Occupational Functioning: Physical Disabilities (Neuro) Days 6–9

Section 3

CHAPTER 10

Cerebrovascular Accident

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Learning Objectives

- Identify and define the two primary etiologies of stroke or cerebrovascular accident.
- Identify two arteries that are included in anterior circulation syndromes and describe the associated clinical presentation of each.
- Identify three arteries that are included in posterior circulation syndromes and describe the associated clinical presentation of each.
- List five examples of preparatory methods and tasks considered when treating stroke.
- Identify and describe standardized assessments and therapeutic interventions that specifically address activities of daily living (ADLs), instrumental activities of daily living (IADLs), upper extremity facilitation and management, functional mobility, vision and perception, cognition, and communication and language.

Key Terms

- *Aphasia:* Characterized as either expressive or receptive aphasia and refers to a diminished ability to verbally express or understand speech
- *Hemorrhage:* Bleeding from a damaged or ruptured blood vessel
- *Ischemia:* A diminished blood supply to a specific part of the body
- *Subluxation:* A partial dislocation or misalignment of a joint
- *Transient ischemic attacks:* Disruption of the blood supply that typically supplies the brain, resulting from neurological dysfunction

Description

Stroke, or cerebrovascular accident (CVA), is a life-threatening vascular disease that results in loss of blood flow to the brain as a result of either ischemia or hemorrhage blockage. Side effects of stroke vary greatly depending on the size and location of the infarct and may result in reduced participation in occupation-based activities. Impaired motor and process performance skills such as organization, reaching, coordination, and walking together with client factors such as attention, emotion, orientation, vision, neuromuscular functions, voluntary movement, and speech affect independence in basic occupations. Stroke is the fourth leading cause of death and the leading cause of disability in adults (Go et al., 2014).

Etiology and Pathology

Stroke affects 795,000 Americans every year, every 40 seconds on average with 185,000 considered recurrent, and 137,000 of these people do not survive (Centers for Disease Control and Prevention, 2015). Hypertension is associated with 77% of first-time strokes. Ischemic strokes account for 87% of events, whereas hemorrhagic stroke accounts for 13%. Stroke prevalence is higher in women, African Americans, and persons from lower socioeconomic backgrounds. Cardiovascular disease, including hypertension, is the highest risk factor (Go et al., 2014). Hypertension management significantly reduces the risk for stroke in diabetic hypertensive adults. Systolic blood pressure is a strong indicator for stroke risk in African Americans compared to Caucasian adults with a 3:1 increased risk for every 10 mmHg increase above the normal range. Other risk factors for stroke

include history of diabetes mellitus, smoking, atrial fibrillation, obesity, hyperlipidemia, and deep vein thrombosis (DVT). Symptoms include dizziness, paresthesia, severe headache, and double vision. Hemiplegia, facial paralysis, and impaired communication are three of the most recognizable signs of stroke. Lesions occurring above the brainstem result in contralateral hemiplegia, whereas ipsilateral hemiplegia occurs from lesions within or below the brainstem, including the spinal cord after the motor tracks have crossed. The length of time circulation affected in any of these scenarios is proportionate to the degree of side effects.

Ischemic stroke occurs when a blood clot blocks normal cerebral blood flow causing ischemia or loss of oxygen from impaired blood flow. These clots form as a result of atherosclerosis, or narrowing of the arteries, from fatty plaque buildup such as cholesterol. Blood clots that develop in the arteries of the brain affecting local cerebral circulation are referred to as cerebral thrombi. When a blood clot originates in another major vessel throughout the body, breaks loose, and then travels to the brain eventually occluding circulation when its size can no longer be accommodated, it is referred to as a cerebral embolism. An irregular heartbeat caused by atrial fibrillation decreases normal blood flow out of the heart thus increasing chances of clots forming in pooled blood and is another cause of embolic ischemic stroke. Depending on the size of the blood clot, the force of normal blood flow may dislodge the clot and circulation may resume. This is especially true in transient ischemic attacks (TIA), which create symptoms similar to stroke but resolve in no more than 24 hours. If symptoms are identified within three hours, nonsurgical medical intervention may include the use of tissue plasminogen activator (tPA) to reduce the size of the blood clot (Go et al., 2014). Surgical intervention may be necessary to remove the blood clot in severe cases.

Hemorrhagic stroke occurs when a weakened blood vessel ruptures, or hemorrhages, in the cranium thus creating pooling of blood that interferes with normal cerebral blood flow. Intracranial hemorrhage is further categorized by location and etiology of the bleed. Intracerebral hemorrhage refers to bleeding in the brain tissue itself and may be the result of leaking or ruptured blood vessels or tissue. Aneurysms and arteriovenous malformations are included in this category. Subarachnoid hemorrhage refers to a bleed in the area between the arachnoid membrane and the pia mater. The size of the hemorrhage will determine if the cerebral tissue will naturally absorb the blood or if surgical intervention is required to remove the blood and/or stop the bleeding.

Clinical Presentations

The clinical presentation of stroke is largely determined by the location and size of the ischemic or hemorrhagic infarct. Furthermore, stroke is often classified according to the affected hemisphere, right or left, respectively. The two major arteries creating cerebral blood flow are the carotid artery, supplying blood flow to the anterior cerebrum, and the vertebral-basilar artery, creating the posterior circulation of the brain.

