جَامعة
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MANARA UNIVERSITY

Stroke

Introduction

stroke, or cerebrovascular accident (CVA), describes a variety of disorders characterized by the sudden onset of neurological deficits caused by vascular injury to the brain. Vascular damage in the brain disrupts blood flow, limits oxygen supply to surrounding cells, and leads to brain tissue death or infarction. The mechanism, location, and extent of the lesion determine the symptoms and prognosis for the patient.

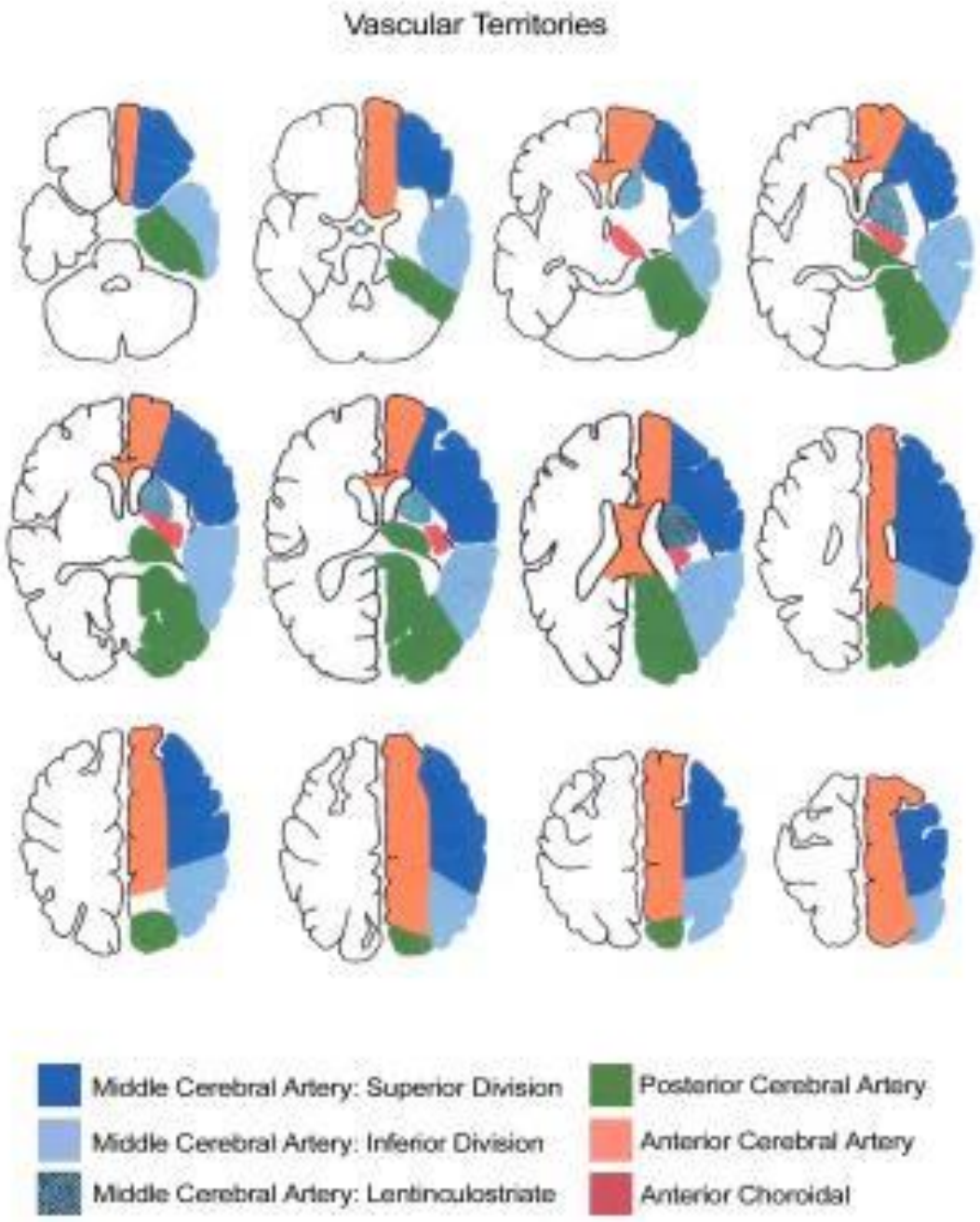
CAUSATION

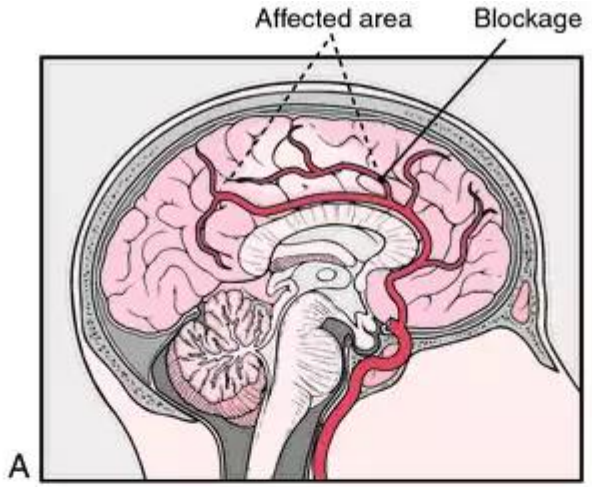
- Strokes are usually classified by the mechanism and location of the vascular damage. The two broad causes are ischemia and hemorrhage .
- Ischemic strokes result from a blockage of a cerebral vessel and can further be categorized as caused by thrombosis or embolism. Thrombosis is the stenosis or occlusion of a vessel, usually as a result of atherosclerosis.
