasks that challenge balance:

- Virtual reality training, which may include treadmill training, motion capture or force sensing devices (e.g. Wii Balance Boards) (55, 56)
- Visual or auditory feedback (e.g. force platform biofeedback) (37, 57)
- Electromechanically assisted gait or standing training (58)

Weak For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/noqVGj
- Local evidence: Four studies of low to very low certainty evidence (59–62). Studies looked at effects of electromechanical and robot-assisted training, virtual reality and toe spreader on outcomes measuring standing balance, including Berg Balance Scale, Functional Reach Test and Centre of Pressure (59–62). Only two studies were randomised controlled trials (61, 62) and found no statistically significant differences in balance outcomes between groups except for Functional Reach Test (62) (Appendix 9.3 Summary of local evidence). To contribute to the EtD framework, future studies can address the limitations in current randomised controlled trials, look into benefits and harms of interventions, values and preferences of stroke survivors and caregivers regarding interventions to improve standing and resource implications (e.g., cost-effectiveness outcomes).
- Recommendations adopted. No changes were made.

13. What interventions improve walking ability in stroke survivors?

Recommendation 19: [Adopted] 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 (51). The following modalities may be used: • Circuit class therapy (with a focus on overground walking practice) (63) • Treadmill training with or without body weight support (64, 65)	**Strong For**
Recommendation 20: [Adopted] For stroke survivors with difficulty walking, one or more of the following interventions may be used in addition to those listed above: • Virtual reality training (55) • Electromechanically assisted gait training (66) • Biofeedback (57) • Cueing of cadence (67) • Electrical stimulation. (68)	**Weak For**
Recommendation 21: [Adopted] For stroke survivors, individually fitted lower limb orthoses may be used to minimise limitations in walking ability. Improvement in walking will only occur while the orthosis is being worn. (69, 70)	**Weak For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/Eglqdj
- Local evidence: Five studies of mostly low to very low certainty evidence (59–61, 71), with one of moderate certainty evidence (72). Studies looked at the effects of electromechanical and robot-assisted gait training and toe spreader, on outcomes measuring walking recovery, including 6-Minute Walk Test, 10-Metre Walk Test, Functional Ambulation Category and gait characteristics. Only two studies were randomised controlled trials (61, 72), but both found no statistically significant differences in walking recovery outcomes between groups (Appendix 9.3 Summary of local evidence). To contribute to the EtD framework, future studies can address the limitations in current randomised controlled trials, look into benefits and harms of interventions, values and preferences of stroke survivors and caregivers regarding interventions to improve walking recovery and resource implications (e.g., cost-effectiveness outcomes).
- Recommendations adopted. No changes were made.

14. What interventions improve upper limb activity in stroke survivors who have difficulty using their upper limbs?

Recommendation 22: [Adopted] 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. (73)	**Strong For**
Recommendation 23: [Adopted] For stroke survivors with at least some voluntary movement of the arm and hand, repetitive task-specific training may be used to improve arm and hand function. (51)	**Weak For**

Recommendation 24: [Adopted] For stroke survivors with mild to severe arm weakness, mechanically assisted arm training (e.g. robotics) may be used to improve upper limb function. (74)	**Weak For**
Recommendation 25: [Adopted] Virtual reality and interactive games may be used to improve upper limb function. (56, 75)	**Weak For**
Recommendation 26: [Adopted] For stroke survivors with mild to severe arm or hand weakness, electrical stimulation in conjunction with motor training may be used to improve upper limb function. (68, 76)	**Weak For**
Recommendation 27: [Adopted] For stroke survivors with mild to moderate weakness of their arm, mental practice in conjunction with active motor training may be used to improve arm function. (77, 78)	**Weak For**
Recommendation 28: [Adopted] For stroke survivors with mild to moderate weakness, mirror therapy may be used as an adjunct to routine therapy to improve arm function after stroke. (79)	**Weak For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/nyGJPj
- Local evidence: Ten studies of mostly low to very low certainty evidence (80–87), with two of moderate certainty evidence (88, 89). Studies looked at the effects of brain-computer interface-based rehabilitation, transcranial direct current stimulation, robot-assisted training, gaming, virtual reality and self-directed upper limb program on outcomes measuring upper limb recovery, including Fugl-Meyer Assessment – Upper Limb, grip strength and the Action Research Arm Test. Only nine studies were randomised controlled trials (80–83, 85–89), five studies compared between-group differences and provided point measures and measures of variability to estimate size of treatment effect (83, 85, 87–89), but all found no statistically significant differences in upper limb recovery outcomes between groups (Appendix 9.3 Summary of local evidence). (Note: Three of the five randomised controlled trials had small sample sizes (n = 19 and 23) and were likely to be underpowered to detect a between-group difference in the primary outcome (85, 87, 89).) To contribute to the EtD framework, future studies can address the limitations in current randomised controlled trials, look into benefits and harms of interventions, values and preferences of stroke survivors and caregivers regarding interventions to improve upper limb recovery and resource implications (e.g., cost-effectiveness outcomes).
- Recommendations adopted. No changes were made.

Recommendation 29: [Adapted] Hand and wrist orthoses (splints) should not be used as part of usual care as they have no effect on function, pain or range of movement. (90)	**Strong Against**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/nyGJPj
- Local evidence: None.
- Recommendation adapted. One change was made: words “usual care” (current guideline) replace the words “routine practice” (source guideline).

6.2 viii. Participation restrictions (Activities of daily living)

15. What interventions improve activities of daily living in patients with stroke?

Recommendation 30: [Adopted] • Community-dwelling stroke survivors who have difficulties performing daily activities should be assessed by a trained clinician. (91) • 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. (91)	**Strong For**
Recommendation 31: [Adopted] For stroke survivors, virtual reality technology may be used to improve activities of daily living in addition to usual therapy. (56)	**Weak For**
Recommendation 32: [Adopted] Acupuncture is not routinely recommended to improve activities of daily living. (92)	**Weak Against**
Recommendation 33: [Adopted] Administration of amphetamines to improve activities of daily living is not recommended. (93)	**Strong Against**
Recommendation 34: [Adopted] Selective serotonin reuptake inhibitors should not be used to reduce disability. (94)	**Weak Against**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/EaYKGE
- Local evidence: Seven studies of mostly low to very low certainty evidence (59, 62, 71, 83–85), with one of moderate certainty evidence (72). Studies looked at the effects of gaming, virtual reality and robot-assisted therapy on outcomes measuring activities of daily living (ADL) and disability, including Functional Independence Measure, Stroke Impact Scale, Barthel Index, Modified Barthel Index and Modified Rankin Scale (59, 62, 71, 72, 83–85). Only four studies were randomised controlled trials (59, 62, 71, 72, 83–85), but all four found no statistically significant differences in ADL outcomes between groups (Appendix 9.3 Summary of local evidence). To contribute to the EtD framework, future studies can address the limitations in current randomised controlled trials, look into benefits and harms of interventions, values and preferences of stroke survivors and caregivers regarding interventions to improve ADL and resource implications (e.g., cost-effectiveness outcomes).
- Recommendations adopted. No changes were made.

6.2 ix. Communication difficulties (Aphasia, Apraxia of speech, Dysarthria)

16. When is the best time to start communication training?

Recommendation 35: [Adopted] For stroke survivors with aphasia, early aphasia therapy, starting within the first 4 weeks post stroke should be provided to maximise language recovery. (95)	**Strong For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/jmqavj
- Local evidence: None.
- Recommendation adopted. No changes were made.

17. What is the best amount of therapy to improve communication in the acute period (0 to 7 days), subacute period (>7 days to 6 months) and chronic period (>6 months)?*

Recommendation 36: [Adopted] For stroke survivors in the acute phase (up to six weeks post stroke onset), language therapy sessions (direct time on task) ranging between 30–45 minutes, two-three days per week may be provided from stroke onset to week 6 post stroke, with additional therapy sessions during this acute phase being unlikely to yield any further benefit to language recovery. (96, 97)	**Weak For**
Recommendation 37: [Adopted] For stroke survivors with chronic aphasia (>6 months post stroke onset), intensive aphasia therapy (at least 10 hours/week of therapist led, individual or group therapy for 3 weeks, together with 5 hours or more, per week of self-managed training) may be used to improve aphasia. (98)	**Weak For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/jmqavj
- Local evidence: None.
- Recommendations adopted. No changes were made.

18. What interventions improve outcomes for patients with aphasia?

Recommendation 38: [Adopted] 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. (95, 99)	**Strong For**
Recommendation 39: [Adopted] Communication partner training should be provided to health professionals or volunteers who interact with people with aphasia after stroke. (100–102)	**Strong For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/jmqavj
- Local evidence: None.
- Recommendations adopted. No changes were made.

Recommendation 40: [Adapted] Communication partner training should be provided to carers or family members of people with aphasia after stroke. (100, 103)	**Strong For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/jmqavj
- Local evidence: None.
- Recommendation adapted. Two changes were made:

  a) Strength of recommendation was changed from “Weak For” (in source guideline) to “Strong For” (in current guideline). Consensus was not reached initially among guideline committee members (7/13 (54%) rated “Strong For” while 6/13 rated “Weak For”). In the consultation session with the stroke survivors and caregivers, there was unaimous consensus with 12/12 (100%) voting for “Strong For”. Based on the EtD framework, there was very low certainty evidence of improvements in language impairment, communication activity and participation, quality of life and psychosocial adjustment/identity, largely due to evidence coming from non-randomised studies, individual experimental design and case studies. Slightly more than half of the

guideline committee members rated the recommendation as “Strong for”. Reasons include carers or family members of people with aphasia perceived as playing a bigger role in their language recovery (due to more time spent with them) compared to health professionals or voluneers. However, the evidence was of very low certainty and some family members/partners may not view training as a priority and there is no clear picture regarding the optimal timing of training (i.e., earlier versus later), with variation in the literature. However, all stroke survivors and caregivers indicated that this was important. They shared that even among stroke survivors, awareness of aphasia was low as the issue of physical disability (and managing physical disability) was more commonly known. Stroke survivors with aphasia and their caregivers shared that current practice focused mainly on stroke survivors. However, it was pertinent that caregivers understood the stroke survivors and know how to communicate with them in order to reduce frustration. One stroke survivor shared that he had coped by joining a related support group based in Australia.

b) Wording of recommendation was changed from *“may be provided”* to *“should be provided”* to reflect the strength of recommendation.

19. What interventions improve outcomes for people with apraxia of speech?

Recommendation 41: [Adopted]

Weak For

For stroke survivors with apraxia of speech, individually tailored interventions incorporating articulatory-kinematic and rate/rhythm approaches may be used (104). In addition, therapy may incorporate (104):

- Use of modelling and visual cueing.
- Principles of motor learning to structure practice sessions.
- Prompts for Restructuring Oral Muscular Phonetic Targets (PROMPT) therapy.
- Self-administered computer programs that use multimodal sensory stimulation.
- For functional activities, the use of augmentative and alternative communication modalities such as gesture or speech-generating devices is recommended.

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/EPbDgL
- Local evidence: None.
- Recommendation adopted. No changes were made.

20. What interventions improve outcomes for people with dysarthria?

Recommendation 42: [Adopted]

Weak For

For stroke survivors with dysarthria, interventions tailored to the individual which include speech production tasks that target connected speech may be provided, which may include for example strategies to reduce speaking rate, emphasise articulatory placement or increased loudness (e.g., LSVT®LOUD). (105, 106)

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/j2308L
- Local evidence: None.
- Recommendation adopted. No changes were made.

6.2 x. Cognition and perception difficulties (Attention and concentration, Memory, Executive function, Limb apraxia, Neglect)

21. What interventions improve outcomes in stroke survivors with attention and concentration deficits?

Recommendation 43: [Adopted] For stroke survivors with attention and concentration deficits, cognitive rehabilitation may be used. (107–109)	**Weak For**
Recommendation 44: [Adopted] For stroke survivors with attention and concentration deficits, exercise training and leisure activities may be provided. (110)	**Weak For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/jlVYQn
- Local evidence: None.
- Recommendations adopted. No changes were made.

22. What interventions improve outcomes in stroke survivors with memory difficulties?

Recommendation 45: [Adopted] For stroke survivors with memory deficits, cognitive rehabilitation may be used to improve memory function in the short term. Memory rehabilitation strategies may include internal (mental) strategies (e.g. association, mental rehearsal, rhymes) and external compensatory aids (e.g. notebooks, diaries, calendars, alarms, audio recordings, photos, mobile phones). (111, 112)	**Weak For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/LpYkkn
- Local evidence: None.
- Recommendation adopted. No changes were made.

23. What interventions to initiate everyday activities in stroke survivors improve impaired executive functioning?

Recommendation 46: [Adopted] For stroke survivors with cognitive impairment, meta-cognitive strategy and/or cognitive training may be provided. (113, 114)	**Weak For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/E8J6OL
- Local evidence: None.
- Recommendation adopted. No changes were made.

24. What interventions improve outcomes for stroke survivors with limb apraxia?

Recommendation 47: [Adopted] For stroke survivors with limb apraxia, interventions such as gesture training, strategy training and/or errorless learning may be provided. (115)	**Weak For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/n34GVE

- Local evidence: None.
- Recommendation adopted. No changes were made.

25. What interventions improve the outcome of stroke survivors with unilateral spatial neglect?

Recommendation 48: [Adopted] For stroke survivors with symptoms of unilateral neglect, cognitive rehabilitation (e.g. computerised scanning training, pen and paper tasks, visual scanning training, eye patching, mental practice) may be provided. (116)	**Weak For**
Recommendation 49: [Adopted] For stroke survivors with symptoms of unilateral neglect, mirror therapy may be used to improve arm function and ADL performance. (79)	**Weak For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/nVb4Nn
- Local evidence: None.
- Recommendations adopted. No changes were made.

