

STROKE REHABILITATION PRINCIPLES

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ABSTRACT

Introduction. Stroke continues to be a major cause of mortality and disability. Besides having residual motor, sensory, or language deficits, there is a need to identify cognitive and mood related issues as well.

Stroke recovery may be best defined as improvement across a variety of outcomes, beginning with biological and neurologic changes that manifest as improvement in performance and activity based behavioural measures. **Alternatively, the broad definition of stroke rehabilitation is: any aspect of stroke care that aims to reduce disability and promote participation in activities of daily living. The objectives of this process are: to prevent deterioration of function; improve function; achieve the highest possible level of independence within the limits of the persistent stroke impairments. The three approaches of rehabilitation are that of restoration, compensation and modification. Four phases (hyperacute, acute, subacute and community reintegration phase) are recognized during stroke rehabilitation, although there is no consensus for the duration of each phase. Specific conditions such as post-stroke shoulder pain, depression and spasticity should be identified and appropriate treatment rendered to improve function and quality of life for the patient.**

Conclusion. Post-stroke patients are increasingly likely to survive and progress to the chronic phase of rehabilitation. It is useful to understand the difference between stroke recovery and rehabilitation and to be aware of pathologies that may impede rehabilitation.

Keywords: Stroke Rehabilitation, Stroke Recovery

INTRODUCTION

This article aims to discuss some of the key principles for stroke rehabilitation and to also highlight certain issues of post-stroke care that may be of interest to the general practitioners.

Stroke continues to be a major cause of mortality and disability. According to the Singapore Stroke Registry Annual Registry

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Report 2016, Cerebro-vascular diseases including stroke, were the ninth most common condition of hospitalisation, the fourth most common principal cause of death, and the leading contributor to the burden of disease in Singapore. From 2007 to 2016, there was an overall increase in the crude incidence rate, from 192.0 per 100,000 population to 222.1 per 100 000 population. In 2016 alone, there were 7413 new stroke cases reported in Singapore¹. In Singapore, the prevalence has been estimated as 36.5 per 100,000 population (In persons more than 50 years of age)².

Sixty-five percent or more of all stroke survivors and 90 percent of patients with mild strokes will return home³. A significant proportion will have residual motor, sensory, or language deficits. Dysphagia affects about 55 percent of stroke victims and may lead to life-threatening aspiration pneumonia⁴. Impairments of cognition occur in 25–65 percent of subjects⁵. Additionally, 15–20 percent of stroke survivors suffer from major depression, 40 percent of excessive fatigue, 20–50 percent have some form of post-stroke pain⁶. Many have mood and sleep problems and suffer from anxiety and apathy severe enough to impede recovery⁷.

From a functional viewpoint, in a large cohort of community-dwelling stroke survivors in Montreal, 39 percent reported a limitation in functional activities, 54 percent reported limitations with higher-level activities of daily living (ADLs) such as housework and shopping, and 65 percent reported restrictions in reintegration into community activities⁸.

GENERAL PRINCIPLES OF STROKE REHABILITATION

Stroke Rehabilitation versus Stroke Recovery

Stroke recovery may be best defined as improvement across a variety of outcomes, beginning with biological and neurologic changes that manifest as improvement in performance and activity based behavioural measures⁹. The degree and rapidity of recovery after a stroke depends on many factors such as: type and extent of brain lesion; severity of the stroke-induced impairments; the age of the stroke patient; social environment; personal motivation and the medical/rehabilitative services provided¹⁰.

Alternatively, the broad definition of stroke rehabilitation is: any aspect of stroke care that aims to reduce disability and promote participation in activities of daily living. The objectives of this process are: to prevent deterioration of function; improve function; achieve the highest possible level of independence (physically, psychologically, socially, emotionally and financially) within the limits of the persistent stroke impairments¹¹. The three major approaches to stroke rehabilitation are detailed in Table 1 below.

Table 1. Summary of the three major approaches to stroke rehabilitation.