- This occlusion is typically a gradual process, often with preceding warning signs, such as transient ischemic attack (TIA).
- An embolism is dislodged platelets, cholesterol, or other material that forms at another location, travels in the bloodstream, and blocks a cerebral vessel.
- Ischemic strokes are the most common type, accounting for about 87% of strokes

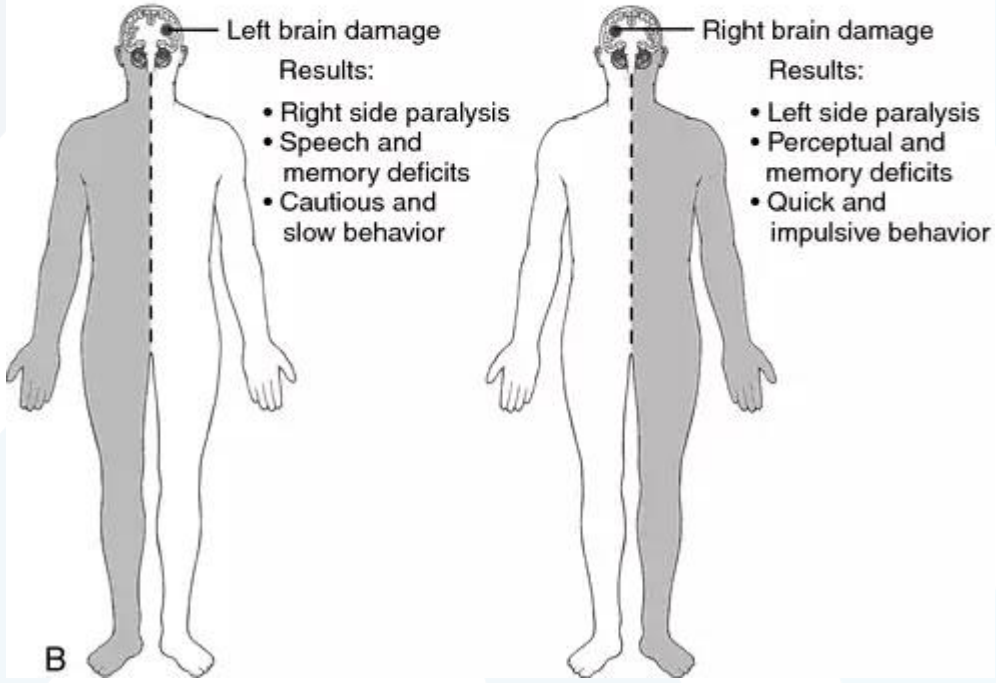
- Hemorrhagic strokes result from a rupture of a weakened cerebral blood vessel. In such strokes, blood accumulates outside of the vascular space and compresses surrounding brain tissue.
- Hemorrhagic strokes are either intracerebral (bleeding into the brain itself) or subarachnoid (bleeding into an area surrounding the brain).
- Aneurysms and arteriovenous malformations are the most common types of weakened blood vessels causing hemorrhagic strokes.
- Hemorrhagic strokes are less common (an estimated 13% of strokes), but they result in a higher mortality rate than ischemic strokes.