Anterior Circulation Syndromes

Anterior circulation of the brain arises from the internal carotid arteries, providing blood flow to the anterior cerebral artery, middle cerebral artery, anterior communicating artery, and posterior communicating artery. The most common clinical presentations for anterior circulation syndromes are summarized in **Table 10-1**.

Posterior Circulation Syndromes

Posterior circulation of the brain is provided by the vertebral arteries, which combine to form the basilar artery. The vertebral arteries give rise to the posterior inferior cerebellar arteries, anterior spinal arteries, and posterior spinal arteries. The basilar artery gives rise to the posterior cerebral arteries, superior cerebellar arteries, anterior inferior cerebellar arteries, and pontine arteries. The most common clinical presentations for posterior circulation syndromes are summarized in **Table 10-2**.

Diagnostic Tests and Medical Imaging

A variety of medical imaging diagnostic tests are used to formally diagnose the location and size of the infarct (**Table 10-3**).

Table 10-1 Anterior Circulation Syndromes

Blood Supply	Clinical Presentation
Anterior cerebral artery • Medial and superior surfaces of the frontal lobe • Medial surface of the parietal lobe	• Contralateral hemiparesis and sensory loss: lower extremity more involved than the UE and face • Executive dysfunction (planning, organization, judgment, flexibility, reasoning) • Cognitive impairments (sustained attention, alternating attention, memory, following directions) • Behavioral changes (flat affect) • Agraphia (difficulty in producing written language) • Apraxia (reduced motor control) • Urinary incontinence
Middle cerebral artery • Largest branch of the internal carotid artery • Supplies entire lateral surface of the hemisphere including the frontal, parietal, and temporal lobes	• Contralateral hemiplegia and sensory loss: UE more involved than lower extremity, face, and tongue • Executive dysfunction (planning, organization, judgment, flexibility, reasoning) • Cognitive impairments (sustained attention, alternating attention, memory, following directions) • Contralateral homonymous hemianopia (visual field loss) • Ideomotor, ideational, and constructional apraxia • Spatial inattention (left neglect, right inattention) • Aphasia, fluent, or nonfluent (left hemisphere affected) • Dysarthria (reduced motor coordination of speech)

Data from Duncan, P. W., Zorowitz, R., Bates, B., Choi, J. Y., Glasberg, J. J., Graham, G. D., . . . Reker, D. (2005). Management of Adult Stroke Rehabilitation Care: a clinical practice guideline. Stroke, 36(9), e100-143. doi:10.1161/01.str.0000180861.54180.ff; Gillen, G. (2013). Cerebrovascular Accident/Stroke. In L. W. Pedretti, H. M. Pendleton, & W. Schultz-Krohn (Eds.), Pedretti's occupational therapy: practice skills for physical dysfunction (7th ed., pp. 844-857). St. Louis, Mo.: Elsevier.)

Table 10-2 Posterior Circulation Syndromes

Blood Supply	Clinical Presentation
Posterior cerebral artery • Medial surface of the temporal lobes • Medial and lateral surfaces of the occipital lobes • Visual cortex	• Homonymous hemianopia (visual field loss on the same side of each eye) • Memory impairment (verbal or visual) • Alexia (reduced comprehension of written language) • Agraphia (difficulty producing written language) • Acalculia (difficulty with mathematical calculations) • Visual agnosia (impaired object recognition) • Prosopagnosia (impaired familiar facial recognition) • Achromatopsia (loss of color vision) • Anton's syndrome (cortical blindness with lack of awareness of blindness)
Cerebellar artery • Cerebellum	• Ipsilateral ataxia (impaired coordination of movement) • Nystagmus (involuntary eye movement) • Dizziness • Vomiting • Contralateral facial paralysis • Decreased contralateral pain and temperature • Decreased touch, vibration, and position sense • Lower extremity more involved than the UE

(*continues*)

Table 10-2 Posterior Circulation Syndromes (*continued*)

Blood Supply	Clinical Presentation
Vertebrobasilar artery • Pons • Midbrain • Thalamus • Lateral medulla • Cranial nerves III–XII	• Quadriparesis • Ptosis (drooping eyelid) • Diplopia (double vision) • Esotropia (convergent eye misalignment) • Exotropia (divergent eye misalignment) • Memory loss • Dysarthria (impaired motor coordination of speech) • Dysphagia (difficulty swallowing) • Coma • Tachycardia • Locked-in syndrome

Data from Duncan, P. W., Zorowitz, R., Bates, B., Choi, J. Y., Glasberg, J. J., Graham, G. D., . . . Reker, D. (2005). Management of Adult Stroke Rehabilitation Care: a clinical practice guideline. Stroke, 36(9), e100-143. doi:10.1161/01.str.0000180861.54180.ff; Gillen, G. (2013). Cerebrovascular Accident/Stroke. In L. W. Pedretti, H. M. Pendleton, & W. Schultz-Krohn (Eds.), Pedretti's occupational therapy : practice skills for physical dysfunction (7th ed., pp. 844–857). St. Louis, Mo.: Elsevier.)