6.2 xi. Telehealth in rehabilitation

26. Does the use of telehealth improve outcomes for patients with subacute stroke?

Recommendation 50: [Adopted] Telehealth services may be used as an alternative approach to delivering rehabilitation, especially for patients who cannot access specialist rehabilitation in the community. It may also be used as an adjunct to in-person therapy. Delivering of specific interventions via telehealth should only be considered for those that have demonstrated benefits. (117)	**Weak For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/j74ONL
- Local evidence: One study of moderte certainty/quality evidence (118). One two-arm randomised controlled trial (n = 124) was conducted to study the effect of tele-rehabilitation on self-reported disability (disability component of the Late-Life Function and Disability Instrument (LLFDI). Results showed no significant difference in self-reported disability scores, compared to the control group (118) (Appendix 9.3 Summary of local evidence), suggesting that tele-rehabilitation is not inferior to usual care. To contribute to the EtD framework, future local studies can look into benefits and harms (e.g., other health-related outcomes), values and preferences of stroke survivors and caregivers regarding telehealth services and resource implications (e.g., cost-effectiveness outcomes, implementation considerations such as barriers and facilitators to using telehealth services post-stroke).
- Recommendation adopted. No changes were made.

* Clinical question has been reworded and differ slightly from the original clinical question in source guideline.

6.3 Managing complications

Source guideline: Chapter 6. Managing complications

6.3 i. Nutrition and hydration (Early hydration, Early feeding)

27. Do early means of hydration improve outcomes in acute stroke?

Recommendation 51: [Adapted] • All stroke survivors should have their hydration status assessed, monitored, and managed throughout their hospital admission. • Where fluid support is required, crystalloid solutions (e.g., normal saline) should be used in preference to colloid solutions (e.g., albumin) as the first option to treat or prevent dehydration. (119)	**Strong For**

• Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/LG3k0L

• Local evidence: None.

• Recommendation adapted. Two changes were made to the wording of the recommendation:

a) Words “stroke survivors” (current guideline) replace the words “stroke patients” (source guideline) to align with the use of person-first language.

b) Examples of crystalloid solutions and colloid solutions were provided, based on feedback from the wider stakeholder engagement.

28. Do early means of feeding improve outcomes in acute stroke?

Recommendation 52: [Adapted] All patients with stroke should be screened for malnutrition at admission and on an ongoing basis (at least weekly) while in hospital. (120) The screening should preferably be done by trained healthcare professionals with use of a validated nutrition screening tool.	**Strong For**
Recommendation 53: [Adapted] For patients with stroke whose nutrition status is poor or deteriorating, nutrition supplementation should be offered. (120, 121) Nutrition supplementation can include oral nutritional supplements, food fortification strategies, small frequent meals and/or specialist dietary advice.	**Strong For**
Recommendation 54: [Adopted] For patients with stroke who are adequately nourished, routine oral nutrition supplements are not recommended. (120, 121)	**Weak Against**

• Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/jNVXyj

• Local evidence: None.

• Recommendations adapted. Two changes were made to the wording of the recommendations:

a) A new sentence “The screening should preferably be done by trained healthcare professionals with use of a validated nutrition screening tool.” was added to the recommendation on screening for malnutrition, based on feedback from the wider stakeholder engagement.

b) Examples of nutrition supplementation were provided, based on feedback from the wider stakeholder engagement.

Recommendation 55: [Adapted] • For patients with stroke who do not recover a functional swallow, nasogastric tube feeding is the preferred method of feeding in the short term. (120–122)	**Weak For**

• For patients with stroke, the use of intermittent bolus feeding is usually recommended in Singapore. The use of continuous pump feeding may be recommended based on clinical indications. (123)	

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/jNVXyj
- Local evidence: None.
- Recommendation adapted. One change was made: Wording of recommendation was changed to indicate usual practice in Singapore. Recommendation was changed from "For patients with stroke , there is no preference with regard to continuous pump (meaning using a pump for greater than or equal to 16 hrs out of 24 hrs for less than or equal to 80 ml/hr) feeding versus intermittent bolus feeding (meaning 250–400 mls/hr for 4–5 times/day) therefore practical issues, cost and patient preferences should guide practice. (123)" (source guideline) to "For patients with stroke, the use of intermittent bolus feeding is usually recommended in Singapore. The use of continuous pump feeding may be recommended based on clinical indications." (current guideline).

6.3 ii. Oral hygiene

29. Do interventions to maintain good oral hygiene improve outcomes in people with acute stroke?

Recommendation 56: [Adopted] All patients with stroke, particularly those with swallowing difficulties, should have assistance and/or education to maintain good oral and dental (including dentures) hygiene. (124)	**Strong For**
Recommendation 57: [Adopted] 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. (124)	**Strong For**
Recommendation 58: [Adopted] For patients with stroke, chlorhexidine in combination with oral hygiene instruction, and/or assisted brushing may be used to decrease dental plaque and gingiva bleeding. Caution should be taken, however, for patients with dysphagia. (125, 126)	**Weak For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/jlVP3n
- Local evidence: None.
- Recommendations adopted. No changes were made.

6.3 iii. Spasticity

30. What interventions to reduce spasticity improve the outcomes for patients with spasticity?

Recommendation 59: [Adopted] For stroke survivors with upper limb spasticity, Botulinum Toxin A in addition to rehabilitation therapy may be used to reduce spasticity, but is unlikely to improve activity or motor function. (127, 128)	**Weak For**
Recommendation 60: [Adopted] For stroke survivors with lower limb spasticity, Botulinum Toxin A in addition to rehabilitation therapy may be used to reduce spasticity but is unlikely to improve motor function or walking. (129–131)	**Weak For**
Recommendation 61: [Adopted] For stroke survivors with spasticity, acupuncture should not be used for treatment of spasticity in routine practice other than as part of a research study. (132)	**Weak Against**

Recommendation 62: [Adopted] For stroke survivors with spasticity, adjunct therapies to Botulinum Toxin A, such as electrical stimulation, casting and taping, may be used. (133–135)	**Weak For**
Recommendation 63: [Adopted] For stroke survivors, the routine use of stretch to reduce spasticity is not recommended. (136)	**Weak Against**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/ERRp1E
- Local evidence: Four studies of low to very low certainty evidence looked at effects of intramuscular neurolysis with 50% ethyl alcohol (137), botulinum toxin A (138, 139) and toe spreader (61) on spasticity and other associated outcomes including pain, activity level, balance, timed walking over 20m and passive joint range of motion. Only two of the four studies were randomised controlled trials (61, 138). One study (n = 17) found that botulinum toxin A showed a statistically significant reduction in spasticity, but no statistically significant differences in pain and passive joint range of motion between groups (138)., while the second study (n = 9) showed that the toe spreader did not lead to any statistically significant results between groups in terms of gait characteristics, pain, activity level and balance outcomes (61) (Appendix 9.3 Summary of local evidence). To contribute to the EtD framework, more randomised controlled trials can be conducted to look into benefits and harms (e.g., health-related outcomes), values and preferences of stroke survivors and caregivers regarding spasticity management and resource implications (e.g., cost-effectiveness outcomes).
- Recommendations adopted. No changes were made.

6.3 iv. Contracture

31. What interventions to reduce contracture improve outcomes for people with stroke?

Recommendation 64: [Adopted] For stroke survivors at risk of developing contracture who are receiving comprehensive, active therapy, the routine use of splints or stretch of the arm or leg muscles is not recommended. (136)	**Strong Against**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/LkVPDj
- Local evidence: None.
- Recommendation adopted. No changes were made.

6.3 v. Subluxation

32. What interventions to prevent or treat shoulder subluxation improve outcomes for people with stroke?

Recommendation 65: [Adopted] For stroke survivors at risk of shoulder subluxation, electrical stimulation may be used in the first six months after stroke to prevent or reduce subluxation. (140, 141)	**Weak For**
Recommendation 66: [Adopted] For stroke survivors at risk of shoulder subluxation, shoulder strapping is not recommended to prevent or reduce subluxation. (142)	**Weak Against**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/n340KE
- Local evidence: None.
- Recommendations adopted. No changes were made.

6.3 vi. Pain (Central post-stroke pain, Shoulder pain)

33. What interventions to prevent or treat shoulder pain improve outcomes for people with stroke?

Recommendation 67: [Adopted] For stroke survivors with shoulder pain, shoulder strapping may be used to reduce pain. (142)	**Weak For**
Recommendation 68: [Adopted] For stroke survivors with shoulder pain, electrical stimulation may be used to manage pain. (143)	**Weak For**
Recommendation 69: [Adopted] For stroke survivors with shoulder pain, shoulder injections (either sub acromial steroid injections for patients with rotator cuff syndrome, or methylprednisolone and bupivacaine for suprascapular nerve block) may be used to reduce pain. (144, 145)	**Weak For**
Recommendation 70: [Adopted] For stroke survivors with shoulder pain and upper limb spasticity, Botulinum Toxin A may be used to reduce pain. (146)	**Weak For**
Recommendation 71: [Adopted] For stroke survivors with shoulder pain, acupuncture in addition to comprehensive rehabilitation may be used to reduce pain. (13)	**Weak For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/jD4eqj
- Local evidence: One study of very low certainty evidence (138). One two-arm randomised controlled trial (n = 17) was conducted to study the effect of botulinum toxin A in the treatment of hemiplegic shoulder pain associated with spasticity. Control group received placebo injections. Outcomes included spasticity, pain and passive joint range of motion. Although results showed statistically significant differences in reduction of spasticity (i.e., improvement in median Ashworth scale for shoulder addctor and elbow flexor spasticity), there were no statistically significant differences in pain and passive shoulder abduction range of motion between groups (138) (Appendix 9.3 Summary of local evidence). To contribute to the EtD framework, more randomised controlled trials can be conducted to look into benefits and harms (e.g., health-related outcomes), values and preferences of stroke survivors and caregivers regarding shoulder pain and resource implications (e.g., cost-effectiveness outcomes).
- Recommendations adopted. No changes were made.

6.3 vii. Incontinence (Urinary incontinence, Faecal incontinence)

34. What interventions improve outcomes in stroke survivors with bladder and/or bowel problems?*

Recommendation 72: [Adopted] • All stroke survivors with suspected urinary continence difficulties should be assessed by trained personnel using a structured functional assessment. (147) • For stroke survivors, a portable bladder ultrasound scan should be used to assist in diagnosis and management of urinary incontinence. (147)	**Weak For**
Recommendation 73: [Adapted] • Stroke survivors in hospital with confirmed continence difficulties, should have a structured continence management plan formulated, documented, implemented and monitored. (148) • If incontinence persists the stroke survivor should be re-assessed and referred for specialist review once in the community. (149)	**Weak For**

Recommendation 74: [Adapted]

For stroke survivors with urge incontinence:

- A prompted or scheduled voiding regime program/bladder retraining can be trialled (149–151);
- Anticholinergic drugs may be considered (150, 152);
- If continence is unachievable, containment aids can assist with social continence.

Weak For

Recommendation 75: [Adopted]

- All stroke survivors with suspected faecal continence difficulties should be assessed by trained personnel using a structured functional assessment. (153)
- For stroke survivors with constipation or faecal incontinence, a full assessment (including a rectal examination) should be carried out and appropriate management of constipation, faecal overflow or bowel incontinence established and targeted education provided. (153)

Weak For

Recommendation 76: [Adopted]

For stroke survivors with bowel dysfunction, bowel habit retraining using type and timing of diet and exploiting the gastro-colic reflex should be used. (154, 155)

Weak For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/L6Kzyn
- Local evidence: None.
- Recommendations adapted. Three changes were made:
  a) Words “stroke survivors” (current guideline) replace the words “stroke patients” (source guideline) to align with the use of person-first language (for recommendation 73).
  b) Sequence of anticholinergic drugs and prompted or scheduled voiding regime program was swapped (for recommendation 74).
  c) Words “can be trialled” (current guideline) replace the words “may be considered” (source guideline) based on feedback from the wider stakeholder engagement (for recommendation 74).

6.3 viii. Mood disturbance (Treatment for emotionalism, Prevention of depression, Treatment for depression)

35. What interventions should be undertaken to reduce emotional distress/emotionalism/emotional lability?

Recommendation 77: [Adapted]

For stroke survivors with emotionalism/pathological emotional expression, specialist assessment for diagnostic clarification is recommended, and antidepressant medication such as selective serotonin reuptake inhibitors (SSRIs) or tricyclic antidepressants may be used. (156)

Weak For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/jO59Gn
- Local evidence: None.
- Recommendation adapted. One change was made: additional text “pathological emotional expression, specialist assessment for diagnostic clarification is recommended” were added to describe emotionalism and the need for specialist assessment, based on feedback from the wider stakeholder engagement.

36. What interventions prevent depression and/or anxiety?

Recommendation 78: [Adapted]

For stroke survivors, antidepressant medication may be used to prevent depression if the benefits of the medication outweigh the risk (e.g., seizures, fractures) and in the absence of contraindications.