Location of Involvement

- Most lesions are either anterior circulation strokes, which present signs and symptoms of hemispheric dysfunction, or posterior circulation strokes, which display signs and symptoms of brainstem involvement.
- Another distinction related to location of CVA is whether the lesion results from large-vessel or small-vessel disease. Thrombosis occurs most often in the large cerebral blood vessels. Small-vessel, or lacunar, strokes are very small infarctions that occur only where small arterioles branch off the larger vessels.


Vascular Territories
Middle Cerebral Artery: Superior Division
Middle Cerebral Artery: Inferior Division
Middle Cerebral Artery: Lentinculostriate
Posterior Cerebral Artery
Anterior Cerebral Artery
Anterior Choroidal


Affected area
Blockage
A


Left brain damage
Results:
• Right side paralysis
• Speech and memory deficits
• Cautious and slow behavior
Right brain damage
Results:
• Left side paralysis
• Perceptual and memory deficits
• Quick and impulsive behavior
B

MEDICAL MANAGEMENT

- In acute ischemic stroke, treatment concerns include restoration of blood flow and limitation of neuronal damage. Medications, including antithrombotics and thrombolytics, are the most common medical intervention for stroke. Antithrombotics include antiplatelet drugs (such as aspirin) and anticoagulation drugs (such as heparin) and are used to prevent further clotting or thrombosis. After stroke, physicians mainly prescribe antithrombotics for prevention, because first time stroke survivors are at a high risk for recurrent strokes. Thrombolytic drugs, such as tissue plasminogen activator (tPA), help reestablish blood flow to the brain by dissolving clots in cerebral vessels.

MEDICAL MANAGEMENT

- With hemorrhagic stroke, acute treatment includes control of intracranial pressure, prevention of rebleeding, maintenance of cerebral perfusion, and control of vasospasm. Surgery or endovascular procedures are often recommended to limit Damage.

RECOVERY FROM STROKE

- The specific abilities lost or affected by stroke and the degree and time course of recovery from stroke vary with the location, type, and extent of the initial injury, and treatment provided.
- Early initial improvement or spontaneous recovery occurs because pathologic processes in the brain resolve, and neurotransmission resumes near and remote from an infarct or hemorrhage. Later, ongoing improvement occurs with structural and functional reorganization within the brain, or neuroplasticity; the term neuroplasticity refers to transiently achieved functional changes in the context of learning and recovery, as well as structural changes on the cellular level.

- Neuroplasticity includes greater excitability and recruitment of intact neurons in both hemispheres of the brain as a response to stimulation, participation, training, and experience
- Intrinsic recovery refers to the remediation of neurological impairments, such as return of movement to a paralyzed limb. Adaptive recovery entails regaining the ability to perform meaningful activities, tasks, and roles without full restoration of neurological function, such as using the unaffected hand for dressing or walking with a cane or walker. Most patients gain some degree of both intrinsic (neurological) and adaptive (compensatory) recovery.
- Rehabilitation, including occupational therapy (OT), is designed to facilitate both processes to maximize an individual's function and participation after stroke.

Neurological Impairments Following Stroke

Neurological Deficit	Possible Effect on Occupational Function
Hemiplegia, hemiparesis	Impaired postural adaptation, bilateral integration Impaired mobility Decreased independence in any or all basic activities of daily living (BADL) and instrumental activities of daily living (IADL)
Hemianopsia, other visual deficits	Decreased awareness of environment, decreased ability to adapt to environment Impaired ability to read, write, navigate during mobility, recognize people and places, drive; can affect all BADL and IADL
Aphasia	Impaired speech and comprehension of verbal or written language; inability to communicate, read, or comprehend signs or directions Decreased social, community involvement; isolation
Dysarthria	Slurred speech, difficulty with oral motor functions such as eating, altered facial expressions
Somatosensory deficits	Increased risk of injury to insensitive areas Impairment of coordinated, dexterous movement
Incontinence	Loss of independence in toileting Increased risk of skin breakdown Decreased social, community involvement
Dysphagia	At risk for aspiration Impaired ability to eat or drink by mouth
Apraxia	Decreased independence in any motor activity (ADL, speech, mobility), decreased ability to learn new tasks or skills
Cognitive deficits	Decreased independence in BADL and IADL, decreased ability to learn new techniques, decreased social interactions
Depression	Decreased motivation, participation in activity; decreased social interaction

