

Poststroke Care

Stroke outcomes can be optimized with an evidenced-based and systematic approach during all phases of recovery.

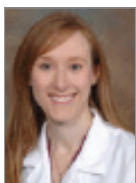
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Acute Poststroke Care: Time is Still Brain During Recovery

Stroke is a leading cause of adult disability in the US. With the improvement and standardization of acute stroke therapeutics as discussed throughout this issue, there are increasing numbers of stroke survivors, with an estimated annual direct cost expected to reach \$184 billion by 2030.¹ The onus falls on acute care providers to be proactive in facilitating:

- 1) Early comprehensive and evidence- and expert consensus-based medical and rehabilitative care
- 2) Timely discharge to the most appropriate post-acute setting
- 3) Prevention of secondary complications of stroke across the continuum of recovery.



The critical time window for spontaneous neurobiologic recovery occurs in the first 3 months poststroke. According to the US Agency for Health Care Research and Quality, the average length of stay in an acute-care hospital after an acute stroke is 5.5 days, which translates to approximately 6% of the critical period for spontaneous neurobiologic recovery. Despite this urgency, observational studies in stroke recovery suggest that the majority of patients perform little to no physical activity in the acute hospital setting.² There is some evidence to suggest that early mobilization in short durations is beneficial to recovery. Although long duration of exercise is currently not supported based on the primary outcome (negative result) of the AVERT^a trial, subgroup analysis suggests that frequent but short periods (< 13.5 min) of mobilization may be of benefit as early as 24 hours after a stroke and was safe and associated with improved odds of a favorable outcome at 3 months.³ A recent study on early

rehabilitation (within 48 hours) after intracerebral hemorrhage, reported improved survival and functional outcomes at 6 months.⁴

Additional approaches to enhancing a patient's rehabilitation-potential and readiness include prevention and management of common medical and cognitive barriers to recovery. Barriers include inadequate sleep⁵ and nutrition.⁶ Early screening for disorders such as insomnia,⁷ obstructive sleep apnea (overnight pulse oximetry),⁸ delirium, depression, and impaired cognition may facilitate early interventions that can help to maximize recovery (Table 1).⁹

Although neuroplastic (eg, serotonergic and dopaminergic) drugs are safe and inexpensive, they are underused in the acute care setting. Although the exact mechanism underlying their neuroplastic effects are still under investigation, preclinical and neuroimaging studies suggest these agents may potentiate and accelerate the period of recovery.¹² For example, patients with and without depression who received fluoxetine, a commonly used selective serotonin reuptake inhibitor (SSRI) within days of stroke had improved functional motor outcomes (Fugl Myer) compared with those who received placebo.²⁸ Subsequent meta-analysis corroborated these findings and suggests that other SSRIs may have similar benefit.²⁹

In addition to medical management and optimization, acute care providers should consult physical therapy (PT), occupational therapy (OT), speech therapy (SLP), and rehabilitation specialists (if available) early in the hospital course to assist with evaluation, management, and assistance with determining the appropriate disposition plan.³⁰ Implementing a treatment plan during the earliest stages of stroke recovery may improve rehabilitation readiness, aid in determining post-acute hospital disposition, and best position a stroke survivor for recovery.

Choosing a Level of Postacute Care

The goal of a rehabilitation program is to optimize function, independence, and return to living in the community and prevent secondary complications (Table 2). Several options for disposition are available for stroke survivors and include inpatient rehabilitation (IRF), skilled nursing facility (ie, subacute rehabilitation), long term acute care facility (LTAC), and home (with home or outpatient physiotherapy) (Figure 1). Each

a. AVERT, A very early rehabilitation trial (NCT01846247)