Weak For

(94, 157) This can be considered for some stroke survivors at high risk of developing depression (e.g., history of depression, previous stroke, more severe stroke/disability and those with aphasia) (158, 159), or when other preventative non-pharmacological approaches do not work, or are not appropriate.	
Recommendation 79: [Adopted] For stroke survivors, psychological therapies (e.g. problem solving, motivational interviewing) may be used to prevent depression. (157)	**Weak For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/jO59Gn
- Local evidence: None on efficacy of intervention. (The College of Psychiatrists had shared the results of a local study which measured the outcomes of a clinical service for routine post-stroke depression (PSD) screening and intervention (160). As the study design was cross-sectional and used a case-control comparison of propensity-score matched samples of 115 patients with stroke in one hospital in Singapore, the evidence was not robust enough to support implementation of the service on a national level, but suggested that such a service using routine screening for mood disturbance by trained allied health professionals (using validated tools) was possible in Singapore and could be considered if resources allowed (160).)
- Recommendation 78 adapted. One change was made: recommendation 78 was rephrased from "For stroke survivors, antidepressant medication may be used to prevent depression. (157)" (source guideline) to "For stroke survivors, antidepressant medication may be used to prevent depression if the benefits of the medication outweigh the risk (e.g., seizures, fractures) and in the absence of contraindications. (94, 157) This can be considered for some stroke survivors at high risk of developing depression (e.g., history of depression, previous stroke, more severe stroke/disability and those with aphasia) (158, 159), or when other preventative non-pharmacological approaches do not work, or are not appropriate." (current guideline), based on feedback from the wider stakeholder engagement. Feedback highlighted that the original short recommendation was controversial and may not sufficiently convey the need to consider the benefit-harm ratio carefully. Hence the recommendation has been expanded on and included additional references highlighting potential risks and the conditions under which antidepressant medication might be appropriate to prevent depression in stroke survivors.

37. What interventions manage depression and/or anxiety?

Recommendation 80: [Adopted] For stroke survivors with depression, antidepressants, which includes SSRIs should be considered. There is no clear evidence that particular antidepressants produce greater effects than others and will vary according to the benefit and risk profile of the individual. (161)	**Weak For**
Recommendation 81: [Adapted] For stroke survivors with depression or depressive symptoms, psychological therapy may be considered. (161)	**Weak For**
Recommendation 82: [Adopted] For stroke survivors with depression or depressive symptoms, structured exercise programs, particularly resistance training or programs of high intensity, may be used. (50, 162)	**Weak For**
Recommendation 83: [Adapted] For stroke survivors with depression, non-invasive brain stimulation (repetitive transcranial magnetic stimulation [rTMS]) may be considered as an alternative where services are available, if pharmacotherapy is contraindicated, not tolerated, or failed. (161)	**Weak For**
Recommendation 84: [Adopted] For stroke survivors with depression or depressive symptoms, acupuncture may be used. (163)	**Weak For**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/j91mvj

- Local evidence: None.
- Recommendations adapted. Two changes were made:
  a) Words "may be considered" (current guideline) replace the words "may be provided" (source guideline) based on feedback from the wider stakeholder engagement (for recommendation 81).
  b) Recommendation 83 was rephrased from "For stroke survivors with depression, non-invasive brain stimulation (repetitive transcranial magnetic stimulation [rTMS]) may be used. (161)" (source guideline) to "For stroke survivors with depression, non-invasive brain stimulation (repetitive transcranial magnetic stimulation [rTMS]) may be considered as an alternative where services are available, if pharmacotherapy is contraindicated, not tolerated, or failed. (161)" (current guideline) based on feedback from the wider stakeholder engagement.

6.3 ix. Deep venous thrombosis or pulmonary embolism

38. What interventions prevent deep venous thrombosis/pulmonary embolism in stroke survivors?

Recommendation 85: [Adapted]

For stroke survivors who are immobile after an acute ischaemic stroke, low molecular weight heparin in prophylactic doses may be used if the benefits of deep venous thrombosis prophylaxis outweigh the risks and in the absence of contraindications. (164, 165)

Weak For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/EKyKVL
- Local evidence: None.
- Recommendation adapted. Two changes were made:
  a) Wording of recommendation was changed to include the words "the benefits of deep venous thrombosis prophylaxis outweight the risks and" (current guideline), as guideline committee members emphasised the importance of weighing the benefits and risks in this patient population (i.e., weighing the benefits of deep venous thrombosis prevention versus risk of bleeding), and to consider the intervention for patients without a high bleeding risk.
  b) Words "stroke survivors who are immobile after an acute ischaemic stroke" (current guideline) replace the words "acute ischaemic stroke patients who are immobile" (source guideline) to align with the use of person-first language.

Recommendation 86: [Adapted]

For stroke survivors who are immobile after an acute stroke, intermittent pneumatic compression may be used, either as an alternative to low molecular weight heparin or in those with a contraindication to pharmacological deep venous thrombosis prophylaxis (including patients with intracerebral haemorrhage or within 24 hours of thrombolysis). (166)

Weak For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/EKyKVL
- Local evidence: None on efficacy of intervention. (The Stroke Services Improvement team had shared the results of a local study with the guideline committee members. The study was conducted in one hospital in Singapore and reported the prevalence rate of deep venous thrombosis at 30% in 105 patients (from days 7–10) and 45% in 93 patients (from days 25–30) (167). No intervention was conducted in the study.)
- Recommendation strength adopted, though consensus was not reached among guideline committee members, stroke survivors and caregivers. Of the guideline committee members, 6/10 (60%) rated "Weak For" and 4/10 rated "Strong For". Of the stroke survivors and caregivers, 9/12 (75%) rated "Weak For" and 3/12 rated "Strong For". As 80% consensus was not reached for both groups, the leads chose to follow the majority vote of the stroke survivors and caregivers. Based on the EtD framework, there was moderate certainty evidence of a significant reduction in deep venous thrombosis but also a significant increase in skin breaks (based on one large study of 2876 patients in the United Kingdom). (166) The study was underpowered to assess the clinically important

outcome of pulmonary embolism and no significant differences in death was found between groups. There was concern regarding implementation since perfect adherence to the intermittent pneumatic compression was only achieved in 31% (445 of 1438) of patients allocated to the intervention group. (166) A prior Cochrane systematic review on intermittent pneumatic compression only found two small studies that included 177 patients. Their results showed that intermittent pneumatic compression was associated with a non-significant trend towards a lower risk of DVTs (OR 0.45, 95% CI 0.19 to 1.10) with no evidence of an effect on deaths (OR 1.04, 95% CI 0.37 to 2.89). (168) Guideline committee members, stroke survivors and caregivers rated "Weak For" in light of the certainty of evidence, benefits and harms, adherence issue, and higher cost of the intermittent pneumatic compression (compared to low molecular weight heparin). Additionally, stroke survivors and caregivers highlighted that preferences were likely to differ. While some mentioned that they would be inclined to defer to healthcare professionals to make the decision, others enquired if they could be consulted on this during their hospital stay. We encourage shared decision making to be initiated between the healthcare professionals, stroke survivors and families prior to the issuance of the intermittent pneumatic compression. Future studies can also look into the cost/economic implications of both interventions (i.e., low molecular weight heparin and intermittent pneumatic compression) targeted at preventing deep venous thrombosis/pulmonary embolism after stroke.

- Recommendation adapted. One change was made. Words "stroke survivors who are immobile after an acute stroke" (current guideline) replace the words "acute stroke patients who are immobile" (source guideline) to align with the use of person-first language.

Recommendation 87: [Adopted]

Antithrombotic stockings are not recommended for the prevention of deep venous thrombosis or pulmonary embolism post stroke. (168)

Strong Against

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/EKyKVL
- Local evidence: None.
- Recommendations adopted. No changes were made.

6.3 x. Falls

39. What interventions are effective in preventing or reducing falls for stroke survivors?

Recommendation 88: [Adapted]

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. (169, 170)

Strong For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/WE8wOn/section/jWRN8E
- Local evidence: None.
- Recommendation adapted. One change was made: Strength of recommendation was changed from "Weak For" (in source guideline) to "Strong For" (in current guideline). Consensus was not reached initially among guideline committee members (8/15 (53%) rated "Weak For", 6/15 rated "Strong For" and 1 rated "Weak Against"). In the consultation session with the stroke survivors and caregivers, consensus was reached with 11/12 (92%) voting for "Strong For" and 1/12 voting for "Weak For", and the majority vote of the stroke survivors and caregivers was adopted. Based on the EtD framework, there was very low certainty evidence of little or no difference in the number of fallers, rate of falls and quality of life with multifactorials falls interventions post-stroke. Slightly more than half of the guideline committee members rated the recommendation as "Weak for" as the evidence was of very low quality, may not be cost-effective given the small benefits and may not be suitable for people with cognitive impairments, though it was also acknowledged that falls is a serious problem and that most stroke survivors would want some form of intervention but it is unclear what works. Almost all of the stroke survivors and caregivers indicated that it would be important to learn to prevent falls and how to fall safely as they continued to face this risk in their daily lives. Participants shared specific examples where they had near-falls and were not sure what to do. Some also shared about the falls that they had, and would like to prevent them if possible.

* Clinical question has been reworded and differ slightly from the original clinical question in source guideline.

6.4 Discharge planning and transfer of care

Source guideline: Chapter 6. Managing complications

6.4 i. Information and Education

40. Does the provision of information and or education improve outcomes after stroke?

Recommendation 89: [Adopted]

- All stroke survivors and their families/carers should be offered information tailored to meet their individual needs using relevant language and communication formats (171).
- Information should be provided at different stages in the recovery process (171).
- 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 (171).

Strong For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/VLpK8j/section/j9074E
- Local evidence: None.
- Recommendation adopted. No changes made.

6.4 ii. Discharge care plans

41. Does the use of discharge care plans improve outcomes after stroke?

Recommendation 90: [Adopted]

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 (172, 173).

Strong For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/VLpK8j/section/jxyRyL
- Local evidence: One study of moderate certainty/quality evidence (174). One three-arm randomised controlled trial (n = 266) was conducted to study the effect of free transport services and/or free stroke rehabilitation sessions on the uptake of and adherence to outpatient rehailitation services. Results showed no significant difference in uptake of outpatient rehabilitation services (defined as patient attending at least one rehabilitation session post-discharge), though the groups that received the free transport services and/or free rehabilitation sessions reported attending a statistically signifant higher number of total rehabilitation sessions, compared to the control group (174) (Appendix 9.3 Summary of local evidence). More studies are needed to explore other specific elements in “comprehensive discharge care plans” that would address the specific needs of stroke survivors. To contribute to the EtD framework, future studies can look into benefits and harms (e.g., health-related outcomes), values and preferences of stroke survivors and caregivers regarding discharge care plans and resource implications (e.g., cost-effectiveness outcomes).
- Recommendation adopted. No changes made.

6.4 iii. Carer training

42. Does the provision of training for carers improve outcomes after stroke?

Recommendation 91: [Adapted]

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. (175)

Strong For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/VLpK8j/section/j7Qm9n
- Local evidence: None.
- Recommendation adapted. Two changes were made:

a) Strength of recommendation was changed from "Weak For" (in source guideline) to "Strong For" (in current guideline). This was supported by 18/19 (95%) guideline committee members and 12/12 (100%) stroke survivors and caregivers. Reasons include a large proportion of foreign domestic workers providing the caregiving support for families in Singapore (176). Based on the EtD framework, the evidence was of moderate certainty but showed little or no difference in reducing carer burden and improving clients' extended activities of daily living. Despite the lack of greater benefits shown, harm was deemed unlikely. All stroke survivors and caregivers deemed carer training to be essential and important in helping the carers and family understand the client's condition. Guideline committee members also emphasised specific training to manage stroke-related problems such as falls and spasticity, while stroke survivors and caregivers emphasised coaching skills to help carers motivate the patient (e.g., during exercise), counselling skills to help carers understand and manage mood problems, physical skills to help with outdoor mobility, and inclusion of support/self-care strategies for the mental health of carers. Stroke survivors and caregivers also emphasised the importance of setting clear expectations and differentiating the training for foreign domestic workers and family members (e.g., basic nursing care might be covered more by foreign domestic workers). This will also depend on the expectations of clients, family and carers.

b) Wording of recommendation was changed from "before the stroke survivor is discharged home" (source guideline) to "as needed" (current guideline), so as to include carer training that might occur in the community (i.e., after the stroke survivor is discharged home).

6.5 Community participation and long-term care

Source guideline: Chapter 8. Community participation and long-term care

6.5 i. Self-management

43. Do self-management programs improve outcomes in stroke survivors once they return to the community?

Recommendation 92: [Adapted]

- Stroke survivors who are cognitively able and their carers should be made aware of the availability of generic self-management programs before discharge from hospital and be supported to access such programs once they have returned to the community.
- Stroke-specific self-management programs may be provided for those who require more specialised programs.
- A collaboratively developed self-management care plan between stroke survivors, caregivers and healthcare professionals may be used to harness and optimise self-management skills. (177, 178)

Weak For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/6nYJxE/section/j1Avkj
- Local evidence: None.
- Recommendation strength adopted, though consensus was not reached initially among guideline committee members (12/20 (60%) rated "Weak For", 7/20 rated "Strong For" and 1/20 rated "Weak Against"). In the consultation session with the stroke survivors and caregivers, 12/12 (100%) rated "Weak For". Based on the EtD framework, there was low certainty evidence of small benefits or no differences in improving impairments, quality of life, self-efficacy and activity limitations with self-management interventions post-stroke. Guideline committee members rated the recommendation as "Weak for" as there was an absence of a specific program that will be beneficial for stroke survivors. Most programs in Singapore target the management of stroke risk factors and vary in content and duration. Although most stroke survivors would not mind receiving the intervention and that there appears to be no harm and potentially important benefits, stroke survivors and caregivers did not deem the intervention as a first line of intervention/"must-have" to improve their lives in the community.
- Recommendation adapted. One change was made: words "between stroke survivors, caregivers and healthcare professionals" were added to the current recommendation based on feedback from the wider stakeholder engagement.