Table 10-3 Diagnostic Tests and Medical Imaging

Test	Description
CT	Computed tomography provides efficient cross-sectional x-ray images, with or without the use of iodine contrast dye, of the internal body structure in as few as 10 minutes, including acute and chronic bleeding
MRI	Magnetic resonance imaging requires more time for processing, but produces a more detailed picture of acute and chronic injury using magnets, with or without the use of noniodine dye, and is especially useful in detecting more finite changes; however, it is contraindicated for persons with metal in their bodies
PET	Positron emission tomography is not usually indicated for acute stroke due to time required for the radioactive venous tracer to detect disease processes and structural changes reflected as 3D images
SPECT	Single-photon emission computed tomography is a newer type of 3D scans that also uses a radioactive tracer to detect changes in blood flow through increased absorption in more active areas of insult

Data from: Duncan et al. (2005); Knesek (2009).

Medical and Surgical Procedures

Medical management of acute stroke prioritizes determining the location, cause, and size of the infarct. Blood flow is most commonly restored using medications; however, more invasive procedures to control intracranial pressure and cerebral edema are also initiated when necessary, which will impact the severity of deficits (**Table 10-4**). Prevention of secondary medical complications including DVT and pneumonia is initiated and may include the use of compression stockings to improve blood flow or aspiration precautions for clients who are unable to manage secretions due to impaired swallowing.

Screening and Assessments

A large variety of screening tools and assessments are used to determine potential goal areas for clients. Standardized assessments are preferred over nonstandardized assessments because they have stronger psychometric properties and require the occupational therapist to administer the test items in a consistent manner. The occupational therapist chooses a combination of both formal standardized assessments and informal interview questions that will most closely represent client factors, performance and process skills, and level of independence in occupation-based activities to be considered in the intervention planning and goal-setting process.

Standardized Assessments

- Activity Card Sort requires the client to choose from a variety of picture cards to represent daily activities that he/she finds most valuable.

Table 10-4 Medical Intervention for Ischemic and Hemorrhagic Stroke

Medical Intervention	Ischemic Stroke	Hemorrhagic Stroke
Nonsurgical		
Thrombolytics, including tPA, to dissolve clots only if symptoms are identified within three hours of onset	✓	Contraindicated due to bleeding
Anticoagulants and antiplatelet medications, including aspirin, heparin, Coumadin, Lovenox, Plavix to inhibit growth of hematoma and/or prevent platelets from forming new clots	✓	Contraindicated due to bleeding
Antihypertensive medications to restore normal blood pressure	✓	✓
Surgical		
Craniotomy with hematoma evacuation to remove excess blood or blood clot	✓	
Clipping or coiling to isolate weakened area of vessel and prevent further bleeding		✓
Endovascular procedures, including carotid endarterectomy, to clear plaque from arteries, reducing the risk of future stroke	✓	
Carotid stenting/angioplasty to improve blood flow	✓	
Decompressive craniotomy to reduce pressure	✓	
Precautions		
• Activity precautions may include no jumping, running, lifting, or bending with any of the above medical interventions • A helmet may be required after a craniotomy until the cerebral edema is under control and the bone flap is replaced • Blood pressure parameters may be implemented		

Data from: Duncan et al. (2005).

- Arm Motor Ability Test evaluates gross and fine motor control through the performance of various reach, grasp, and release test items.
- Arnadottir Occupational Therapy Neurobehavioral Evaluation (A-ONE) measures neurobehavioral dysfunction through the performance of activities of daily living (ADLs).
- Assessment of Motor Process Skills (AMPS) is a performance-based assessment of the quality of a person's ADL and instrumental activity of daily living (IADL) performance in a familiar environment.
- Beck Depression Inventory is a self-report questionnaire that quantifies depression.
- Berg Balance Scale is a performance-based assessment that measures balance and fall risk.
- Boston Diagnostic Aphasia Examination measures speech and language skills.
- Canadian Neurological Scale is a brief assessment of cognitive and motor function after stroke.
- Dynamometry measures numerical grip using a handheld gauge.
- Executive Function Performance Test evaluates mental process skills while the client performs structured meal preparation, bill management, placing a phone call, and medication management.
- Frenchay Activities Index (self-report tool) is an assessment of ADL function after stroke.
- Fugl-Meyer Assessment of Motor Function measures a person's ability to move in and out of synergistic gross and fine motor control patterns.
- Functional Reach Test measures the maximum reach of a person in standing.
- Functional Test for the Hemiplegic/Paretic Upper Extremity measures functional use of the hemiparetic upper extremity (UE) after stroke.
- Geriatric Depression Scale assesses depression in the elderly.
- Glasgow Coma Scale is a measure of consciousness after neurological injury.
- Jebsen Test of Hand Function measures hand function through the performance of various reaching, grasp, and release tasks.

