

STROKE REHABILITATION: AN OUTLINE FOR THE FAMILY PHYSICIAN

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ABSTRACT

Stroke is an important cause of chronic disability globally and is the most common neurological cause of long-term disability in adults in Singapore. With improved treatments of acute stroke and an ageing population, the number of stroke survivors living in the community is likely to increase. This article discusses some aspects of recovery and the rehabilitation approach and also highlights two common post-stroke complications, namely post-stroke spasticity and hemiplegic shoulder pain. The benefits of increasing physical activity and reducing sedentary time for the prevention of stroke recurrence are also described, together with information on how the family practitioner can encourage their stroke patients to develop an active lifestyle.

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INTRODUCTION

Stroke is a leading cause of acquired, long-term disability worldwide. Although preventive measures and improved treatment of acute stroke (such as thrombolysis and thrombectomy) have led to a decrease of age-standardised stroke mortality rates over the past decades, the absolute number of stroke survivors living in our society has increased considerably, leading to a growing burden of disease and related disability.¹ This situation is likely to worsen with an ageing population.

Following a stroke, a wide range of deficits can occur with varying onset latencies, such as hemiparesis, abnormal posture, sensory impairments, spatial hemi-neglect, aphasia, and spasticity, along with affective and cognitive deficits, chronic pain, and depression. A comprehensive rehabilitation programme is essential to optimise post-stroke outcomes.

RECOVERY FROM STROKE

Motor recovery after stroke has been regarded by some as the individual's change in two domains: 1) body function

and structure, whose improvement has been called "true recovery" and refers to the restitution of a movement repertoire that the individual had before the injury; and 2) the ability to successfully perform the activities of daily living. While the former is mainly due to the interaction of post-stroke neuroplasticity mechanisms and sensorimotor training, the latter is also influenced by the use of explicit and implicit compensatory strategies.²

Rehabilitation emphasises a functional approach, aiming to restore what has been lost, whenever possible and to use compensatory and adaptive approaches if necessary. Underlying all these physical training methods is neuroplasticity, changes in the nervous system that have been demonstrated in animal studies and through clinical research using functional MRI imaging. These include neurogenesis, gliogenesis, axonal sprouting, formation of new synaptic connections, and the rebalancing of excitation and inhibition in the cortical networks.³ A strong driver of such neural re-organisation and recovery is training, especially those involving high-intensity, repetitive, and task-specific practice.

Strokes involving the middle cerebral artery territory of the brain are one of the most common and important stroke subtypes seen in the rehabilitation setting. They result in a typical pattern of greater motor weakness of the upper limb compared to the lower limb on the hemiparetic side. In general, for such patients, recovery of motor function occurs in a fairly predictable fashion of return of movements and control of the proximal limb taking place before the distal limb as well as the affected lower limb regaining function earlier and to a greater extent than the upper limb. Prolonged flaccidity of the affected limb of longer than two months' duration portend a poorer outcome of motor recovery.

Traditionally, the critical window for recovery has been thought to be within the first 3-6 months after stroke onset. However, there has been recent research that indicates that this window extends beyond the 12-month post-stroke period. The research results suggest that there is a long-lasting critical period of enhanced neuroplasticity that enables improvement in body function and structure even at the late chronic stages.⁴

The stroke survivors typically spend 1-2 months in the inpatient rehabilitation setting before discharge back home. Therefore, the bulk of the patients' recovery will take place in the community, emphasising the importance of services to support their journey, from medical care provided by their family physicians, to outpatient rehabilitation services as well as relevant social support agencies.

The following sections outline post-stroke spasticity and hemiplegic shoulder pain, which are common complications occurring in the stroke survivor. Some of the current

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recommendations on physical activity for people living with disability will also be discussed to help the family physician encourage their patients to reduce their sedentary time and be more physically active.