6.5 ii. Driving

44. Do driver retraining interventions improve a stroke survivors' ability to return to driving?

Recommendation 93: [Adopted]

For stroke survivors needing driving rehabilitation, driving simulation may be used. Health professionals using driving simulation need to receive training and education to deliver intervention effectively and appropriately, and mitigate driving simulator sickness. (179, 180)

Weak For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/6nYJxE/section/Eg8zGj
- Local evidence: None.
- Recommendation adopted. No changes made.

6.5 iii. Community mobility and outdoor travel

45. What interventions improve stroke survivors' ability to access community transport?

Recommendation 94: [Adapted]

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. (181, 182)

Strong For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/6nYJxE/section/jX2mWn
- Local evidence: None.
- Recommendation adapted. Two changes were made:

a) Strength of recommendation was changed from "Weak For" (in source guideline) to "Strong For" (in current guideline). Consensus was not reached initially among guideline committee members (8/13 (62%) rated "Weak For" and 5/13 rated "Strong For"). In the consultation session with the stroke survivors and caregivers, 12/12 (100%) rated "Strong For". Based on the EtD framework, there was low certainty evidence of improvements in walking speed and overall participation with outdoor mobility interventions post-stroke. Most guideline committee members rated the recommendation as "Weak for" as the evidence was of low quality and largely came from one large multicentre trial (low certainty due to high drop outs and lack of blinding resulting in imprecision). However, all stroke survivors and caregivers deemed outdoor mobility as important and necessary for learning and growth on their recovery journeys, and to help them "broaden their horizons". Most stroke survivors had received mobility training in a highly controlled environment, which did not adequately prepare them for navigating real-life scenarios, such as crossing the road and climbing the stairs at the carpark. Going outdoors was also deemed to bring additional benefits in terms of mood and emotional regulation. Hence, there was unanimous consensus from the stroke survivors and caregivers that outdoor mobility was important, and that training should be adapted to suit the lifestyle or home environment of the stroke survivor.

b) Wording of recommendation was changed from *"agencies"* (source guideline) to *"services"* (current guideline) to suit the local context. Examples of services would include referral to occupational therapy services for prescription of personal mobility aids, physiotherapy services for prescription of walking aids, orthotist services for prescription of ankle-foot orthoses, and the Singapore National Stroke Association for outdoor walking activities/opportunities.

6.5 iv. Leisure

46. What interventions increase participation of stroke survivors in leisure and/or vocational activities?

Recommendation 95: [Adapted]

For stroke survivors, targeted occupational therapy or other programs including leisure therapy may be used to increase participation in leisure activities. (183, 184)

Weak For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/6nYJxE/section/nY7Vgj
- Local evidence: None.
- Recommendation adapted. Two changes were made:

a) Strength of recommendation adopted, though consensus was not reached initially among guideline committee members (12/16 (75%) rated "Weak For" and 4/16 rated "Strong For"). In the consultation session with the stroke survivors and caregivers, 11/12 (92%) rated "Weak For" and 1/12 rated "Strong For". Based on the EtD framework, there was low certainty evidence of small benefits or no differences in improving

leisure activity, extended activities of daily living and mobility and independence with leisure therapy. Most guideline committee members rated the recommendation as "Weak for" as the evidence was of low quality (due to risk of bias, inconsistency and imprecision) and emphasis should be placed on other occupational therapist-led interventions with more evidence (e.g., constraint-induced movement therapy). There was also the acknowledgement of a shortage of occupational therapists in the community. Stroke survivors and caregivers acknowledged the importance of leisure therapy in helping with their mental health. However, they highlighted that this leisure therapy need not be provided by allied health professionals (particularly occupational therapists) if there is a shortage of them in the community. They would prefer therapy time to be more focused on exercise due to the prioritisation of regaining function over leisure. In their opinion, leisure can be pursued on their own or via other means such as referral to the Singapore National Stroke Association, and need not be led by allied health professionals.

b) Wording of recommendation was changed in that the words "or other programs" were added to reflect other leisure programs that are not led by occupational therapists. In Singapore, some of these leisure programs can be found at the following organisations for stroke survivors and people with disabilities:

- https://www.snsasg.org/getactive
- https://www.s3.org.sg/news-detail/activities-for-stroke-patients
- https://www.enablingguide.sg/im-looking-for-disability-support/leisure-recreation

6.5 v. Return to work

47. What interventions improve a stroke survivors' ability to return to work?

Recommendation 96: [Adapted]

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. (185)

Strong For

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/6nYJxE/section/LrPpwE
- Local evidence: One study of very low certainty/quality evidence (186). One pre-post study (n = 50) was conducted to study the effect of a return to work programme on return to work rates and community reintegration (measured by the Community Integration Questionnaire (CIQ)). Although the study showed that 88% returned to work after the programme and that participants' CIQ scores improved significantly at the end of the programme, the study was not a randomised controlled trial and there was no follow-up after programme completion (186) (Appendix 9.3 Summary of local evidence). Randomised controlled trials are needed to test the efficacy of return to work programmes for people after stroke. To contribute to the EtD framework, future studies can look into benefits and harms (e.g., health-related outcomes), values and preferences of stroke survivors and caregivers regarding return to work and resource implications (e.g., cost-effectiveness outcomes, implementation considerations such as barriers and facilitators to returning to work post-stroke).
- Recommendation adapted. Two changes were made:

a) Strength of recommendation was changed from "Weak For" (in source guideline) to "Strong For" (in current guideline). Consensus was not reached initially among guideline committee members (11/20 (55%) rated "Weak For" and 8/20 rated "Strong For"). In the consultation session with the stroke survivors and caregivers, 12/12 (100%) rated "Strong For". Based on the EtD framework, there was low certainty evidence of return to work rates, significant improvement in activities of daily living but no significant difference for perceived quality of life with a return to work programme. Most guideline committee members rated the recommendation as "Weak for" as the evidence was of low quality and came from only one study conducted in South Africa (185). It was also acknowledged that return to work was not always a goal that stroke survivors wanted to achieve. Some might wish to return to work while others might not. Stroke survivors and caregivers agreed that individual preferences to return to work might vary, including returning to the same job (before stroke) or looking for a new job (after stroke). They acknowledged that the recommendation might not be applicable to

all stroke survivors (particularly if they are retired), and that return to work programmes require specialised input and training that might not be readily available in all hospitals and day rehabilitation centres where they were receiving formal rehabilitation. Hence, the general sentiments were for allied health professionals to ask only stroke survivors who were previously working if they wished to return to work, and to facilitate access and referral to appropriate resources/services to help them to do so. Where applicable, allied health professionals can also help provide a report on what the stroke survivor can or cannot do in a job to facilitate job matching. With the information, the stroke survivors would then make their decision on whether to return to work based on their circumstances.

b) Wording of recommendation was intially shortened from *"All stroke survivors should be asked about their employment (paid and unpaid) prior to their stroke and if they wish to return to work. For stroke survivors who wish to return to work, assessment should be offered to establish abilities relative to work demands. In addition, assistance to resume or take up work including worksite visits and workplace interventions, or referral to a supported employment service should be offered."* (source guideline) to *"Stroke survivors, who were previously working should be asked if they would like to return to work and referred to appropriate social service agencies if they wish to."* (current guideline). However, based on feedback from the wider stakeholder engagement, the final guideline recommendation was reworded as such: *"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."* (current guideline).

6.5 vi. Support (Peer support, Carer support)

48. Does peer support improve the outcomes of stroke survivors?

Recommendation 97: [Adapted]	**Strong For**
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. (187)	

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/6nYJxE/section/EvbxGE
- Local evidence: None.
- Recommendation adapted. Two changes were made:

a) Strength of recommendation was changed from "Weak For" (in source guideline) to "Strong For" (in current guideline). Consensus was not reached among guideline committee members, stroke survivors and caregivers. Of the guideline committee members, 12/21 (57%) rated "Weak For" and 9/21 rated "Strong For". Of the stroke survivors and caregivers, 9/12 (75%) rated "Strong For" and 3/12 rated "Weak For". As 80% consensus was not reached for both groups, the leads chose to follow the majority vote of the stroke survivors and caregivers. Based on the EtD framework, there was very low certainty evidence of improvement in quality of life and social participation with peer support. Slightly more than half of the guideline committee members rated the recommendation as "Weak for" as the evidence was of very low quality and not part of routine care at present, though it was acknowledged that the benefits of peer support outweigh the harms and consolidating the peer support resources can be easily done and provided to stroke survivors and families who do often ask about peer support during formal rehabilitation. Similarly, mixed opinions were shared by the stroke survivors and caregivers. While all indicated the importance and value of peer support, some shared that it might not be a priority during hospital stay and that information on local stroke support groups could be found easily on their own. In light of the workload of the rehabilitation team, stroke survivors and caregivers agreed that it was sufficient to be provided the information on local stroke support groups without the need for the rehabilitation team to explain the potential benefits. Stroke survivors can then make the decision to connect with the local stroke support group if they wish to.

b) Wording of recommendation was removed; *"…information about the availability and potential benefits of a local stroke support group…"* (source guideline) was changed to *"…information about the availability of a local stroke support group…"* (current guideline) to reduce the work required of the rehabiltiation team.

49. Do interventions to support carers improve outcomes for stroke survivors?

Recommendation 98: [Adopted]

Strong For

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. (188, 189)

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/6nYJxE/section/Eg8zGj
- Local evidence: None.
- Recommendation adopted. No changes made.

7. Implementation, update and further research

7.1 Barriers and strategies for implementing the recommendations

Implementation of guideline recommendations are known to be challenging, and factors influencing the implementation of guideline recommendations are often multifactorial and multilevel (e.g., individual level, organisational level, national level). In a 2022 systematic review on the healthcare professionals' perceived barriers and facilitators to implementing stroke rehabilitation guideline, data from 10 qualitative, 6 quantitative and 6 mixed-method studies involving 1576 participants, found that organisational practice barriers (time, resources and a lack of supporting organisational processes) and professional barriers mainly healthcare professionals' competence in guideline-recommended interventions (knowledge and skills) were cited the most (190).

Possible strategies to help overcome the barriers and implement stroke guideline recommendations include audit and feedback, educational materials, educational meetings, educational outreach visits, local opinion leaders, reminders/ behavioural nudges and team meetings (191, 192), though the evidence is not yet strong in favour of the strategies. At present, we are uncertain if implementation strategies work in stroke rehabilitation as the certainty of evidence is either very low (in improving healthcare professional adherence to evidence-based practice), or show little or no difference in patient adherence to recommended treatment, psychological well-being (low certainty evidence), health-related quality of life and activities of daily living (moderate certainty evidence).

As a first step to help clinicians implement guideline recommendations in Singapore, a toolkit has also been developed by the guideline committee. We encourage clinicians to refer to the implementation toolkit and adopt a step-by-step approach in implementing the guideline recommendations that have been rated as "Strong For" (refer to accompanying document "Singapore Stroke Rehabilitation Guideline – Implementation Toolkit).

7.2 Strategy for updating guideline

We aim to update the guideline once every five years as per Agency for Care Effectiveness' requirements. This includes reviewing the new updates from the source guideline (https://informme.org.au/guidelines/living-guidelines-updates) and repeating the process as covered in Section 5.1 Adaptation framework and process.

7.3 Challenges and suggestions for further research

We foresee two challenges:

a) keeping up with the volume of research and making the necessary decisions regarding the strength of recommendations in a short timeframe, and

b) gathering feedback in a systematic and transparent manner.

As pointed out by the Australian and New Zealand guideline committee, draft changes go through a rigorous review process and get submitted to the National Health and Medical Research Council (NHMRC) for approval. The median time from initiation to NHMRC submission is about six months (193). Without the MAGICapp platform (https://magicevidence.org), it is anticipated that our turnaround time will be longer than six months, and we are unable to gather input from the public and other stakeholders beyond the guideline committee and the Singapore National Stroke Association. As we are adapting from a living guideline, there has already been updates to the source guideline recommendations, namely in the areas on sleep disorders (Chapter 6), carer support (Chapter 8), and self-management (Chapter 8). Readers can refer to the following link for more details on the updates: https://informme.org.au/guidelines/living-guidelines-updates.

Guideline recommendations are dependent on the quality of research conducted on a particular intervention. Our work has demonstrated gaps in stroke rehabiltiation research in Singapore, and has also highlighted methodological limitations of existing studies. Future research can focus on areas where there is limited stroke rehabilitation research in Singapore (Appendix 9.3 Summary of local evidence), and improve on the methods so that results can be trusted to inform practice, and research resources are not wasted. Additionally, there remained many areas of stroke

rehabilitation care that only has consensus recommendations, or good practice points due to the lack of research. Future research can also focus on these areas. The clinical questions are as follows:

- What interventions (compensatory or restorative) improve visual field loss?
- What interventions improve outcomes in stroke survivors with cognitive communication difficulties?
- What interventions improve perceptual impairment in stroke survivors?
- What interventions are effective at managing and/or reducing oedema?
- What interventions improve the management of fatigue in stroke survivors?
- What interventions manage personality and behaviour changes?
- What interventions improve the outcomes for stroke survivors with central post-stroke pain?
- Does assessment of stroke survivors' and carers' needs prior to discharge improve outcomes after stroke?
- Does conducting a home assessment of the stroke survivor prior to discharge improve outcomes?
- Does access to information and support regarding sexuality issues improve outcomes for stroke survivors?

8. Acknowledgements

We acknowledge the help and support received from the Chief Allied Health Officer's Office, whose guidance and assistance were instrumental in bringing this work to completion. Our sincere thanks also go to the guideline committee members, stroke survivors and caregivers, advisors, and the secretariat, all of whom dedicated significant time and effort – often above and beyond their professional and personal responsibilities. Their invaluable contributions are recognised in the table below.