- Kohlman Evaluation of Living Skills measures functional independence in ADLs.
- Mini-Mental State Examination is a brief screen of cognitive impairment.
- Montreal Cognitive Assessment screens for changes in visual perceptual skills, attention, memory, and orientation.
- Motor Assessment Scale measures motor function poststroke.
- Motor-Free Visual Perceptual Test is an assessment of visual perceptual skills.
- Motricity Index measures strength in the upper and lower extremities after stroke.
- National Institutes of Health Stroke Scale measures the severity of stroke deficits.
- Nine Hole Peg Test is a timed measurement of finger dexterity.
- Neurobehavioral Cognitive Status Examination quantifies cognitive functioning in the areas of language, constructions, memory, calculations, and memory.
- PCG Instrumental Activities of Daily Living measures IADL performance and independence.
- Pinch Strength uses a handheld gauge to measure lateral and palmar pinch strength.
- Rankin Scale (global disability scale) is a clinician-reported measure of disability.
- Rivermead Mobility Index measures gait, balance, and transfers after stroke.
- Stroke Impact Scale measures health status after stroke.
- Test Evaluant les Membres supérieurs des Personnes Agées (TEMPA) measures UE function.
- Tinetti Test assesses the perception and fear of falling during ADLs.
- Wolf Motor Function Test is a timed, performance-based assessment of gross and fine motor control skills.

Semistandardized Assessments

- Brain Injury Visual Assessment Battery for Adults screens for changes in visual perceptual skills.
- Canadian Occupational Performance Measure measures the importance and performance of client-selected daily activities.
- Goniometry uses a goniometer to objectively measure joint range of motion.
- Functional Independence Measure is a performance-based assessment of ADL independence.
- Manual Muscle Testing measures the strength of each muscle group in both gravity and gravity-eliminated positions.
- Modified Ashworth Scale is a measurement of spasticity in the extremities.

Nonstandardized Assessments

- Formal and informal interview
- Shoulder subluxation palpation

Criterion-Referenced Assessments

- AMPS

Interventions

Occupational therapy (OT) practitioners use detailed activity analysis for intervention planning, implementation of skilled occupation-based activities, and ongoing review of progress and care for clients recovering from stroke throughout multiple levels of care. Preparatory methods and tasks, including assistive devices and adapted equipment that complement intervention planning, are also provided in this section. While the impact of stroke on occupational performance varies greatly depending on the severity of impairment, occupational therapists are skilled at incorporating therapeutic use of personalized occupations into treatment. It is essential that the occupational therapists and therapy assistants provide ongoing education and training for the client and family to ensure carryover of new learning for increased independence and safety. Outcome measures and goals are used to help ensure an evolving treatment plan is being used to maximize the client's participation in occupation-based activities and the most appropriate discharge plan is carried out.

Continuum of Care

The complexity of poststroke management requires multiple stages of medical care and OT intervention throughout a continuum of care that may be classified as the acute phase (Intensive Care and Acute Care) and the poststroke rehabilitation phase (Subacute

Care, Inpatient Rehabilitation, DayRehab, Outpatient Therapy, and Home Health Care) (Duncan et al., 2005). Motor recovery may occur in either phase without limit; however, intense therapy encourages the greatest period of neuroplasticity in the first 12 months poststroke.

The flowchart in **Figure 10-1** provides a continuum of care overview with possible progressions through each level of care. Clients who respond successfully to skilled therapy would most likely follow the central pathway, reflecting the greatest amount of rehabilitation. Access to each level of care may not be possible in every community and, therefore, clients may default to home health or outpatient therapy. The skilled nursing facility level of care is reserved for patients who do not regain sufficient mobility or independence to return home alone or with a caregiver. Minimal therapy is provided at these facilities. Home health therapy is recommended for clients who are medically stable to return home with a responsible caregiver, continue to progress with goals, and remain future candidates for more intense therapy at the day rehabilitation or outpatient therapy levels of care.

The occupational therapist considers evaluation results and client collaboration when determining short- and long-term goals for the intervention plan and upgrades the goals regularly. While short-term goals are set to reflect progress that is attainable within days during the acute phase and up to two weeks during the poststroke rehabilitation phase, long-term goals represent the anticipated level of functioning at discharge from each level of care.

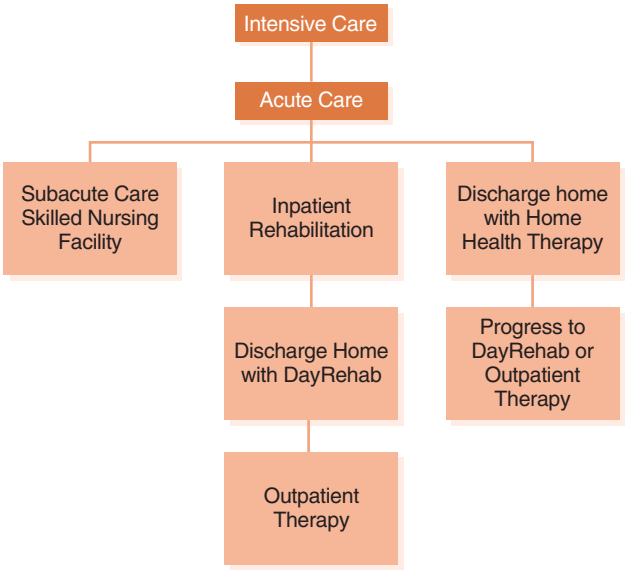

Figure 10-1 Continuum of care.