TABLE 1. APPROACHES TO MAXIMIZING THE POTENTIAL FOR RECOVERY IN THE ACUTE CARE PHASE

Topic	Intervention	Implication
Medication management Certain classes of drugs (ie, anticholinergics, sedative/hypnotics, opioid analgesics, anticonvulsants) may impair neurorecovery; use of others (ie, serotonergic agents) may facilitate recovery. ¹⁰	When feasible, avoid medications that may impair neuroplasticity and functional recovery. ¹¹ Consider initiating medications beneficial to recovery process. ¹² Educate patients on safe and sustainable medication use.	Promote neurorecovery, minimize adverse and side effects; promote safety, independence and self-sufficiency for patient and caregivers after discharge.
Nutritional Status Malnutrition is common in patients with stroke, and dysphagia contributes to malnutrition risk that is associated with extended hospital stay, poorer functional outcome, and increased mortality rates 3-6 months after stroke. ¹³	Early nutrition/dietary consultation to evaluate and treat malnutrition. Early dysphagia screening to evaluate risk for aspiration, and enteral nutrition through a nasogastric tube, when risk persists for more than 48 to 72 hours. ¹⁴ Screening: thiamine (B1), pyridoxine (B6), folate (B9), cyanocobalamin (B12), and vitamin D levels. ¹⁵	Prevention of complications resulting from energy-protein deficit. ^{6,16} Facilitation of myelin synthesis, optimizing neural functioning. ¹⁵ Promotes vascular health via reduction of serum homocysteine levels. ¹⁷
Insomnia Adequate sleep is vital for neural recovery, energy, and focus and insomnia may be premorbid or secondary to the stroke. Associated with worse recovery outcomes. ¹⁸	Early implementation of a sleep log and treatment appropriate pharmacotherapeutics (eg, melatonin, trazodone, mirtazapine). ⁷ When feasible, avoid use of antipsychotics, anticholinergics, benzodiazepine, opioid analgesics or zolpidem, which may impair cognition, reduce and/or reverse neuroplasticity. ¹⁹	Early screening and treatment of insomnia may enhance neuronal plasticity, enhance spontaneous neurobiological recovery, and improve motivation and participation in therapy. ⁵
Obstructive Sleep Apnea A common premorbid or acquired sleep disorder in stroke patients. Associated with decreased recovery and increased risk of recurrent stroke and mortality. ²⁰	Overnight oximetry may help identify patients at risk by alerting nocturnal apneic or hypoxemic events. ⁸	Early screening and treatment of hypoxemic events and apnea facilitates adequate cerebral oxygenation, and improves sleep quality, alertness and focus during therapy. ⁸
Delirium Post stroke delirium is associated with higher mortality, prolonged hospitalizations, and poor functional outcome. ²¹	Early screening and treatment, particularly in patients with predisposing factors such as old age, dementia, visual impairment, history of excessive alcohol use, polypharmacy, malnutrition, renal impairment, and dehydration. ²²	Early recognition and prevention of delirium may improve outcomes in stroke patients. ²¹
Depression/Mood Disorders Premorbid clinical depression and other mood and adjustment disorders may be exacerbated or worsen, after a stroke—with adverse effects on cognitive recovery, physical recovery, and mortality. ²³	Early screening for mood, adjustment disorders, and apathy (Nine-item Patient Health Questionnaire [PHQ9], or 15-item Geriatric Depression Scale [GD-15]). Discuss initiation of an antidepressant, or neurostimulant (dopaminergic or cholinergic agents). ²⁴⁻²⁶	Early effective treatment of depression and mood disorder may improve motivation and positively influence rehabilitation outcome of stroke patients. ²⁷

level of postacute care varies in intensity and type of therapy provided and amount of physician and nursing involvement but all share a similar goal in maximizing function.

Inpatient Rehabilitation

The most comprehensive and intensive postacute option

for qualifying stroke survivors, IRF is recommended in the current AHS/ASA guidelines for those with residual functional impairments who meet qualifying criteria (see below, Level IA Evidence) (Figure 2).³¹ Studies have shown that patients discharged to IRF setting have higher rates of discharge to community living and improved functional ability