	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 guideline 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 guideline 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 Guideline, 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 guideline.
	Associate Professor Shamala Thilarajah	1. Chief Allied Health Officer's Office, Office of the Director General of Health Singapore 2. Physiotherapy Department, Singapore General Hospital	1. Co-Lead of CRTW sub-team 1. Clinical Practice Guideline, Senior Principal Project Administrator 2. Senior Princpal 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 implementation toolkit.

Guideline committee members

Name	Organisation	Role	Contribution
Adjunct Associate Professor Effie Chew	Division of Rehabilitation Medicine, Department of Medicine, National University Hospital	Head of Rehabilitation Medicine, Senior Consultant	Rated the strength of most recommendations and input into the wording (across 4–6 meetings), and reviewed final draft of guideline and implementation toolkit.
Adjunct Associate Professor Loh Yong Joo	Department of Rehabilitation Medicine, Tan Tock Seng Hospital	Head of Rehabilitation Medicine, Senior Consultant	Rated the strength of most recommendations and input into the wording (across 4–6 meetings), and reviewed final draft of guideline and implementation toolkit.
Dr Geoffrey Sithamparapillai	Department of Rehabilitation Medicine, Singapore General Hospital	Head of Rehabilitation Medicine, Senior Consultant	Rated the strength of most recommendations and input into the wording (across 4–6 meetings), and reviewed final draft of guideline and implementation toolkit.
Associate Professor Wee Seng Kwee	1. Clinic for Advanced Rehabilitation Therapeutics (CART), Tan Tock Seng Hospital 2. Health and Social Sciences Cluster, Singapore Institute of Technology	1. Senior Principal Physiotherapist 2. Associate Professor	Rated the strength of most recommendations and input into the wording (across 4–6 meetings), and reviewed final draft of guideline and implementation toolkit.
Ms Jean Tan	NTUC Health	Principal Physiotherapist	Rated the strength of most recommendations and input into the wording (across 4–6 meetings), and reviewed final draft of guideline and implementation toolkit.
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 guideline and implementation toolkit.
Mr Krishnasamy Gopikannan	Sunlove Abode For I/I Ltd	Rehabiltation Head	Rated the strength of most recommendations and input into the wording (across 4–6 meetings), and reviewed final draft of guideline and implementation toolkit.

	Name	Organisation	Role	Contribution
Guideline committee members	Associate Professor Tim Xu	Health and Social Sciences Cluster, Singapore Institute of Technology	Associate Professor	Rated the strength of most recommendations and input into the wording (across 4–6 meetings), and reviewed final draft of guideline and implementation toolkit.
	Dr Silvana Choo	Occupational Therapy Department, Singapore General Hospital	Senior Principal Occupational Therapist	Rated the strength of most recommendations and input into the wording (across 4–6 meetings), and reviewed final draft of guideline and implementation toolkit.
	Ms Charissa Tan	Occupational Therapy Department, Seng Kang Community Hospital	Deputy Head of Occupational Therapy, Principal Occupational Therapist	Rated the strength of most recommendations and input into the wording (across 4–6 meetings), and reviewed final draft of guideline and implementation toolkit.
	Mr Dave Leong Chee Chong	St Luke's Eldercare	Senior Occupational Therapist	Rated the strength of most recommendations and input into the wording (across 4–6 meetings), and reviewed final draft of guideline and implementation toolkit.
	Ms Janet Pua Hui Fen	SPD Therapy Hub	Cluster Head, Senior Occupational Therapist	Rated the strength of most recommendations and input into the wording (across 4–6 meetings), and reviewed final draft of guideline and implementation toolkit.
	Ms Sri Marni Bte Moonshi Nasiruddin	Jurong Community Hospital Day Rehab Centre	Senior Occupational Therapist	Rated the strength of most recommendations and input into the wording (across 4–6 meetings), and reviewed final draft of guideline and implementation toolkit.
	Dr Sajlia Bte Jalil	Woodlands Health, National University of Singapore	Head of Speech Therapy, Principal Speech Therapist	Rated the strength of most recommendations and input into the wording (across 4–6 meetings), and reviewed final draft of guideline and implementation toolkit.
	Ms Gan Hui Hui	Singapore General Hospital	Principal Speech Therapist	Rated the strength of most recommendations and input into the wording (across 4–6

Guideline committee members

Name	Organisation	Role	Contribution
			meetings), and reviewed final draft of guideline and implementation toolkit.
Dr Leonard Yeo Leong Kitt	Division of Neurology, National University Hospital	Senior Consultant	Rated the strength of some recommendations (in area of expertise) and input into the wording (across 1–3 meetings), and reviewed final draft of guideline and implementation toolkit.
Dr Carol Tham Huilian	National Neuroscience Institute	Senior Consultant	Rated the strength of some recommendations (in area of expertise) and input into the wording (across 1–3 meetings), and reviewed final draft of guideline and implementation toolkit.
Dr Tay Chong Meng	National University Centre for Oral Health	Consultant (Advanced General Dental Practice)	Rated the strength of some recommendations (in area of expertise) and input into the wording (across 1–3 meetings), and reviewed final draft of guideline and implementation toolkit.
Ms Wendy Yue Lai Theng	Alexandra Hospital	Assistant Director of Nursing (Advanced Practice Nurse)	Rated the strength of some recommendations (in area of expertise) and input into the wording (across 1–3 meetings), and reviewed final draft of guideline and implementation toolkit.
Ms Jiang Yan	Singapore General Hospital	Nurse Clinician (Advanced Practice Nurse)	Rated the strength of some recommendations (in area of expertise) and input into the wording (across 1–3 meetings), and reviewed final draft of guideline and implementation toolkit.
Ms Serene Tan	Tan Tock Seng Hospital	Senior Nurse Clinician (Advanced Practice Nurse)	Rated the strength of some recommendations (in area of expertise) and input into the wording (across 1–3 meetings), and reviewed final draft of guideline and implementation toolkit.

Guideline committee members

Name	Organisation	Role	Contribution
Ms Moh Pei Shi Shirlene	Changi General Hospital	Principal Dietitian	Rated the strength of some recommendations (in area of expertise) and input into the wording (across 1–3 meetings), and reviewed final draft of guideline and implementation toolkit.
Ms Yeo Qi Mei	Tan Tock Seng Hospital	Senior Dietitian	Rated the strength of some recommendations (in area of expertise) and input into the wording (across 1–3 meetings), and reviewed final draft of guideline and implementation toolkit.
Ms Janet Lim	Tan Tock Seng Hospital	Principal Medical Social Worker	Rated the strength of some recommendations (in area of expertise) and input into the wording (across 1–3 meetings), and reviewed final draft of guideline and implementation toolkit.
Ms Tang Siang Ning	National University Hospital	Senior Medical Social Worker	Rated the strength of some recommendations (in area of expertise) and input into the wording (across 1–3 meetings), and reviewed final draft of guideline and implementation toolkit.
Ms Lim Si Huan	Institute of Mental Health	Senior Clinical Psychologist	Rated the strength of some recommendations (in area of expertise) and input into the wording (across 1–3 meetings), and reviewed final draft of guideline and implementation toolkit.
Ms Valerie Wang	Tan Tock Seng Hospital	Senior Psychologist	Rated the strength of some recommendations (in area of expertise) and input into the wording (across 1–3 meetings), and reviewed final draft of guideline and implementation toolkit.
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
Guideline committee members				final draft of guideline and implementation toolkit.
	Ms Tan Xue Ling Serene	Tan Tock Seng Hospital	Senior Pharmacist	Rated the strength of some recommendations (in area of expertise) and input into the wording (across 1–3 meetings), and reviewed final draft of guideline and implementation toolkit.
Stroke survivors and caregivers	Ms Atika Bte Ahmed	Singapore National Stroke Association	Stroke Survivor	Rated the strength of some recommendations and input into the wording (across two meetings), and reviewed final list of recommendations.
	Ms Evelyn Leong	Singapore National Stroke Association	Stroke Survivor	Rated the strength of some recommendations and input into the wording (across two meetings), and reviewed final list of recommendations.
	Mr Kogilam Hannah	Singapore National Stroke Association	Stroke Survivor	Rated the strength of some recommendations and input into the wording (across two meetings), and reviewed final list of recommendations.
	Mr Amos Wee	Singapore National Stroke Association	Stroke Survivor	Rated the strength of some recommendations and input into the wording (across two meetings), and reviewed final list of recommendations.
	Mr Jason Ong	Singapore National Stroke Association	Stroke Survivor	Rated the strength of some recommendations and input into the wording (across two meetings), and reviewed final list of recommendations.
	Mr Hassan Chew	Singapore National Stroke Association	Stroke Survivor	Rated the strength of some recommendations and input into the wording (across two meetings), and reviewed final list of recommendations.
	Mr Terence Ang	Singapore National Stroke Association	Stroke Survivor	Rated the strength of some recommendations and input into the wording (across two meetings), and reviewed final list of recommendations.

	Name	Organisation	Role	Contribution
Stroke survivors and caregivers	Ms Maya Seah	Singapore National Stroke Association	Stroke Survivor	Rated the strength of some recommendations and input into the wording (across two meetings), and reviewed final list of recommendations.
	Mr Jonathon Tan	Singapore National Stroke Association	Caregiver	Rated the strength of some recommendations and input into the wording (across two meetings), and reviewed final list of recommendations.
	Ms Elaine Wee	Singapore National Stroke Association	Caregiver	Rated the strength of some recommendations and input into the wording (across two meetings), and reviewed final list of recommendations.
	Mr James Fong	Singapore National Stroke Association	Caregiver	Rated the strength of some recommendations and input into the wording (across two meetings), and reviewed final list of recommendations.
	Mr Melvin Yap	Singapore National Stroke Association	Caregiver	Rated the strength of some recommendations and input into the wording (across two meetings), and reviewed final list of recommendations.
	We extend our heartfelt gratitude and sincere thanks to the stroke survivors and caregivers who shared their valuable insights for this guideline but have chosen to remain anonymous.			
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 guideline and implementation of stroke guideline recommendations.

	Name	Organisation	Role	Contribution
Advisors	Dr Janine Margarita Dizon	Aged Care Research & Industry Innovation Australia (ARIIA), Flinders University	Research Fellow	Provided advice and consultation based on expertise in guideline 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.
	Ms Jasly Koo	Chief Allied Health Officer's Office, Office of the Director General of Health Singapore	Senior Manager	Co-ordinated and supported meetings, summarised meeting minutes, and collated all feedback and responses.
	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.
	Ms Wong Xiu Qing Clara	Chief Allied Health Officer's Office, Office of the Director General of Health Singapore	Principal Project Administrator	Co-ordinated and supported meetings, summarised meeting minutes, and collated all feedback and responses.
	Ms Chen Zhen Zhen	Chief Allied Health Officer's Office, Office of the Director General of Health Singapore	Principal Project Administrator	Co-ordinated and supported meetings, summarised meeting minutes, and collated all feedback and responses.

In addition to the advisors and guideline committee members, we would like to extend our appreciation to the various ministerial bodies, professional organisations, and individuals whose thoughtful insights and constructive feedback on both the methodology and final drafts of the guideline and implementation toolkit have significantly strengthened the credibility, quality, and relevance of our work. Your collaboration and shared commitment to our vision of delivering the best stroke rehabilitation care to all stroke survivors in Singapore are deeply appreciated and have been vital to the success of this initiative. We acknowledge the input and engagement with the following:

- Chairman of Medical Boards (DGH-CMB)
- National One Rehabilitation Steering Committee (NORSC)
- Agency for Care Effectiveness (ACE), Ministry of Health (MOH)
- MOH Frailty Workgroup
- MOH Divisions
- MOH Chief Offices - Chief Dental Officer, Chief Nursing Officer, Chief Pharmacist
- 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)
- Stroke Services Improvement Team
- Academy of Medicine, Singapore, along with the Colleges and Chapters for their feedback on the guideline:
  - Chapter of Family Medicine Physicians
  - 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
- Dr Davide de Sousa (Senior Physiotherapist, Northern Sydney Local Health District, NSW Government) who provided advice regarding the recommendation on strength training.

Thank you once again for your professionalism, insight, and support.

9. Annexes

9.1 Declaration form for conflict of interest

MINISTRY OF HEALTH
SINGAPORE

CONFLICT OF INTEREST DISCLOSURE DECLARATION

10 mins estimated time to complete

Instructions

The following questions are designed to allow participants in the guideline appraisal group to disclose any real or apparent conflict(s) of interest with respect to their activities in guideline development. Conflicts of interest include the appraisers' participation in the development or endorsement of any of the guideline that are being reviewed for the purpose of this project. They may also involve relationships with pharmaceutical companies or other corporations whose products or services are related to the guideline topics. Financial interests or relationships requiring disclosure include but are not limited to honoraria, consultancies, employment, or stock ownership.

The intent of the disclosure declaration is to have the participants in guideline appraisal identify any potential conflict(s) in relation to any of the guideline that are under consideration in order that appraisal group members can form their own judgments, while taking the conflict(s) of interest of other group members into consideration.

Please answer each of the following questions by circling either "NO" or "YES". If you answer "YES" to any question, please describe the nature of the interest and/or relationship, and identify the relevant commercial entity.