Expected Functional Outcomes

Acute phase: The acute phase of stroke recovery begins in the Intensive Care Unit (ICU) where OT practitioners are responsible for addressing basic client factors such as mental functions, sensory functions, neuromusculoskeletal functions, and multisystem regulatory functions for organ and speech function in their treatment plans. UE range of motion, sitting balance, alertness, orientation, and visual tracking are included in treatment planning. The OT practitioner documents response to treatment and monitors vitals regularly including blood pressure, heart rate, and oxygen saturation. The OT practitioner is also competent with managing intravenous lines, respiratory care equipment, tracheostomy care, nasogastric and gastrostomy tubes, aspiration and swallowing precautions. Postsurgical clients will have a longer length of stay in the ICU than the client who did not require surgical intervention.

Medically stable clients are transferred from the ICU to Acute Care in the hospital setting to further address medical stability, motor control, cognition, visual perception, communication, and swallowing. Occupational therapists expand treatment plan goals to include ADLs, functional mobility for transfers, and UE function. Adaptive equipment for ADL performance is introduced at this level of care to expedite a client's level of independence and participation in occupational performance. Occupational grooming and dressing tasks may be graded from sitting to standing with assistive devices used for balance as needed. Occupational therapists and OTAs continue client and family education on the importance of incorporating the affected extremities and core trunk control into all functional tasks to improve component skills of strength and coordination. Sensorimotor deficits may emerge at this stage as the activity level of the client is increased including ideational and ideomotor apraxia during ADLs, reduced proprioception and light touch, shoulder pain, and spasticity. The OT or Occupational therapy assistant (OTA) provides tactile or verbal cues or both to aide in motor learning and continues education for proper UE awareness and positioning. Visual perceptual strategies for scanning across the entire visual field improve the client's awareness of the environment. The length of stay in Acute Care varies from days to weeks and may include a transition to Subacute Care while discharge planning is finalized.

The client's level of independence and access to a support system determines if discharge home is appropriate or if admission to a subacute nursing facility or assisted living is warranted. If further progress is anticipated, the client will progress through to the poststroke rehabilitation phase on the Inpatient Rehabilitation Unit within the hospital or at an independent rehabilitation facility.

Poststroke rehabilitation phase: The poststroke rehabilitation phase begins when a client continues to show potential for increasing motor control, cognition, visual perceptual skills, language, and overall independence in daily occupations. Clients may begin this stage when transferred to an Inpatient Rehabilitation Unit that provides a minimum of three skilled therapy hours five days per week. If the client shows potential as a rehabilitation candidate but does not have access to inpatient rehabilitation, the client may begin the rehabilitation stage at the subacute level of care such as skilled nursing facility. When the client demonstrates sufficient strength, cognition, and independence to return home with a responsible caregiver, the client may continue the rehabilitation stage at the DayRehab level of care, which provides up to six intensive hours of skilled therapy per day. DayRehab is becoming more prevalent due to the benefits of intense rehabilitation and is very useful in progressing endurance for clients preparing for return to work or school. When sufficient gains in ADLs and IADLs have been made, clients may use the outpatient therapy level of care to fine-tune residual neurological deficits. Home Health Care is reserved for clients who are unable to attend outside therapy due to personal or environmental factors.

While ADL independence may continue to be a goal area in the poststroke rehabilitation phase, OT also addresses performance in IADLs including, but not limited to, meal preparation, medication management, bill paying, computer use, handwriting, home management, parenting, community reentry, and return to work or school goals. Therapeutic interventions to improve UE motor control and balance should reflect high repetitions of graded tasks that incorporate the affected muscles into functional activities to facilitate neuroplasticity (Winstein et al., 2004). Interdisciplinary team management of a client's rehabilitation ensures that the best comprehensive care is provided. Streamlined communication, team rounds, and goal carryover across disciplines give the interdisciplinary team model an advantage over other models. Primary team members include physiatry, nursing, OT, physical therapy, speech therapy, psychology, and vocational rehabilitation specialists. Additional referrals may include, but are not limited to, assistive technology specialists, wheelchair seating and positioning, driving rehabilitation, social work, and case management.

Impact on Occupational Performance

Preparatory Methods and Tasks

The level of impairment and subsequent disability also determines if any preparatory methods or tasks are needed to improve participation and positioning in occupation-based activities, including massage, manual therapy, splints, environmental modifications, assistive technology, or assistive devices (**Table 10-5**).

OT practitioners will use range of motion and soft tissue mobilization to prepare a client's UE for functional use if spasticity impedes movement. Other preparatory methods may include moving the placement of activity items to a space that is more noticeable or accessible to improve performance.

The effects of stroke on occupational performance vary greatly and are primarily determined by severity and location of the stroke. Client evaluation may occur using a top-down approach (Gillen, 2013) through the use of occupational performance to determine functional goal areas including increased independence with basic dressing, or using the affected hand to open containers, reach for and grasp light switches, or feed self independently with the affected hand. Therapists may also implement a bottom-up approach to evaluate affected performance skills such as balance, strength, coordination, vision, and cognitive skills. Results from these skilled assessments are used to guide each phase of treatment to ultimately improve independence in client-centered occupations after stroke. Since various levels of care are usually involved in comprehensive stroke rehabilitation, overlap may exist across each phase of recovery.