Approach	Goals	Example
Restoration	Retrain parts of the central nervous system to regain lost functions; Restores the function of damaged brain tissue	Home exercise program to improve hemiparesis
Compensation	Adapt behaviour to the loss of function without changing the impairments, or reorganization of partially spared brain pathways to relearn lost functions	Use of prisms in glasses to address post-stroke diplopia
Modification	Altering environmental setting to promote function and activities of daily living	Adding rails in shower to assist with transfers and prevent falls

Reproduced from Dewy et al, 2007.¹¹

The three main mechanisms a human brain recovers from stroke are: adaptation, regeneration and neuroplasticity⁹.

Adaptation is the reliance on alternative physical movements or devices to make up for post-stroke deficits. For example, using of the non-dominant hand for feeding after dominant hand function loss following a motor stroke.

Regeneration is the growth of neurons and associated cells to replace those damaged from a stroke. This approach has historically been considered least useful in stroke rehabilitation as it was believed that central nervous system tissue did not have the capacity for regrowth after injury. Advances in stem cell treatment and tissue growth factor treatments may make this a more viable mechanism in the future.

Neuroplasticity, is generally defined as changes or a rewiring in the neural network. It is considered to be the main process of stroke recovery. As time progresses during the acute and subacute periods, the neural networks that had been disrupted by the stroke reconnect in adjacent areas to the area of stroke and this coincides with clinical recovery. For example, functional neuroimaging techniques show that as hand function improves, the area of representation in the motor cortex that once served the hand moves toward the cortical face area.

General Phases of Stroke Rehabilitation

Four phases (hyperacute, acute, subacute and community reintegration phase) are recognized, although there is no consensus for the duration of each phase¹².

The first 24 hours after stroke onset is known as the hyperacute phase. It includes emergency care, diagnosis, the decision to give thrombolysis therapy or not, an assessment of stroke severity, and the presence of dysphagia and hospital admission for further stroke care or discharge home with a referral for further evaluation and secondary prevention counselling. The acute phase begins about 24 hours after stroke onset and for medically stable patients, lasts five to seven days.

Ideally, the patient is managed by an interdisciplinary professional team experienced in the treatment of persons post-stroke. Members of the team ensure that the patient is medically stable and initiate acute rehabilitation shown to be both safe and beneficial (which in the first few days may consist of positioning to protect the paretic upper extremity and early mobilizations for medically stable persons). The patient is evaluated using several standardized outcome measures. The triage scores are used by the rehabilitation team (ideally comprising of the rehabilitation medicine physician, the physiotherapist, occupational therapist and speech therapist), in consultation with the stroke victim and family or caregivers, to recommend optimal rehabilitation trajectories¹³.

The subacute phase begins when the patient is transferred from acute care, ideally about one week after stroke onset for medically stable patients. Available evidence suggests that initiating rehabilitation in the first one or two weeks post-stroke has a beneficial effect on overall functional recovery¹³.

Once the person is discharged home, the community reintegration phase begins. It involves the collaboration of home care services, outpatient rehabilitation facilities, community organizations and stroke associations. The duration of this community-dwelling phase is dependent on factors such as the person's health, caregiver support, access to maintenance rehabilitation services and community services that encourage participation in meaningful activities¹⁴. It is worth noting that the average survival post-stroke is seven years¹⁵.

Specific Issues in Stroke Rehabilitation

Given the prevalence of stroke survivors in the community, one can reasonably expect to see them as part of the case mix in a standard general practice. Some of the more common complications post-stroke and the corresponding abridged recommendations are highlighted below. Patients with such complications may benefit from further review at a tertiary centre with neurological or rehabilitation medicine services if they are not better despite initial treatment.

Post-Stroke Shoulder Syndrome

Loss of arm function is a common post-stroke outcome and results in shoulder pain in up to 70 percent of patients with upper extremity dysfunction. Shoulder pain delays recovery as the painful joint limit participation in rehabilitation. Shoulder pain can result from multiple causes, including: subluxation; rotator cuff tendon injury, complex regional pain syndrome, thalamic pain syndrome, spasticity, or other conditions such as radiculopathies¹⁶.