Post-stroke Spasticity

Spasticity is defined as a motor disorder associated with a velocity-dependent increase in tonic stretch reflexes leading to an increase in muscle tone. It is accompanied by other signs of upper motor neuron syndrome, such as weakness and exaggerated tendon reflexes. It is common after stroke, with a prevalence of 30 to 80 percent.⁵

Affected patients often seek medical attention for pain and stiffness of the joints and limbs, worsening function, and for adverse events, such as falls. Caregivers may also experience an increased burden of care due to difficulties with dressing, showering, or transferring the patient. However, not all cases of spasticity augment disability. Spasticity of the quadriceps muscles, for example, may aid the patient in overcoming leg weakness and help with weightbearing and walking, albeit with an abnormal gait pattern. Abolishing the spasticity in such a case may render the patient non-ambulant.

A patient presenting to the family physician with complaints of increased muscle tone will benefit from a focused evaluation to exclude medical triggers. These may include sepsis, pressure sore, in-grown toenail, constipation, and urinary retention. Oftentimes, just treating these triggers will be sufficient to settle the spasticity without specific treatment for the abnormal tone.

All patients with spasticity will benefit from regular ranging of the limbs and joints to maintain range of motion and reduce the risk of contracture. The pattern of spasticity will also help to determine the treatment required. Those with a generalised pattern may need oral medications, such as baclofen and gabapentin. Patients with focal spasticity may benefit from targeted injection therapies, such as botulinum toxin injection and nerve blocks.

HEMIPLEGIC SHOULDER PAIN (HSP)

This is an important and common complication in stroke survivors with an incidence rate of up to 84 percent.⁶ Patients often present 2-3 months after stroke onset although it can occur earlier. It leads to impaired movement of the affected upper limb with decreased range of motion, reduced ability to perform ADLs, poor sleep, depression, and worsened quality of life.

Multiple contributory factors may influence the development of this condition and they include muscle weakness and muscle tone changes, such as spasticity/flaccidity resulting in muscle imbalances around the shoulder joint.⁷ Flaccidity of the muscles predisposes to glenohumeral subluxation, which can result in HSP. Soft tissue lesions, such as adhesive capsulitis, rotator cuff tendinopathy or tears, bursitis, and bicipital tendinopathy can also cause shoulder pain. Another group of predisposing factors is associated with

altered peripheral and central nervous system dysfunction, such as somatosensory abnormalities, hemi-spatial neglect, and central post-stroke pain syndrome.

The above factors may occur singly, or more likely in combination. The situation is often aggravated by poor positioning and handling of the affected arm.

In the clinical evaluation of the patient, it is important to examine the affected upper limb and the shoulder joint (which includes the range of motion). It would also be useful to do a neurological examination to determine, in particular, the strength, sensation, and visuospatial abilities. If there is any clinical suspicion, an X-ray of the shoulder joint will be needed to exclude occult fractures or a space-occupying lesion.

Management of HSP includes prescribing a short course of analgesics to relieve pain and inflammation as well as educating patients and caregivers on proper positioning and handling techniques of the affected arm when sitting, lying, and during transfers.⁸ It is important for the joints to be ranged regularly to prevent stiffness and contracture. Selected patients may also benefit from referral to an outpatient exercise programme to improve joint alignment, strengthen muscles around the joint, and address any muscle imbalances. For patients with shoulder subluxation, their caregivers can be taught to apply neuro-muscular stimulation to specific muscles around the joint in the home setting.

PHYSICAL ACTIVITY AFTER STROKE

There is strong evidence to indicate a high rate of sedentary behaviour among stroke survivors, which adversely impacts performance of activities of daily living, increases the risk for falls, and may contribute to a heightened risk for recurrent stroke and other cardiovascular diseases (CVD). Although stroke survivors vary in their level of participation in physical activity, hospital- and community-based studies have consistently found low levels of activity. On a population basis, the physical activity of community-living stroke survivors is lower than that of older adults with other chronic health conditions of the musculoskeletal or cardiovascular system.⁹