Therapeutic Use of Occupations

OT practitioners use ongoing activity analysis to determine and implement occupation-based activities to promote

Table 10-5 Preparatory Methods and Tasks

Mobility	• Wheelchair (power, manual, tilt-in-space, transport) • Walker (standard, rolling, hemi-walker) with basket or tray • Cane (large-base quad cane, small-base quad cane, straight cane) • Gait belt	
ADL	• Bedside drop-arm commode • Shower transfer bench • Shower chair • Long-handled reacher • Dressing stick • Zipper pull • Button hook • Foam toothbrush handle • Foam handles for silverware • Scoop dish • Plate guard	• Raised toilet seat • Handheld shower • Grab bars • Long-handled shoe horn • Elastic shoelaces • Sock aide • Heel slide • Wash mitt • Dycem • Rocker knife
IADL	• Walker tray • Walker basket • Foam handle for pen/pencil	• Adapted cutting board • Pot holder
Vision	• Prism glasses • Line guide	• Partial occlusion glasses
Communication	• Communication boards • Phone/computer apps	• Dragon naturally speaking
Orthotics	• Resting hand splint • Antispasticity splint • Thumb strap	• Ankle–foot orthosis • Knee–ankle–foot orthosis

Data from: Duncan et al. (2005); Gillen (2013).

recovery and independence. **Table 10-6** provides examples of multidimensional graded activities that may be incorporated into skilled OT sessions to enable improved client factors and performance skills using motor control, cognitive training, compensatory, and group therapy techniques.

Education and Training

Client and family education begins on the first day of treatment with an introduction to the role and purpose of OT in the rehabilitation process. Education in the acute phase of treatment focuses on safe bed mobility, handling and positioning of the hemiparetic UE, proper use of assistive mobility devices, home exercise programs to promote healthy joint integrity and muscle length, and strategies to improve visual attention and awareness. As the client transitions throughout each level of care, education for the client and family reflects progress made and activity suggestions from the OT practitioner to increase functional use of the affected extremities, safe functional mobility, cognition and visual perceptual skills throughout all ADLs and IADLs. Occupational therapists and OTAs are responsible for educating the client and family in strategies to increase attention and awareness to the complete visual field, use of partial occlusion glasses for diplopia, safe ADL transfers, splint use and care, and pertinent home exercise programs.

Table 10-6 Therapeutic Interventions

Activities of daily living	• **Motor control techniques** include incorporating the hemiplegic UE as a functional assist (e.g., stabilizing toiletry items when opening and stabilizing clothes when managing fasteners), for gross grasp and reaching (e.g., brushing teeth, pumping soap, managing faucets, brushing hair, holding adapted or standard silverware for hand to mouth, sliding jacket off or pulling onto shoulder, and pulling up pants) and for fine motor control (e.g., cutting food, zippering, buttoning, donning socks, and tying shoes). Visual cues, tactile cues, or physical assistance may be provided to facilitate success. Functional mobility may be addressed concurrently by grading the activity from sitting to standing while incorporating safe use of necessary assistive devices • **Cognitive training techniques** incorporate sequencing steps for each task, visually locating required items, attending to the client's complete personal environment and safety awareness • **Compensatory techniques** include donning clothes over the hemiplegic extremities first, using elastic shoelaces, incorporating one-handed strategies for dressing, and incorporating use of assistive devices such as a sock aid, reacher, and long-handled shoe horn to increase overall independence and reduce disability as a result of motor, cognitive, and visual perceptual deficits • **Group therapy** is useful for clients working on improved independence in ADLs including attending to food on their entire plate or learning and practicing the steps of donning a shirt using hemi-techniques as part of eating or dressing groups, respectively
Instrumental activities of daily living	• **Motor control techniques** encourage the client to begin incorporating their affected UE into a greater variety of daily tasks as a functional assist (e.g., gross grasp to stabilize everyday containers when opening, stabilizing paper when writing, carrying items or light bags), for refined grasp and reaching (opening doorway, appliance and cabinet doors, managing light switches, item retrieval, cleaning, and holding onto treadmill), and in fully integrated movement (e.g., feeding a child, handwriting, in-hand manipulation of money, pouring and cutting during meal preparation, folding laundry, zippering a purse, computer use, and dialing a phone). Functional mobility may be addressed concurrently by grading the activity from sitting to standing while incorporating safe use of necessary assistive devices • **Cognitive training techniques** address the process skills contributing to successful performance of meal preparation, medication management, money management, shopping, home maintenance, child care, and leisure skills including attention (e.g., sustained, alternating, divided, and visual), planning, sequencing, organization, short- and long-term memory, reasoning, and problem solving • **Compensatory techniques** improve awareness of the hemiplegic side through the use of positioning (e.g., resting the arm on the table during meal prep or desk work, and supporting the arm in a hand-based sling during functional mobility) and the use of adaptive equipment (adaptive cutting board to stabilize food items during meal preparation) • **Group therapy** may involve clients working together to learn and prepare a multistep meal based on their respective abilities in nutrition and meal planning group, enjoy leisure activities including Wii games, board games, or adaptive bowling, and plan and execute community outings using public transportation
Upper extremity facilitation and management	• **Motor control techniques** including task-oriented training (Winstein et al., 2004) and constraint-induced movement therapy (Dromerick, Edwards, & Hahn, 2000; Taub et al., 1993; Wolf et al., 2006, 2008) facilitate the greatest amount of neuroplasticity when function is the foundation of each activity, and may address proximal, distal, or concurrent proximodistal motor control (e.g., sweeping cotton balls off the edge of the table to encourage shoulder control, prehension of poker chips to place into slotted container for translation and reaching, turning a key for lateral pinch, pouring beans for controlled grasp and forearm control then release for active finger extension, and shuffling cards or folding laundry for bilateral integration). Activities are constantly graded based on client's performance to steadily increase difficulty and number of repetitions to provide the just right challenge. Shoulder strapping is recommended for clients that have the strength and awareness to respond to the taping as tactile feedback and is contraindicated for clients without volitional motor control. Botox may be recommended to reduce spasticity in affected muscle groups for improved positioning and function of the UE. A skilled occupational therapy practitioner appreciates biomechanics, as well as the effects gravity has on emerging movement, and designs a treatment plan that appropriately facilitates improved motor control