Careful assessment of both normal and affected shoulders and ranges of motion (passive and active) are required to diagnose the cause. A restricted range of movement without pain at rest but present on limited movement suggests adhesive capsulitis as the primary pathology. Pain in one specific plane of motion such as shoulder flexion only would point to specific rotator cuff tendon injuries such as supraspinatus tendonitis or tendon tear.

Appropriate investigations include X-rays to rule out occult fractures and ultrasound imaging of the soft tissues to assess for rotator cuff injury or adhesive capsulitis.

Treatment for shoulder pain should begin early by recognizing patients at risk. Those with flaccid upper extremity paresis are prone to shoulder subluxation and traction in the glenohumeral capsule, which lead to damage of surrounding soft tissues. Proper positioning - especially supporting the distal forearm from the elbow down at rest, reduces strain at the shoulder; slings may be used to provide additional support. Strapping or taping of the upper arm to the shoulder and clavicle has been used routinely in the management of subluxation¹⁷.

Simple oral medications such as paracetamol and NSAIDs have been shown to be of value as first line treatment¹⁷. Subacromial bursal injections of steroids may be considered for rotator cuff tendonitis.

Depression

Post-stroke depression is increasingly recognized as a common sequela of stroke. The prevalence of clinically diagnosed post-stroke depression is likely under diagnosed and ranges from 20 percent to 40 percent¹⁸. Depression symptoms (such as fatigue, reduced motivation, loss of confidence, and attention and concentration difficulties) limit the benefits of rehabilitation and can even offset them. Higher rates of mortality and morbidity are seen in stroke patients diagnosed with post-stroke depression. On the other hand, treatment of depression leads to improved functional recovery after stroke.

A simple two question tool such as the Patient Health Questionnaire-2(<https://www.hiv.uw.edu/page/mental-health-screening/phq-2>) may be used to assess the presence and severity of depression in post stroke patients and has been shown to have good sensitivity and specificity¹⁹.

Selective Serotonin Reuptake Inhibitors (SSRIs) are the most studied agents for the treatment of post-stroke depression. Evidence suggests for the use of citalopram (20 mg per day) sertraline (50 mg per day to 100 mg per day) and fluoxetine (20 mg per day) are superior to placebo in treating post-stroke depression and improve quality-of-life measures²⁰.

Spasticity

Spasticity is generally defined as a motor disorder evidenced by a velocity-dependent increase in tonic stretch reflexes leading to increased tone. Compared with patients without spasticity, those who have significantly increased tone are more likely to have poorer motor and activity scores, lower Barthel Index scores and are more likely to be institutionalized²¹. The onset of spasticity is highly variable and can occur in the acute, subacute or community re-integration phase.

Spasticity should be assessed and treated if it causes severe pain, difficulty performing hygiene of the affected limb, impedes function or severe body image issues.

Historically, treatment of spasticity has involved oral medications such as baclofen (a gamma-Aminobutyric acid (GABA) agonist); nerve blocks with phenol; and serial casting. Alternatively, botulinum toxin and intrathecal baclofen devices are now more widely used in the management of spasticity in patients with chronic stroke. All these treatments will not work without a good supporting physiotherapy program to stretch the restricted joints²².

Conclusion

Post-stroke patients are increasingly likely to survive and progress to the chronic phase of rehabilitation. It is useful to understand the difference between stroke recovery and rehabilitation and to be aware of pathologies that may impede rehabilitation progress.

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LEARNING POINTS

- **Stroke is a leading cause of disability and besides having residual motor, sensory or language deficits, there is a need to identify cognitive and mood related issues as well.**
 - **Stroke rehabilitation should be distinguished from stroke recovery and the three approaches are that of restoration, compensation and modification.**
 - **Specific conditions such as post-stroke shoulder pain, depression and spasticity should be identified and appropriate treatment rendered to improve function and quality of life for the patient.**
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