1. Name (This field is required):
2. Designation:
3. Preferred Mobile number (For contact):
4. Email:
5. PARTICIPATION IN GUIDELINE DEVELOPMENT Have you been involved in the development on any of the guideline under review (e.g., a member of the guideline development committee)?
   No Yes
6. GUIDELINE ENDORSEMENT Have you directly participated in any processes to formally endorse any of the guideline under review?
   No Yes
7. EMPLOYMENT Are you or have you been employed by a guideline developer or an entity having a commercial interest in any of the guideline under consideration?
   No Yes
8. CONSULTANCY Have you served as a consultant for any guideline developer or an entity having a commercial interest in any of the guideline under consideration?
   No Yes
9. OWNERSHIP INTERESTS – PART A Do you have any ownership interests (including stock options) in any entity, the stock of which is not publicly traded, which has a commercial interest in any of guideline under consideration?
   No Yes

10. OWNERSHIP INTERESTS – PART B Do you have any ownership interests (including stock options but excluding indirect investments through mutual funds and the like) valued at $1500 or more in any entity that has a commercial interest in any of the guideline under consideration?
    No Yes

11. RESEARCH FUNDING Are you currently receiving or have you received research funding from any entity that has a commercial interest in any of the guideline under consideration?
    No Yes

12. HONORARIA Have you been paid honoraria or received gifts of value equal to or greater than $3500 per year or $7500 over a three-year period from a guideline developer or an entity having a commercial interest in any of the guideline under consideration or from the developers of any of the guideline under consideration?
    No Yes

13. OTHER POTENTIAL CONFLICT(S) OF INTEREST
    No Yes

9.2 GRADE approach to rate certainty of evidence and strength of recommendations

Certainty/quality of evidence and strength of recommendations in source guideline

Certainty of evidence are presented in the form of "Summary of Findings" tables (consisting of outcomes, study results, absolute effect estimates and certainty of the evidence), while strength of recommendations are presented as "Strong For", "Weak For", "Strong Against" or "Weak Against" regarding an intervention. An example of a "Summary of Findings" table and strength of a recommendation for commencement of rehabilitation was previously shown in Figure 3.

To rate the certainty of evidence, the source guideline project team referred to Section 5. Quality of evidence in the GRADE handbook (https://gdt.gradepro.org/app/handbook/handbook.html#h.9rdbelsnu4iy) which guides the quality rating of the body of evidence, and individual systematic reviews and randomised controlled trials. The quality ratings for the body of evidence are defined as follows (4):

Certainty of evidence grade	Definition
High	We are very confident that the true effect lies close to that of the estimate of the effect.
Moderate	We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low	Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect.
Very low	We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect.

To determine the strength of recommendations, the source guideline project team referred to Section 6. Going from evidence to recommendations in the GRADE handbook (https://gdt.gradepro.org/app/handbook/handbook.html#h.33qgws879zw). Using the GRADE 'Evidence to Decision' framework, four factors are used to guide the development of a recommendation and determine the strength of that recommendation (1, 4):

1. Balance between desirable and undesirable consequences
2. Confidence in the estimates of effect (quality/certainty of evidence)
3. Confidence in values and preferences and their variability (clinical and consumer preferences), and
4. Resource use (cost and implementation considerations).

For each recommendation, readers can view the judgements and considerations made by the source guideline panel under the 'Evidence to Decision' tab on the MAGICapp platform (https://app.magicapp.org/#/guideline/Kj2R8j). Readers can refer to the following publications for further information on the development of the source guideline as a living guideline, and the feasibility of maintaining a large national guideline for stroke management (193, 194).

As per the GRADE handbook, a strong recommendation is defined as one for which the guideline panel is confident that the desirable effects of an intervention outweigh its undesirable effects (strong recommendation for an intervention), or that the undesirable effects of an intervention outweigh its desirable effects (strong recommendation against an intervention). A strong recommendation also implies that most or all clients will be best served by the recommended intervention (4). A weak recommendation is defined as one for which the desirable effects probably outweigh the undesirable effects (weak recommendation for an intervention), or undesirable effects probably outweigh the desirable effects (weak recommendation against an intervention) but appreciable uncertainty exists. A weak recommendation implies that not all clients will be best served by the recommended intervention. For weak recommendations, there is a need to consider the client's circumstances, preferences, and values and to allow more time for shared decision making with the client and caregivers (4).

The implications of a strong and weak recommendation for clients, clinicians and policy makers are provided as follows (4):

	Strong recommendations	Weak recommendations
Clients	Most clients in this situation would want the recommended course of action and only a small proportion would not.	The majority of clients in this situation would want the suggested course of action, but many would not.
Clinicians	Most clients should receive the recommended course of action. Adherence to this recommendation according to the guideline could be used as a quality criterion or performance indicator. Formal decision aids are not likely to be needed to help individuals make decisions consistent with their values and preferences.	Recognise that different choices will be appropriate for different clients, and that you must help each client arrive at a management decision consistent with her or his values and preferences. Decision aids may well be useful helping clients make decisions consistent with their values and preferences. Clinicians should expect to spend more time with clients when working towards a decision.
Policy makers	The recommendation can be adapted as policy in most situations including for the use as performance indicators.	Policy making will require substantial debates and involvement of many stakeholders. Policies are also more likely to vary between regions. Performance indicators would have to focus on the fact that adequate deliberation about the management options has taken place.

9.3 Summary of local evidence

Summary of local evidence to guide recommendations for Singapore Stroke Rehabilitation Guideline – Part 1 of 2

To adapt the Stroke Foundation guideline to the Singapore context, we considered the local evidence. Criteria for consideration of local evidence was similar to the criteria used in the (Australian) Stroke Foundation guideline (https://informme.org.au/guidelines/living-clinical-guidelines-for-stroke-management#) for consideration of new evidence. This included studies testing the effects of interventions and studies related to preferences and values of patients on a topic and/or intervention (e.g., goal-setting, physical activity, technology). In this document, we will only present the studies testing the effects of interventions which influence **the certainty of the evidence**. Studies related to the preferences and values of patients will be shared with patients once we have a first draft of the guideline. Studies related to Neuroaid will be discussed with the Stroke Services Improvement team. Hence, both types of studies are not included in this document.

We conducted a search on Pubmed on 2 July 2023. Of the 2687 titles and abstracts screened, 138 full-text articles were downloaded, and **22 articles** were included which are relevant for **9 recommendations**: Sensorimotor impairment, Activity limitations (e.g., arm activity), Activity limitations (e.g., sitting, standing, standing up, walking), Telehealth in rehabilitation, Spasticity, Contracture, Pain, Discharge care plans, and Return to Work. There are two parts to this document. Part 1 contains summary of local evidence for 7 recommendations: Activity limitations (e.g., sitting, standing, standing up, walking), Telehealth in rehabilitation, Spasticity, Contracture, Pain, Discharge care plans, and Return to Work. Part 2 contains summary of local evidence for 2 recommendations: Sensorimotor impairment, Activity limitations (e.g., arm activity) – to follow at later stage.

We referred to section 5 of the GRADE handbook (https://gdt.gradepro.org/app/handbook/handbook.html#h.m9385o5z3li7) in determining the quality/certainty of evidence and how confident we are in the effect estimate in the context of making recommendations. As per the GRADE approach, the following criteria reduce the certainty/quality of evidence:

- Study design – observational studies (as opposed to randomised controlled trials (RCTs))
- (For RCTs) Lack of allocation concealment
- (For RCTs) Lack of blinding
- (For RCTs) Incomplete accounting of patients and outcome events
- (For RCTs) Selective outcome reporting
- (For RCTs) Other limitations (e.g., use of unvalidated outcome measures, stopping trial early, recruitment bias)

A summary of the articles in terms of their certainty of evidence is presented in the following table. **Please consider not only the certainty of the evidence, but also the results of the study when determining the strength of recommendations** for the Singapore Stroke Rehabilitation Guideline. Note that almost all study results need to be interpreted with caution due to study limitations.

Summary of local evidence to guide recommendations for Singapore Stroke Rehabilitation Guideline – Part 1 of 2

Recommendations	Studies	Certainty of the Evidence
Activity limitations (e.g., sitting, standing, standing up, walking)	Chiong (2012)(1)	• **Low certainty evidence:** toe spreader on gait characteristics, pain, acitivity level and balance • Results showed no statistically significant differences in outcomes between groups. • Study limitations include: ◦ Small sample size (n = 9)
	Chua (2016)(2)	• **Moderate certainty evidence:** electromechanical gait trainer on walking (FAC), function (BI), gait velocity and health status (SIS). Two-arm trial (n = 106) consisting of electromechanical gait trainer and conventional physiotherapy.

Recommendations	Studies	Certainty of the Evidence
		• Results showed: ◦ No statistically significant difference for all outcomes between groups. • Study limitations include: ◦ <85% follow-up (though note missing data were imputed)
	Chua (2020)(3)	• **Very Low certainty evidence:** an automated, speed-sensing treadmill prototype with partial body weight support on walking capacity (6MWT), gait speed (10MWT), ambulation ability (FAC), balance ability (BBS), adverse events and subjective feedback/user acceptability. • Results (within-group) showed: ◦ Statistically significant improvements in 6MWT, 10MWT and BBS. ◦ No statistically significant improvements in FAC – interpret with caution due to study limitations. • Study limitations include: ◦ Not a randomised controlled trial ◦ Small sample size (n = 11)
	Tay (2021a)(4)	• **Very Low certainty evidence:** robotic-assisted gait training on walking (FAC), lower limb motor impairment (FMA-LL) and activities of daily performance scores (FIM). Two retrospective cohorts (n = 150) consisting of robotic-assisted gait training and usual care (conventional physiotherapy). • Results showed: ◦ Statistically significant difference for FIM scores between groups ◦ No statistically significant difference for other outcomes between groups— interpret with caution due to study limitations. • Study limitations include: ◦ Not a randomised controlled trial
	Tay (2021b)(5)	• **Very Low certainty evidence:** robotic therapy with patient-guided suspension system gait training on activities of daily performance scores (FIM), BBS, FAC, mRS, ambulation distance and patient satisfaction. Two retrospective cohorts (n = 100) consisting of robotic therapy and usual care. • Results showed: ◦ Statistically significant difference for FAC scores between groups ◦ No statistically significant difference for other outcomes between groups – interpret with caution due to study limitations. • Study limitations include: ◦ Not a randomised controlled trial

Recommendations	Studies	Certainty of the Evidence
	Rajaratnam (2013)(6)	• **Very Low certainty evidence:** virtual reality on dynamic balance (FRT, TUG, MBI, BBS, CoP) • Results showed: ◦ Statistically significant difference for FRT scores between groups ◦ No statistically significant difference for other outcomes between groups – interpret with caution due to study limitations. • Study limitations include: ◦ No concealed allocation ◦ Small sample size (n = 19)
Telehealth in rehabilitation	Asano (2021)(7)	• **Moderate certainty evidence:** tele-rehabilitation on self-reported disability (disability component of the Late-Life Function and Disability Instrument (LLFDI). Two-arm trial (n = 124) consisting of tele-rehab and usual care. • Results showed no statistically significant difference for LLFDI scores between groups. • Study limitations include: ◦ No concealed allocation ◦ <85% follow-up
Spasticity	Chiong (2012)(1)	• **Low certainty evidence:** toe spreader on gait characteristics, pain, activity level and balance • Results showed no statistically significant differences in outcomes between groups. • Study limitations include: ◦ Small sample size (n = 9)
	Lim (2006)(8)	• **Very Low certainty evidence:** botulinum toxin A on spasticity, pain, functional disability and timed walking over 20m • No statistical tests done • Study limitations include: ◦ Not a randomised controlled trial ◦ Small sample size (n = 7)
	Kong (2007)(9)	• **Very Low certainty evidence:** botulinum toxin A on spasticity, pain and passive joint range of motion • Results showed: ◦ Statistically significant differences in reduction of spasticity ◦ No statistically significant differences in pain ◦ No statistically significant differences in passive joint range of motion between groups • Study limitations include: ◦ No concealed allocation ◦ Small sample size (n = 17)

Recommendations	Studies	Certainty of the Evidence
	Kong (2002)(10)	• **Very Low certainty evidence:** intramuscular neurolysis or motor point blocks of the finger flexors on spasticity and joint range of motion • Results showed: ◦ Statistically significant differences in reduction of spasticity ◦ Statistically significant differences in improvement of joint range of motion between groups at 4 weeks, 3 months and 6 months post neurolysis – interpret with caution due to study limitations. • Study limitations include: ◦ Not a randomised controlled trial ◦ Small sample size (n = 30)
Contracture	Kong (2007)(9)	• **Very Low certainty evidence:** botulinum toxin A on spasticity, shoulder pain and passive joint range of motion • Results showed: ◦ Statistically significant differences in reduction of spasticity ◦ No statistically significant differences in pain ◦ No statistically significant differences in passive joint range of motion between groups. • Study limitations include: ◦ No concealed allocation ◦ Small sample size (n = 17)
	Kong (2002)(10)	• **Very Low certainty evidence:** intramuscular neurolysis or motor point blocks of the finger flexors on spasticity and joint range of motion • Results (within-group) showed: ◦ Statistically significant differences in reduction of spasticity ◦ Statistically significant differences in improvement of joint range of motion at 4 weeks, 3 months and 6 months post neurolysis. • Study limitations include: ◦ Not a randomised controlled trial ◦ Small sample size (n = 30)
Pain (e.g., shoulder pain)	Chiong (2012)(1)	• **Low certainty evidence:** toe spreader on gait characteristics, pain, activity level and balance • Results showed no statistically significant differences in outcomes. • Study limitations include: ◦ Small sample size (n = 9)
	Kong (2007)(9)	• **Very Low certainty evidence:** botulinum toxin A on spasticity, pain and passive joint range of motion • Results showed: ◦ Statistically significant differences in reduction of spasticity