Table 10-6 Therapeutic Interventions (*continued*)

	• **Compensatory techniques** include education of passive and self-range of motion to maintain joint and muscle integrity, positioning at rest and positioning during functional mobility using a hand-based sling. Traditional hemi-slings are strongly discouraged as they promote soft tissue shortening of the shoulder internal rotators and elbow flexors • **Group therapy** includes clients at various stages of recovery working together on common goals for improved function and may focus on hand coordination, UE strengthening, and endurance using dowel rods or Thera-Band, and game group (e.g., Wii, balloon volleyball, bean bag toss, and board games requiring management of small pieces or cards)
Functional mobility	• **Motor control techniques** incorporate active participation of the client with assistive devices as needed in bed mobility (e.g., rolling, bridging, supine to sit, and sit to stand), transfers (e.g., bed, toilet, shower, chair, floor, and car), sitting, and standing balance (e.g., static and dynamic ADLs and IADLs) • **Cognitive training techniques** add another level of performance to the activity by engaging the client in attention or visual scanning tasks while engaged in functional mobility activities • **Compensatory techniques** include passively changing the position of the client in bed and during transfers, and relying on a wheelchair for functional mobility when the client has the necessary strength and coordination for higher-level functional mobility using an alternative assistive device that provides less support (e.g., walker, quad cane, and straight cane) • **Group therapy** incorporates functional activities through the use of standing groups (e.g., Wii, balloon volleyball, bean bags, community outings, yoga, and Pilates)
Vision and perception	• **Motor control techniques** encourage extraocular muscle strengthening to improve diplopia, or double vision, as the weaker eye learns to coordinate again with the unaffected eye through the implementation of pen/cap or Brock String exercises. The stronger eye may be patched for intermittent periods to force the use of the weaker eye muscles, including keeping the eye open when ptosis is present • **Cognitive training techniques** include implementation of the lighthouse strategy, or head turning during occupational performance to improve amount of visual input the client processes, if a visual field cut such as homonymous hemianopia is detected (Niemeier, Cifu, & Kishore, 2001) • **Compensatory techniques** reduce the effects of disabling diplopia through the preferred use of partial occlusion glasses over eye patches to preserve peripheral vision while increasing light perception to the eye • **Group therapy** may involve clients working on board games to address visual attention, visual scanning, and visual fields
Cognition	• **Cognitive training techniques** address a large variety of skills including basic orientation, awareness, categorization, money management (e.g., identifying correct coins, collecting, and making change), memory, attention (e.g., sustained, alternating, and divided), executive functions (e.g., planning, organization, problem solving, and reasoning), and safety awareness in the context of functional bill management, meal planning, homemaking tasks, deductive reasoning puzzles, computer use, medication management, and time management • **Compensatory techniques** include using a memory book or notes section in a cell phone to record daily activities, setting alarms in a cell phone for prospective memory • **Group therapy** may address attention levels, problem solving, and following directions while clients are engaged in board games
Communication and language	• **Motor control techniques** may include Supported Conversation for Aphasia, a technique that involves the occupational therapy practitioner or trained conversation partner to anticipate and confirm what the client with reduced expression is saying throughout the conversation using a black marker on white paper to write simple phrases, which encourage and assist the client to express their thoughts purposefully (Kagan, Black, Duchan, Simmons-Mackie, & Square, 2001) • **Compensatory techniques** may include the use of communication boards or personal communication devices that produce a person's voice through prerecorded phrases in the case of reduced verbal expression • **Group therapy** may include conversation groups and book clubs

Data from: Duncan et al. (2005); Gillen (2013); Knesek (2009); Woodson (2014).

Referrals and Discharge Considerations

Clients are continuously reevaluated throughout each level of care using short-term and long-term goals. These goals are established as part of the initial evaluation and are used to guide intervention planning. Short-term goals are modified to reflect progress made. Long-term goals reflect the occupational therapist's best clinical judgment for a client's anticipated status at discharge from the respective level of care.

Discharge planning varies greatly depending on the levels of impairment. Many clients are discharged home with a trained responsible caregiver for a period of time, or permanently, with the necessary assistive devices and adaptive equipment to ensure a safe transition home. The ultimate goal reflects discharge home with increased independence in occupational roles and return to work or school activities on a reduced or full-time schedule. Additional referrals may be made to a fitness center, vocational rehabilitation, psychology, and driver's rehabilitation.