TABLE 2. TABLE 2. LIMITING SECONDARY COMPLICATIONS OF STROKE IN THE LATE ACUTE TO CHRONIC PHASE

Complication	Intervention	Implication
Neurologic recurrent stroke, hemorrhage, seizure	Monitoring and managing comorbidities, risk factors: HTN, DLD, DM, substance use	Identify and recognize neurologic changes early, medically reduce/optimize contributing factors for prevention of future neurologic injury
Thrombotic/embolic events, deep venous thrombosis, pulmonary embolism	Screening dopplers Medical prophylaxis with subcutaneous heparin, lovenox Mobility promotion with SCDs, OOB at least TID	Prevent DVTs/PEs for decreased morbidity, mortality
Dysphagia, malnutrition	Speech/swallow therapy and retraining Nutrition assessment Dietary counseling Feeding tube management	Minimize risk of aspiration (pneumonia, pneumonitis) Optimize nutritional status Improve quality of life
Spasticity	Elevate affected extremities Encourage passive ranging, stretching, strengthening Brace/splint to prevent contracture: eg. resting hand splints, PRAFOs with kickstands Pharmacology: baclofen (oral or intrathecal), benzodiazepines, dantrolene, clonidine, botulinum toxin	Maximize active range, functionality, independence; maintain passive range for assisted ADLs, hygiene; prevent pain; prevent contracture
Shoulder/hip derangement or dislocation, subluxation, impingement	Elevate affected extremities Encourage passive ranging, stretching, strengthening Clinically assess, examine, image, diagnose Pharmacology: oral or injected analgesics, anti-inflammatories	Maximize active range, functionality, independence; maintain passive range for assisted ADLs, hygiene; prevent pain
Osteoporosis	Nutritional assessment, counseling Physiotherapy with education Pharmacology: nutritional supplements	Reduce the risk of nutritional deficiencies, falls, fractures
Skin breakdown	Turn every 2 hours Cushion pressure dependent areas Reassess and stage wounds regularly Wound care and cleaning daily Nutrition assessment, counseling Pharmacology: barrier topicals, antibiotics/antifungals	Prevent skin breakdown and ulceration Minimize risk of infection or injury, prevent pain
Neurogenic bladder/bowel	Timed voids every 2-4hours Post void residuals ISC volumes > 150 mLs Bladder scan for retention > 6 hours ISC volumes > 350 mLs Education, nutrition, behavioral counseling/training Pharmacology: anticholinergics, alpha blockers, mirabegron, botox	Maximize independence of bowel/bladder programs for both continent and incontinent patients Prevent skin breakdown, infection and injury (UTI, AKI) Prevent constipation, ileus; Improve education of patient and caregivers
Pain CRPS, central, neuropathic	Physiotherapy: desensitization (tactile massage, garments), ranging, strengthening, neurologic retraining Pharmacology: eg. antiepileptics, SSRIs, SNRIs, TCAs, topicals	Prevent pain, promote functionality and independence Minimize emotional distress
Mental health	Psychologic assessment and counseling Pharmacology: SSRIs, SNRIs, TCAs, anxiolytics	Minimize risk of depression, anxiety, adjustment disorders associated with stroke and functional decline

Abbreviations: ADL, activity of daily living; DLD, dyslipidemia, DM, diabetes mellitus; DVT, deep venous thrombosis; HTN, hypertension; PE, pulmonary embolism; SCD, sequential compression device; PRAFO, pressure relief ankle foot orthosis; SSRI, selective serotonin reuptake inhibitor; SNRI, selective norepinephrine reuptake inhibitor; TCA, tricyclic antidepressant.

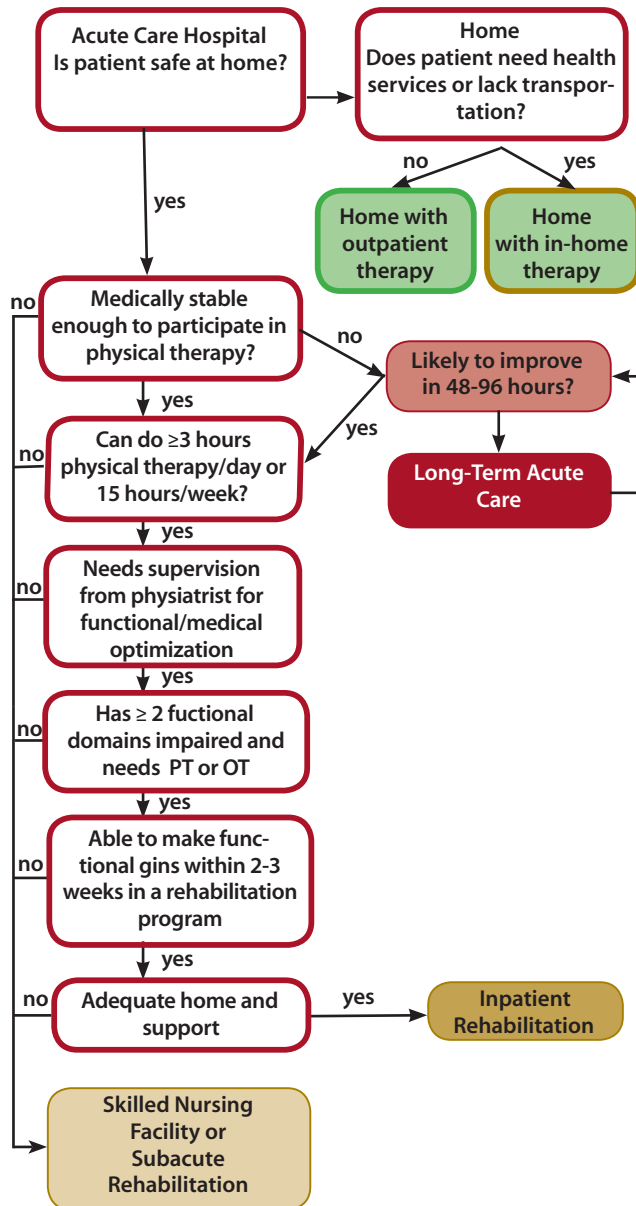


Figure 1. Algorithm for Post-Acute Care Rehabilitation Disposition

compared to those going to a skilled nursing facility.^{32,33} The IRF setting is ideal for motivated stroke survivors who can tolerate a minimum of 3 hours of intensive rehabilitation therapy per day, 5 days per week in at least 2 areas of functional impairment (physical and/or occupational therapy and speech); have active new (eg, bowel or bladder dysfunction or spasticity) or chronic medical issues that require daily evaluation and treatment by a rehabilitation physician (minimum of 3 days/week) and 24-hour nursing care, and have a high likelihood of being discharged into the community within 2-3 weeks.³⁴ The IRF setting also offers services such as neuro-