Factors Influencing Recovery

Body structures such as the type, size, and site of the brain lesion and body functions such as presence and severity of hemiparesis or aphasia influence the extent and course of recovery. In addition, the context of personal factors such as advanced age and the presence and severity of coexisting disease, such as diabetes, heart disease, and peripheral vascular disease, can impede optimal functional recovery. The effect of age may partly explain more frequent co-impairments, such as arthritis or dementia; many elderly patients with poor outcomes following a stroke had reduced function prior to the stroke. Environmental factors, such as access to acute stroke units and rehabilitation services, help from family members, can also enhance or inhibit recovery

Time Frame for Recovery

- Summarizing stroke literature, the largest percentage of motor and functional recovery occurs in the first month after stroke. Improvement after 6 months poststroke can be expected but is limited.

ASSESSMENT

- Self-Care
  - Barthel Index

FEEDING
0 = unable
5 = needs help cutting, spreading butter, etc., or requires modified diet
10 = independent

BATHING
0 = dependent
5 = independent (or in shower)

GROOMING
0 = needs to help with personal care
5 = independent face/hair/teeth/shaving (implements provided)

DRESSING
0 = dependent
5 = needs help but can do about half unaided
10 = independent (including buttons, zips, laces, etc.)

BOWELS
0 = incontinent (or needs to be given enemas)
5 = occasional accident
10 = continent

BLADDER
0 = incontinent, or catheterized and unable to manage alone
5 = occasional accident
10 = continent

TOILET USE
0 = dependent
5 = needs some help, but can do something alone
10 = independent (on and off, dressing, wiping)

TRANSFERS (BED TO CHAIR AND BACK)
0 = unable, no sitting balance
5 = major help (one or two people, physical), can sit
10 = minor help (verbal or physical)
15 = independent

MOBILITY (ON LEVEL SURFACES)
0 = immobile or < 50 yards
5 = wheelchair independent, including corners, > 50 yards
10 = walks with help of one person (verbal or physical) > 50 yards
15 = independent (but may use any aid; for example, stick) > 50 yards

STAIRS
0 = unable
5 = needs help (verbal, physical, carrying aid)
10 = independent

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ASSESSMENT

The Barthel ADL Index: Guidelines

1. The index should be used as a record of what a patient does, not as a record of what a patient could do.
2. The main aim is to establish degree of independence from any help, physical or verbal, however minor and for whatever reason.
3. The need for supervision renders the patient not independent.
4. A patient's performance should be established using the best available evidence. Asking the patient, friends/relatives and nurses are the usual sources, but direct observation and common sense are also important. **However direct testing is not needed.**
5. Usually the patient's performance over the preceding 24-48 hours is important, but occasionally longer periods will be relevant.
6. Middle categories imply that the patient supplies over 50 per cent of the effort.
7. Use of aids to be independent is allowed.

ASSESSMENT

- Barthel Index Scoring

No. of Points (Sinoff 1997)	Status
80–100	Independent
60–79	Minimally dependent
40–59	Partially dependent
20–39	Very dependent
<20	Totally dependent

https://www.mdapp.co/barthel-index-for-activities-of-daily-living-adl-calculator-361/

ASSESSMENT

- Self-Care
  - Functional Independence Measure (FIM)

	ADMISSION	DISCHARGE	FOLLOW-UP
Self-Care			
A. Eating			
B. Grooming			
C. Bathing			
D. Dressing - Upper Body			
E. Dressing - Lower Body			
F. Toileting			
Sphincter Control			
G. Bladder Management			
H. Bowel Management			
Transfers			
I. Bed, Chair, Wheelchair			
J. Toilet			
K. Tub, Shower			
Locomotion			
L. Walk/Wheelchair			
M. Stairs			
Motor Subtotal Score			
Communication			
N. Comprehension			
O. Expression			
Social Cognition			
P. Social Interaction			
Q. Problem Solving			
R. Memory			
Cognitive Subtotal Score			
TOTAL FIM Score			

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ASSESSMENT

- Self-Care
  - Functional Independence Measure (FIM)

LEVELS	**Independent** 7 Complete Independence (Timely, Safely) 6 Modified Independence (Device)	**NO HELPER**
	Modified Dependence 5 Supervision (Subject = 100%+) 4 Minimal Assist (Subject = 75%+) 3 Moderate Assist (Subject = 50%+) **Complete Dependence** 2 Maximal Assist (Subject = 25%+) 1 Total Assist (Subject = less than 25%)	**HELPER**
Note: Leave no blanks. Enter 1 if patient is not testable due to risk.		