Advocacy efforts are made by the OT team through recommendation of peer support groups, providing helpful documentation to property management companies regarding environmental modifications, assisting with vehicle placard applications for disabled parking permits, and overseeing successful transitions for return to work or school. It is common for the occupational therapist to create a detailed list of recommended accommodations to an employer or school, or revised schedules for a gradual return to work or school trial to enable successful reintegration.

Management and Standards of Practice

Occupational therapists and OT assistants are an integral part of the interdisciplinary team directing the care of clients who are regaining their independence after stroke. Early evaluation and intervention allows the occupational therapist to develop a client-centered intervention plan that incorporates goals of the client and family that address client factors, performance skills, occupations, performance patterns, contexts, and environments that contribute to independence. The occupational therapist and OT assistant collaborate together using clinical reasoning, activity analysis, and outcome measures to implement the most effective and comprehensive intervention plan to ultimately promote independence in daily occupations. While the occupational therapist provides any necessary clarification of evaluation results and goal setting, the OT assistant has the autonomy to create daily treatment plans, direct patient and family education, recommend necessary durable medical equipment and assistive devices and status ongoing short- and long-term goals.

Ethical considerations in the treatment of stroke reflect the importance of maintaining the client's participation in decision making, ADLs, and IADLs. While each client may present with a certain set of deficits that are addressed as part of the rehabilitation plan, each client also presents with certain motor and cognitive skills that remain intact. Emphasizing these strengths may enable the interdisciplinary team to preserve some level of independence for the client during difficult decisions regarding caregiving needs. Concerns may also arise during discharge planning if a client requires ongoing supervision or assistance yet the client and/or family is not in agreement with each other or with recommendations for ongoing assistance. The client's safety is of utmost importance, and every effort should be made to provide sufficient training and education to facilitate a successful discharge. If the family is unable to provide support for the client at discharge, a referral to social work or case management is necessary.

Chapter 10 Self-Study Activities (Answers Are Provided at the End of the Chapter)

Correctly answer the following multiple choice questions:

1. This is the leading cause of disability in adults:
   - **A.** Gunshot wounds
   - **B.** Stroke
   - **C.** Cancer
   - **D.** Diabetes
2. Which of the following conditions contribute to increased stroke risk?
   - **A.** Hypertension
   - **B.** Smoking
   - **C.** Atrial fibrillation
   - **D.** All of the above

3. CVA is an abbreviation for:
   - **A.** Cardiovascular accident
   - **B.** Cerebrovascular accident
   - **C.** Cerebrovascular arrest
   - **D.** None of the above
4. Which of the following are the most recognizable signs of stroke?
   - **A.** Weight loss, hypertension, and hemiplegia
   - **B.** Incontinence, hypertension, and hemiplegia
   - **C.** Hemiplegia, facial paralysis, and impaired communication
   - **D.** All of the above
5. This type of stroke occurs when a blood clot blocks normal cerebral flow causing a lack of oxygen to the brain:
   - **A.** Ischemic
   - **B.** Hemorrhagic
   - **C.** Aortic
   - **D.** None of the above
6. This type of stroke causes pooling of blood in the brain, interrupting normal blood flow:
   - **A.** Ischemic
   - **B.** Hemorrhagic
   - **C.** Aortic
   - **D.** None of the above
7. TIA is an abbreviation for:
   - **A.** Temporary ischemic attack
   - **B.** Transient ischemic attack
   - **C.** Temporary ischemic arrest
   - **D.** None of the above
8. Which of the following are considered to be levels of care in the management of stroke?
   - **A.** Acute Care
   - **B.** Inpatient Rehabilitation
   - **C.** DayRehab
   - **D.** All of the above
9. Which of the following blood supplies are included in anterior circulation syndromes?
   - **A.** Anterior cerebral artery
   - **B.** Middle cerebral artery
   - **C.** A and B
   - **D.** None of the above
10. Which of the following blood supplies are included in posterior circulation syndromes?
    - **A.** Posterior cerebral artery
    - **B.** Cerebellar artery
    - **C.** Vertebrobasilar artery
    - **D.** All of the above
11. Answer the following short-answer question: You evaluated a client in Acute Care who was found to have a middle cerebral artery stroke two weeks ago. Goals include independent sitting at the edge of the bed for grooming and dressing, moderate assistance for standing balance during transfers for toileting and functional mobility, and moderate cues to consistently locate items on the left side. Describe three different skilled therapy sessions that you would include in your intervention plan.

Chapter 10 Self-Study Answers

1. B
2. D
3. B
4. C
5. A
6. B
7. B
8. D
9. C
10. D
11. There are many acceptable examples of skilled therapy sessions for treating middle cerebral artery stroke. One example could include sitting at the edge of the bed with support as needed to address sitting balance while visually scanning for various food items on the left side of the plate during feeding. Other examples may include visually scanning for grooming items on the sink or using visual perceptual skills to don a shirt correctly. Standing may also be incorporated into the grooming routine in the bathroom or while transferring to a bedside commode.

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