Physical activity and exercise have the potential to positively influence multiple physical and psychosocial domains after stroke. Physical activity is defined as “any bodily movement produced by skeletal muscles that results in energy expenditure”,⁹ whereas exercise is “a subset of physical activity that is planned, structured, and repetitive and has as a final or an intermediate objective of the improvement or maintenance of physical fitness”.⁹ There is strong evidence that exercise after stroke can improve cardiovascular fitness, walking ability, and extremity muscle strength. Although exercise has primarily been used to improve physical function after stroke, emerging research suggests that exercise may improve depressive symptoms, some aspects of executive functioning and memory, health-related quality

of life after stroke, and post-stroke fatigue. In addition, exercise integrated into a comprehensive plan of care that includes diet modification and use of cholesterol-lowering medications, antihypertensive medications, and aspirin could lower the risk of a second stroke by as much as 80 percent.

On the basis of the available evidence, it is recommended that stroke survivors undertake regular aerobic exercise to increase aerobic capacity and improve gait efficiency, thereby reducing fall risk and enhancing functional independence, as well as reducing the risk of recurrent cardiovascular events. In addition, resistance (strength) training 2-3 days a week is advocated to increase independence in activities of daily living, flexibility training to increase range of movement and prevent deformities, and neuromuscular training to enhance balance and coordination.

For patients who are medically stable and asymptomatic without unstable CVD, uncontrolled hypertension, or uncontrolled diabetes, starting light-intensity exercises generally does not require pre-exercise medical clearance.¹⁰ They should be encouraged to reduce sedentary time as much as possible. They can start with small amounts of physical activity, such as 5-10 minutes of standing and walking if they are ambulant and gradually increase frequency, intensity, and duration over time to achieve at least 30 minutes a day most days of the week. In this way, the current recommendations of 150-300 minutes per week of moderate intensity aerobic exercise can be accomplished over time in a safe and comfortable manner. For ambulant patients, step trackers on watches or phone apps are relatively affordable, easy to use, and convenient ways to set targets and monitor progress. Exercise intensity can be easily monitored subjectively through the Rating of Perceived Exertion scale and the Talk Test.

For patients who are more disabled and can only exercise safely sitting down, they should also be advised to be more physically active by moving their limbs with or without some light weights or an exercise band to provide light resistance. Easy-to-follow exercise videos are now readily available online and can be set up by the caregivers for the patients to do at home. Exercises in a group setting can also be fun and motivating with an added element of socialising and these may now be available in the day activity and rehabilitation centres.

Local resources for further information include the Exercise is Medicine Singapore, Active Health Singapore, and the Health Promotion Board. The Stroke Buddy mobile app offers personalised advice based on the profile of the individual user, exercise videos, and a wide array of other educational resources, all on one platform. Users can also set alerts to start their exercise routine, reminders to take their medicine as well as track their blood pressure, glucose, and body mass index. This app is housed within the SingHealth Health Buddy app. Patients can also be directed to the Stroke Hub section of the Health Hub app to look for educational resources as well as links to community support agencies.

CONCLUSION

The journey of the stroke survivor through rehabilitation to recovery is often long, with most of it occurring in the community, where the family physician is in a unique position to provide medical support and follow-ups. Spasticity and shoulder pain are two common complications that can be initially managed in the GP clinic, with only the more complex cases being considered for referral to the specialists. Important health advantages have been associated with increased levels of physical activity and this should be encouraged and emphasised in all stroke patients during their interaction with their family doctors.

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LEARNING POINTS

- **After a short, intensive bout of inpatient rehabilitation, the bulk of stroke rehabilitation and recovery occurs in the community, where the family physician plays an important role in the medical care and management of the stroke survivor.**
 - **The pattern of recovery after strokes in the middle cerebral artery territory of the brain tends to follow a fairly predictable trajectory.**
 - **Task-specific, repetitive physical training at high intensity has been shown to stimulate neuro-plastic changes in the brain.**
 - **Post-stroke Spasticity and Hemiplegic Shoulder Pain are two common complications that can affect stroke patients.**
 - **Increased physical activity and regular exercise are important in the primary and secondary prevention of stroke.**
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