psychologists and vocational and recreational rehabilitation and is ideal for individuals who may benefit from a multidisciplinary approach to their care.³⁵ Given these opportunities, disposition to IRF is the current gold-standard in rehabilitation, with a few notable exceptions.

Long-Term Acute Care Facility

Discharge to an LTAC may be appropriate for individuals who are unable to tolerate 3 hours of intensive therapy per day but still have complicated medical and rehabilitative needs requiring long-term care (> 3 weeks), such as those with ventilator dependence, functional-limiting cardiopulmonary disease, multisystem organ failure, polytrauma, or extensive burn injury.

Subacute Rehabilitation

As a third option, subacute rehabilitation is appropriate for individuals with limited medical needs at discharge who may not be physically able to participate in intensive physiotherapy, such as those who lack physical stamina, are unable to participate in the program due to limited carryover/mental alertness (ie, cannot follow commands), or have associated orthopedic injuries or weight-bearing precautions. Subacute rehabilitation is usually reserved for patients who may not reach full or partial recovery. Rehabilitation and medical care are still dictated by a physician but there is not a Medicare requirement for daily physician visits.

In-Home or Outpatient Rehabilitation

Some patients may be suitable for discharge home with rehabilitation in an outpatient facility or through home health care. Home health care provides rehabilitation and nursing needs within an individual's home. This is typically available to stroke survivors who are high functioning, do not need the intensity provided in an IRF setting, and are safe to be discharged home from the acute hospital.



Figure 2. Inpatient Rehabilitation (IRF) Setting. Standard inpatient rehabilitation gym and available equipment (A); weekly multidisciplinary meeting (B); independent activities of daily living stations are instrumental for assessing and preparing for transition to the home environment (C).

Advantages of home health therapy include evaluating the home environment for barriers to activities of daily living (ADLs) and providing the necessary equipment to complete ADLs as independently as possible within the context of their own living environment. Outpatient therapy is also an option for patients who qualify for discharge home. Also reserved for high functioning individuals, outpatient therapy requires transportation to and from a clinic but provides more resources and equipment in a gym environment—facilitating a smoother transition to independence within the community.

Timing of Decision Making

It is important to keep in mind that individuals who were not considered appropriate for IRF at acute hospital discharge and were subsequently discharged to a subacute rehabilitation or LTAC, are eligible for transfer to an IRF when they improve and are able to participate in intense rehabilitation. Therefore, determining postacute disposition should be based on the patient's rehabilitation and medical needs at the time of assessment.

Preventing Secondary Complications

Survivors of stroke not only present with preexisting medical comorbidities, they also can develop a number of poststroke medical complications thereafter (Table 2). In the days to weeks following stroke, patients remain at highest risk of poststroke edema, hemorrhage, or seizures. Furthermore, acquired stroke impairments may also lead to complications, many of which are avoidable.³⁰ For example, dysphagia may predispose patients to aspiration pneumonia, pneumonitis, or the progressive development of malnutrition. Neurogenic bladder and bowel put an individual at risk of retention or constipation respectively, with danger of infection, skin breakdown, and potentially end organ damage. The development of spasticity, a velocity dependent increase in tonic stretch reflexes, may result in joint dysfunction, contracture, dystonia, pain, and generalized functional impairment. Immobility also increases the risk of deep venous thrombosis and pulmonary embolism in the acute-subacute stages, and risk of osteoporosis and fractures chronically. Irrespective of the postacute care disposition, awareness of these potential secondary complications and early education of patients and caregivers may prevent their occurrence, or at the least reduce severity.

Conclusion

While promising new areas of research are underway to determine effective and reproducible approaches to enhance the rate and extent of recovery poststroke, this review provides practical approaches to optimizing and facilitating the delivery of comprehensive post stroke

rehabilitation care. Taking advantage of the critical period of spontaneous neurobiological recovery through early mobilization, screening and treating of common medical and cognitive barriers and complications, triaging to the appropriate postacute care disposition, educating patients and caregivers, and preventing of secondary complications of stroke are steps in the right direction. ■

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