Recommendations	Studies	Certainty of the Evidence
		◦ No statistically significant differences in pain ◦ No statistically significant differences in passive joint range of motion between groups. • Study limitations include: ◦ No concealed allocation ◦ Small sample size (n = 17)
	Lim (2006)(8)	• **Very Low certainty evidence:** botulinum toxin A on spasticity, pain, functional disability and timed walking over 20m • No statistical tests done • Study limitations include: ◦ Not a randomised controlled trial ◦ Small sample size (n = 7)
Discharge care plans	Matchar (2022)(11)	• **Moderate certainty evidence:** free transport services and/or free stroke rehabilitation sessions on uptake of and adherence to outpatient stroke rehabilitation services. Three-arm trial (n = 266) consisting of free transport (Rx arm 1), free transport and free stroke rehabilitation sessions (Rx arm 2) and education session (control). • Results showed: ◦ No difference in uptake between groups ◦ Statistically significant differences in number of total rehabilitation sessions between Rx groups and control – interpret with caution due to study limitations. • Study limitations include: ◦ No blinded outcome assessor ◦ No intention-to-treat analysis ◦ No baseline comparability ◦ No health-related outcomes
Return to work	Bin Zainal (2020)(12)	• **Very low certainty evidence:** return to work programme on return to work rate and community reintegration (measured by the Community Integration Questionnaire). • Results (within-group) showed: ◦ 88% returned to work after programme ◦ Statistically significant differences between CIQ scores at program enrolment and completion – interpret with caution due to study limitations. • Study limitations include: ◦ Not a randomised controlled trial ◦ Small sample size (n = 50) ◦ No follow-up after programme completion

BBS, Berg Balance Scale; BCI MI, Brain-Computer Interface-Assisted Motor Imagery; BI, Barthel Index; CoP, Centre of Pressure; FAC, Functional Ambulation Category; FMA-UL, Fugl-Meyer Upper Limb Assessment; FRT, Functional Reach Test; MBI, Modified Barthel Index; mRS, Modified Rankin Scale; Rx, Treatment; SIS, Stroke Impact Scale; TMS, Transcranial Magnetic Stimulation; TUG, Timed-Up and Go Test; 6MWT, 6-Minute Walk Test; 10MWT, 10-Metre Walk Test.

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Summary of local evidence to guide recommendations for Singapore Stroke Rehabilitation Guideline – Part 2 of 2

Recommendations	Studies	Certainty of the Evidence
Sensorimotor impairment (e.g., weakness, loss of sensation)	Ang (2014a)(1)	• **Very Low certainty evidence:** EEG-based MI BCI system on FMA-UL • Results showed: ◦ No statistically significant difference for FMA-UL between groups. • Study limitations include: ◦ No concealed allocation ◦ No intention-to-treat analysis ◦ No point estimates and variability ◦ Small sample size (n = 26)
	Ang (2014b)(2)	• **Very low certainty evidence:** EEG-based MI BCI system coupled with HK robot on FMA-UL. Three-arm trial (n = 22) consisting of BCI-HK robot (Rx arm 1), HK robot (Rx arm 2) and standard arm therapy (control) • Results showed: ◦ No statistically significant difference for FMA-UL between groups. • Study limitations include: ◦ No concealed allocation ◦ No intention-to-treat analysis ◦ Small sample size (n = 21)
	Ang (2015)(3)	• **Very low certainty evidence:** tDCS on FMA-UL. • Results showed: ◦ No statistically significant difference for FMA-UL between groups. • Study limitations include: ◦ No concealed allocation ◦ No intention-to-treat analysis ◦ No point estimates and variability ◦ Small sample size (n = 19)
	Budhota (2021)(4)	• **Moderate certainty evidence:** Robot-aided therapy on FMA-UL, grip strength and ARAT. • Results showed: ◦ No statistically significant difference for FMA-UL, grip strength and ARAT between groups. • Study limitations include – nil (although sample size appears small at n = 44, prior sample size calculation to detect between-group differences was at 40 and study recruited 44, to account for possible 10% drop-out rate)
	Chin (2021)(5)	• **Moderate certainty evidence:** Self-directed UL program outside therapy (Self-Empowered UL Repetitive Engagement, SURE) on FMA-UL and ARAT.

Recommendations	Studies	Certainty of the Evidence
		• Results showed: ◦ No statistically significant difference for FMA-UL, and ARAT between groups. • Study limitations include: ◦ Small sample size (n = 23)
	Hong (2017)(6)	• **Very Low certainty evidence:** combined MI-BCI and tDCS on FMA-UL. • Results showed: ◦ No statistically significant difference for FMA-UL between groups. • Study limitations include: ◦ No concealed allocation ◦ No intention-to-treat analysis ◦ No point estimates and variability ◦ Small sample size (n = 19)
	Hu (2021)(7)	• **Very Low certainty evidence:** combined MI-BCI and tDCS on FMA-UL. • Results showed: ◦ No statistically significant difference for FMA-UL between groups. • Study limitations include: ◦ No concealed allocation ◦ No intention-to-treat analysis ◦ Small sample size (n = 19)
	Kong (2016)(8)	• **Low certainty evidence:** NW gaming and conventional therapy on FMA-UL, ARAT, FIM and SIS. Three-arm trial (n = 105) consisting of NW gaming (Rx arm 1), conventional therapy (Rx arm 2) and no additional upper limb exercises/ usual OT care (control). • Results showed: ◦ No statistically significant difference for FMA-UL, ARAT, FIM and SIS between groups. • Study limitations include: ◦ No concealed allocation ◦ No blinded assessor ◦ No intention-to-treat analysis
	Samuel (2015)(9) FMA-UL, ARAT, FIM	• **Very Low certainty evidence:** Additional VR-based therapy in addition to standard therapy on FMA-UL, and FIM. • Results (within one individual) showed: ◦ “Clinically significant” improvement in FMA-UL – “upper limb speed and quality of movement” ◦ No “clinically significant” improvement for ARAT ◦ No reporting of significant improvement for FIM

Recommendations	Studies	Certainty of the Evidence
		• Study limitations include ◦ Not a randomised controlled trial (single case study) ◦ No statistical comparisons ◦ No point estimates and variability
	Yin (2014)(10)	• **Low certainty evidence:** VR therapy on FMA-UL, ARAT, FIM and MAL • Results showed: ◦ No statistically significant difference for FMA-UL, ARAT, FIM and MAL between groups • Study limitations include: ◦ No blinded assessor ◦ No intention to treat analysis ◦ Small sample size (n = 23)
Activity limitations (e.g., arm activity)	Budhota (2021)(4)	• **Moderate certainty evidence:** Robot-aided therapy on FMA-UL, grip strength and ARAT. • Results showed: ◦ No statistically significant difference for FMA-UL, grip strength and ARAT between groups. • Study limitations include – nil (although sample size appears small at n = 44, prior sample size calculation to detect between-group differences was at 40 and study recruited 44, to account for possible 10% drop-out rate)
	Chin (2021)(5)	• **Moderate certainty evidence:** Self-directed UL program outside therapy (Self-Empowered UL Repetitive Engagement, SURE) on FMA-UL and ARAT. • Results showed: ◦ No statistically significant difference for FMA-UL, and ARAT between groups. • Study limitations include: ◦ Small sample size (n = 23)
	Kong (2016)(8)	• **Low certainty evidence:** NW gaming and conventional therapy on FMA-UL, ARAT, FIM and SIS. Three-arm trial (n = 105) consisting of NW gaming (Rx arm 1), conventional therapy (Rx arm 2) and no additional upper limb exercises/ usual OT care (control). • Results showed: ◦ No statistically significant difference for FMA-UL, ARAT, FIM and SIS between groups. • Study limitations include: ◦ No concealed allocation ◦ No blinded assessor ◦ No intention-to-treat analysis
	Samuel (2015)(9) FMA-UL, ARAT, FIM	• **Very Low certainty evidence:** Additional VR-based therapy in addition to standard therapy on FMA-UL, and FIM.

Recommendations	Studies	Certainty of the Evidence
		• Results (within one individual) showed: ◦ "Clinically significant" improvement in FMA-UL – "upper limb speed and quality of movement" ◦ No "clinically significant" improvement for ARAT ◦ No reporting of significant improvement for FIM • Study limitations include ◦ Not a randomised controlled trial (single case study) ◦ No statistical comparisons ◦ No point estimates and variability
	Yin (2014)(10)	• **Low certainty evidence:** VR therapy on FMA-UL, ARAT, FIM and MAL • Results showed: ◦ No statistically significant difference for FMA-UL, ARAT, FIM and MAL between groups • Study limitations include: ◦ No blinded assessor ◦ No intention to treat analysis ◦ Small sample size (n = 23)

ARAT, Action Research Arm Test; EEG, Electroencephalography; BCI MI, Brain-Computer Interface-Assisted Motor Imagery; FMA-UL, Fugl-Meyer Upper Limb Assessment; FIM, Functional Independence Measure; HK, Haptic Knob robot; MAL, Motor Activity Log; NW, Nintendo Wii; OT, Occupational therapy; SIS, Stroke Impact Scale; tDCS, transcranial direct current stimulation; VR, Virtual reality

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9.4 Differences between source guideline and current guideline

Changes made in our current guideline are summarised as follows and categorised into three broad changes: a) guideline recommendations that were removed (n = 5), b) guideline recommendations that were changed in terms of strength (n = 7), and c) guideline recommendations that were changed in terms of wording (n = 25). Feedback received from stakeholders also resulted in changes to wording throughout the guideline to reflect the use of person-first language. Instead of "stroke patient(s)", we have replaced relevant text with "stroke survivor(s)". This ensures that our language recognises individuals first, rather than defining them by their condition.

a) Guideline recommendations removed (n = 5)

For older stroke survivors living in a nursing home, routine occupational therapy is not recommended to improve activities of daily living function. (195)	**Weak Against**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/EaYKGE
- Local evidence: None.
- Recommendation removed. Consensus was not reached among guideline committee members (12/16 (75%) rated "Weak Against", 3/12 rated "Strong Against" and 1/12 rated "Weak For"). There were concerns that the recommendation was not applicable in Singapore due to a shortage of occupational therapists working in the community including nursing homes. Some concerns were also raised with the word "routine" and that in some cases, some therapy provided by other professions (e.g., leisure therapy provided by nursing aides) might help improve some seated activities of daily living. All guideline committee members agreed to the removal of the guideline recommendation.

Brain stimulation (transcranial direct stimulation or repetitive transcranial magnetic stimulation) should not be used in routine practice for improving arm function, and only used as part of a research framework. (196–198)	**Weak Against**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/nyGJPj
- Local evidence: Ten studies of mostly low to very low certainty evidence (80–87), with two of moderate certainty evidence (88, 89). Studies looked at the effects of brain-computer interface-based rehabilitation, transcranial direct current stimulation, robot-assisted training, gaming, virtual reality and self-directed upper limb program on outcomes measuring upper limb recovery, including Fugl-Meyer Assessment – Upper Limb, grip strength and the Action Research Arm Test. Only nine studies were randomised controlled trials (80–83, 85–89), five studies compared between-group differences and provided point measures and measures of variability to estimate size of treatment effect (83, 85, 87–89), but all found no statistically significant differences in upper limb recovery outcomes between groups (Appendix 9.3 Summary of local evidence). (Note: Three of the five randomised controlled trials had small sample sizes (n = 19 and 23) and were likely to be underpowered to detect a between-group difference in the primary outcome (85, 87, 89).) To contribute to the EtD framework, future studies can address the limitations in current randomised controlled trials, look into benefits and harms of interventions, values and preferences of stroke survivors and caregivers regarding interventions to improve upper limb recovery and resource implications (e.g., cost-effectiveness outcomes).
- Recommendation removed. Consensus was reached among guideline committee members with a majority rating of "Weak Against", largely due to moderate certainty evidence of little or no difference on arm activity, lack of equipment in clinical practice, unknown optimal dosages and cost of repetitive transcranial magnetic stimulation. As per our protocol, the recommendation should be included; however it was removed as feedback from the wider stakeholder engagement indicated that brain stimulation was currently offered in some rehabilitation settings in Singapore, and many randomised trials were ongoing which might change the quality of evidence in the near future (196). We encourage shared decision making to be initiated between the

healthcare professionals, stroke survivors and families prior to the delivery of brain stimulation. Future studies can also look into the cost/economic implications of the brain stimulation interventions targeted at improving arm activity after stroke.

Brain stimulation (transcranial direct stimulation or repetitive transcranial magnetic stimulation) should not be used in routine practice to improve activities of daily living and only used as part of a research framework. (196, 198)	**Weak Against**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/EaYKGE
- Local evidence: None.
- Recommendation removed. Consensus was reached among guideline committee members with a majority rating of "Weak Against", largely due to low to moderate certainty evidence of a small improvement in activities of daily living, lack of equipment in clinical practice, unknown optimal dosages and cost of repetitive transcranial magnetic stimulation. As per our protocol, the recommendation should be included; however it was removed as feedback from the wider stakeholder engagement indicated that brain stimulation was currently offered in some rehabilitation settings in Singapore, and many randomised trials were ongoing which might change the quality of evidence in the near future (196). We encourage shared decision making to be initiated between the healthcare professionals, stroke survivors and families prior to the delivery of brain stimulation. Future studies can also look into the cost/economic implications of the brain stimulation interventions targeted at improving activities of daily living after stroke.

Brain stimulation (transcranial direct current stimulation or repetitive transcranial magnetic stimulation), with or without traditional aphasia therapy, is not recommended in routine practice for improving speech and language function in chronic patients with aphasia and only used as part of a research framework. (199, 200)	**Weak Against**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/jmqavj
- Local evidence: None.
- Recommendation removed. Consensus was reached among guideline committee members with a majority rating of "Weak Against", largely due to low certainty evidence of a small improvement in speech and language function, lack of equipment in clinical practice, unknown optimal dosages and cost of repetitive transcranial magnetic stimulation. As per our protocol, the recommendation should be included; however it was removed as feedback from the wider stakeholder engagement indicated that brain stimulation was currently offered in some rehabilitation settings in Singapore, and many randomised trials were ongoing which might change the quality of evidence in the near future (196). We encourage shared decision making to be initiated between the healthcare professionals, stroke survivors and families prior to the delivery of brain stimulation. Future studies can also look into the cost/economic implications of the brain stimulation interventions targeted at improving aphasia after stroke.

Non-invasive brain stimulation should not be used in routine clinical practice to decrease unilateral neglect, but may be used within a research framework. (201–203)	**Weak Against**

- Link to research evidence and the Evidence to Decision (EtD) framework in source guideline: https://app.magicapp.org/#/guideline/Kj2R8j/section/nVb4Nn
- Local evidence: None.
- Recommendation removed. Consensus was reached among guideline committee members with a majority rating of "Weak Against", largely due to low to moderate certainty evidence of a small improvement in neglect,

lack of equipment in clinical practice, unknown optimal dosages, possible side effects/harm and cost of repetitive transcranial magnetic stimulation. As per our protocol, the recommendation should be included; however it was removed as feedback from the wider stakeholder engagement indicated that brain stimulation was currently offered in some rehabilitation settings in Singapore, and many randomised trials were ongoing which might change the quality of evidence in the near future (196). We encourage shared decision making to be initiated between the healthcare professionals, stroke survivors and families prior to the delivery of brain stimulation. Future studies can also look into the cost/economic implications of the brain stimulation interventions targeted at improving neglect after stroke.

b) Guideline recommendations changed in terms of strength from "Weak For" (source guideline) to "Strong For" (current guideline) (n = 7)

Recommendation 1: [Adapted] Secondary prevention: Lifestyle modifications

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 (28–31).

Recommendation 40: [Adapted] Communication partner training

Communication partner training should be provided to carers or family members of people with aphasia after stroke. (100, 103)

Recommendation 88: [Adapted] Falls

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. (169, 170)

Recommendation 91: [Adapted] Carer training

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. (175)

Recommendation 94: [Adapted] Community mobility and outdoor travel

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. (181, 182)

Recommendation 96: [Adapted] Return to work

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. (185)

Recommendation 97: [Adapted] Peer support

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. (187)

c) Guideline recommendations changed in terms of wording (Change in italics.) (n = 25)	
Source Guideline	**Current Guideline**
Recommendation 1: Secondary prevention: Lifestyle modifications Interventions addressing secondary stroke risk factors may 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 (28–31).	**[Adapted] Recommendation 1: Secondary prevention: Lifestyle modifications** *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 (28–31).
Recommendation 2: Commencement of rehabilitation For stroke patients, starting intensive out-of-bed activities within 24 hours of stroke onset is not recommended. (9, 11, 34)	**[Adapted] Recommendation 2: Commencement of rehabilitation** For stroke *survivors*, starting intensive out-of-bed activities within 24 hours of stroke onset is not recommended. (9, 11, 34)
Recommendation 3: Commencement of rehabilitation All stroke patients should commence mobilisation (out-of-bed activity) within 48 hours of stroke onset unless otherwise contraindicated (e.g. receiving end-of-life care). (9, 35)	**[Adapted] Recommendation 3: Commencement of rehabilitation** 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). (9, 35)
Recommendation 7: Early supported discharge services Where appropriate home-based coordinated stroke services are available, early supported discharge services should be offered to stroke patients with mild to moderate disability. (40)	**[Adapted] Recommendation 7: Early supported discharge services** Where appropriate home-based coordinated stroke services are available, early supported discharge services should be offered to *stroke survivors* with mild to moderate disability. (40)
Recommendation 8: Home-based rehabilitation Home-based rehabilitation may be considered as a preferred model for delivering rehabilitation in the community. Where home rehabilitation is unavailable, stroke patients requiring rehabilitation should receive centre-based care. (41, 42)	**[Adapted] Recommendation 8: Home-based rehabilitation** Home-based rehabilitation may be considered as a preferred model for delivering rehabilitation in the community. Where home rehabilitation is unavailable, *stroke survivors* requiring rehabilitation should receive centre-based care. (41, 42)
Recommendation 13: Sensation For stroke survivors with sensory loss of the upper limb, sensory-specific training may be provided. (47–49)	**[Adapted] Recommendation 13: Sensation** For stroke survivors with sensory loss of the upper limb, sensory-specific training may be provided *to improve sensation*. (47–49)
Recommendation 29: Arm activity Hand and wrist orthoses (splints) should not be used as part of routine practice as they have no effect on function, pain or range of movement. (90)	**[Adapted] Recommendation 29: Arm activity** Hand and wrist orthoses (splints) should not be used as part of *usual care* as they have no effect on function, pain or range of movement. (90)

Source Guideline	Current Guideline
Recommendation 40: Communication partner training Communication partner training may be provided to carers or family members of people with aphasia after stroke. (100, 103)	**[Adapted] Recommendation 40: Communication partner training** Communication partner training *should* be provided to carers or family members of people with aphasia after stroke. (100, 103)
Recommendation 51: Nutrition and hydration • All stroke patients should have their hydration status assessed, monitored, and managed throughout their hospital admission. Where fluid support is required, crystalloid solution should be used in preference to colloid solutions as the first option to treat or prevent dehydration. (119)	**[Adapted] Recommendation 51: Nutrition and hydration** • All *stroke survivors* should have their hydration status assessed, monitored, and managed throughout their hospital admission. Where fluid support is required, crystalloid solutions *(e.g., normal saline)* should be used in preference to colloid solutions *(e.g., albumin)* as the first option to treat or prevent dehydration. (119)
Recommendation 52: Nutrition and hydration All patients with stroke should be screened for malnutrition at admission and on an ongoing basis (at least weekly) while in hospital.	**[Adapted] Recommendation 52: Nutrition and hydration** All patients with stroke should be screened for malnutrition at admission and on an ongoing basis (at least weekly) while in hospital. (120) *The screening should preferably be done by trained healthcare professionals with use of a validated nutrition screening tool.*
Recommendation 53: Nutrition and hydration For patients with stroke whose nutrition status is poor or deteriorating, nutrition supplementation should be offered.	**[Adapted] Recommendation 53: Nutrition and hydration** For patients with stroke whose nutrition status is poor or deteriorating, nutrition supplementation should be offered. (120, 121) *Nutrition supplementation can include oral nutritional supplements, food fortification strategies, small frequent meals and/or specialist dietary advice.*
Recommendation 55: Nutrition and hydration: Early feeding • For patients with stroke who do not recover a functional swallow, nasogastric tube feeding is the preferred method of feeding in the short term. (120–122) • For patients with stroke , there is no preference with regard to continuous pump (meaning using a pump for greater than or equal to 16 hrs out of 24 hrs for less than or equal to 80 ml/hr) feeding versus intermittent bolus feeding (meaning 250–400 mls/hr for 4–5 times/day) therefore practical issues, cost and patient preferences should guide practice. (123)	**[Adapted] Recommendation 55: Nutrition and hydration: Early feeding** • For patients with stroke who do not recover a functional swallow, nasogastric tube feeding is the preferred method of feeding in the short term. (120–122) • *For patients with stroke, the use of intermittent bolus feeding is usually recommended in Singapore. The use of continuous pump feeding may be recommended based on clinical indications. (123)*

Source Guideline	Current Guideline
Recommendation 73: Incontinence • Stroke patients in hospital with confirmed continence difficulties, should have a structured continence management plan formulated, documented, implemented and monitored. (148) If incontinence persists the stroke survivor should be re-assessed and referred for specialist review once in the community. (149)	**[Adapted] Recommendation 73: Incontinence** • *Stroke survivors* in hospital with confirmed continence difficulties, should have a structured continence management plan formulated, documented, implemented and monitored. (148) If incontinence persists the stroke survivor should be re-assessed and referred for specialist review once in the community. (149)
Recommendation 74: Incontinence For stroke survivors with urge incontinence: • Anticholinergic drugs can be tried (150, 152); • A prompted or scheduled voiding regime program/ bladder retraining can be trialled (149–151); If continence is unachievable, containment aids can assist with social continence.	**[Adapted] Recommendation 74: Incontinence** For stroke survivors with urge incontinence: • A prompted or scheduled voiding regime program/ bladder retraining can be trialled (149–151); • Anticholinergic drugs *may be considered* (150, 152); If continence is unachievable, containment aids can assist with social continence.
Recommendation 77: Mood disturbance For stroke survivors with emotionalism, antidepressant medication such as selective serotonin reuptake inhibitors (SSRIs) or tricyclic antidepressants may be used. (156)	**[Adapted] Recommendation 77: Mood disturbance** For stroke survivors with emotionalism*/pathological emotional expression, specialist assessment for diagnostic clarification is recommended, and* antidepressant medication such as selective serotonin reuptake inhibitors (SSRIs) or tricyclic antidepressants may be used. (156)
Recommendation 78: Mood disturbance For stroke survivors, antidepressant medication may be used to prevent depression. (157)	**[Adapted] Recommendation 78: Mood disturbance** For stroke survivors, antidepressant medication may be used to prevent depression *if the benefits of the medication outweigh the risk (e.g., seizures, fractures) and in the absence of contraindications. (94, 157) This can be considered for some stroke survivors at high risk of developing depression (e.g., history of depression, previous stroke, more severe stroke/ disability and those with aphasia) (158, 159), or when other preventative non-pharmacological approaches do not work, or are not appropriate.*
Recommendation 81: Mood disturbance For stroke survivors with depression or depressive symptoms, psychological therapy may be provided. (161)	**[Adapted] Recommendation 81: Mood disturbance** For stroke survivors with depression or depressive symptoms, psychological therapy may be *considered*. (161)
Recommendation 83: Mood disturbance For stroke survivors with depression, non-invasive brain stimulation (repetitive transcranial magnetic stimulation [rTMS]) may be used. (161)	**[Adapted] Recommendation 83: Mood disturbance** For stroke survivors with depression, non-invasive brain stimulation (repetitive transcranial magnetic stimulation [rTMS]) may be *considered as an alternative where services are available, if*

Source Guideline	Current Guideline
	pharmacotherapy is contraindicated, not tolerated, or failed. (161)
Recommendation 85: Deep venous thrombosis or pulmonary embolism For acute ischaemic stroke patients who are immobile, low molecular weight heparin in prophylactic doses may be used in the absence of contraindications. (164, 165)	**[Adapted] Recommendation 85: Deep venous thrombosis or pulmonary embolism** For stroke survivors who are *immobile after an acute ischaemic stroke*, low molecular weight heparin in prophylactic doses may be used *if the benefits of deep venous thrombosis prophylaxis outweigh the risks and* in the absence of contraindications. (164, 165)
Recommendation 86: Deep venous thrombosis or pulmonary embolism For acute stroke patients who are immobile, intermittent pneumatic compression may be used, either as an alternative to low molecular weight heparin or in those with a contraindication to pharmacological deep venous thrombosis prophylaxis (including patients with intracerebral haemorrhage or within 24 hours of thrombolysis). (166)	**[Adapted] Recommendation 86: Deep venous thrombosis or pulmonary embolism** For *stroke survivors who are immobile after an acute stroke*, intermittent pneumatic compression may be used, either as an alternative to low molecular weight heparin or in those with a contraindication to pharmacological deep venous thrombosis prophylaxis (including patients with intracerebral haemorrhage or within 24 hours of thrombolysis). (166)
Recommendation 92: Self-management • Stroke survivors who are cognitively able and their carers should be made aware of the availability of generic self-management programs before discharge from hospital and be supported to access such programs once they have returned to the community. • Stroke-specific self-management programs may be provided for those who require more specialised programs. • A collaboratively developed self-management care plan may be used to harness and optimise self-management skills.	**[Adapted] Recommendation 92: Self-management** • eStroke survivors who are cognitively able and their carers should be made aware of the availability of generic self-management programs before discharge from hospital and be supported to access such programs once they have returned to the community. • Stroke-specific self-management programs may be provided for those who require more specialised programs. • A collaboratively developed self-management care plan *between stroke survivors, caregivers and healthcare professionals* may be used to harness and optimise self-management skills.
Recommendation 94: Community mobility and outdoor travel 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 agencies. 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. (181, 182)	**[Adapted] Recommendation 94: Community mobility and outdoor travel** 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. (181, 182)

Source Guideline	Current Guideline
Recommendation 95: Leisure For stroke survivors, targeted occupational therapy programs including leisure therapy may be used to increase participation in leisure activities. (183, 184)	**[Adapted] Recommendation 95: Leisure** For stroke survivors, targeted occupational therapy or other programs including leisure therapy may be used to increase participation in leisure activities. (183, 184)
Recommendation 96: Return to work All stroke survivors should be asked about their employment (paid and unpaid) prior to their stroke and if they wish to return to work. For stroke survivors who wish to return to work, assessment should be offered to establish abilities relative to work demands. In addition, assistance to resume or take up work including worksite visits and workplace interventions, or referral to a supported employment service should be offered. (185)	**[Adapted] Recommendation 96: Return to work** 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.* (185)
Recommendation 97: Peer support Stroke survivors and their families/carers should be given information about the availability and potential benefits of a local stroke support group and/or other sources of peer support before leaving hospital and when back in the community. (187)	**[Adapted] Recommendation 97: Peer support** 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. (187)

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