ASSESSMENT

- Self-Care
- Instrumental Activities of Daily Living

“minimal IADL skills required to stay at home alone include the ability to

(1) prepare or retrieve a simple meal,

(2) use safety precautions and exhibit good judgement,

(3) take medication, and

(4) get emergency aid, if needed”

ASSESSMENT

- Self-Care
  - Frenchay Activities Index

In the last 3 months how often have you undertaken:	
1. Preparing main meals 2. Washing up after meals	0 = Never 1 = Less than once a week 2 = 1-2 times per week 3 = Most days
3. Washing clothes 4. Light housework 5. Heavy housework 6. Local Shopping 7. Social occasions 8. Walking outside for > 15 minutes 9. Actively pursuing hobby 10. Driving car/going on bus	0 = Never 1 = 1-2 times in 3 months 2 = 3-12 times in 6 months 3 = At least weekly

In the last 6 months how often have you undertaken:	
11. Travel outing/car ride	0 = Never 1 = 1-2 times in 6 months 2 = 3-12 times in 6 months 3 = At least weekly
12. Gardening	0 = Never
13. Household maintenance	1 = Light 2 = Moderate 3 = Heavy/All necessary
14. Reading books	0 = None 1 = 1 in 6 months 2 = Less than 1 in 2 weeks 3 = More than 1 every 2 weeks
15. Gainful work	0 = None 1 = Up to 10 hours/week 2 = 10-30 hours/week 3 = Over 30 hours/week

ASSESSMENT

- Frenchay Activities Index

In patients with stroke, the FAI should be used to assess pre-morbid IADL at 3 and 6 months before stroke, and subsequently to record changes in IADL following stroke, at specific intervals (Holbrook & Skilbeck, 1983). Studies typically examine change in post-stroke IADL by examining patients at 1 year after stroke, and looking retrospectively at the past 3 and 6 months.

ASSESSMENT

- Self-Care
  - Philadelphia Geriatric Center Instrumental Activities of Daily Living Scale
  - Canadian Occupational Performance Measure

- Postural Adaptation

Postural adaptation , or postural control, refers to the individual's ongoing ability to achieve, maintain, or restore an upright position against gravity (balance) for stability during activities or changes in body position.

  - Berg Balance Scale
  - The Functional Reach Test

Determining status of a patient's trunk control after stroke is an important starting point for assessing motor capacities or skills because poor trunk control can lead to dysfunctional limb control, increased risk of falls, contracture and deformity, diminished sitting and standing endurance, decreased visual feedback and swallowing effectiveness secondary to head and neck malalignment, and impaired ability to interact with the environment

- Postural Adaptation
  - Berg Balance Scale
  - Scoring: A five-point ordinal scale, ranging from 0-4. “0” indicates the lowest level of function and “4” the highest level of function. Total Score = 56

Interpretation:

- 41-56 = low fall risk
- 21-40 = medium fall risk
- 0 –20 = high fall risk

ITEM DESCRIPTION	SCORE (0-4)
Sitting to standing	_____
Standing unsupported	_____
Sitting unsupported	_____
Standing to sitting	_____
Transfers	_____
Standing with eyes closed	_____
Standing with feet together	_____
Reaching forward with outstretched arm	_____
Retrieving object from floor	_____
Turning to look behind	_____
Turning 360 degrees	_____
Placing alternate foot on stool	_____
Standing with one foot in front	_____
Standing on one foot	_____
Total	_____

Common Impairments in Sitting Posture Seen after Stroke

Body Part	Normal Sitting Posture Ready for Function	Abnormal Sitting Posture Typical of Stroke
Head, neck	Neutral	Forward Flexed to weak side Rotated away from weak side
Shoulders	Symmetrical height Aligned over pelvis	Uneven height Involved shoulder retracted
Spine, trunk	Straight from posterior view Appropriate lateral curves Lateral trunk muscle lengths equal bilaterally	Curved from posterior view Thoracic kyphosis Shortened lateral trunk muscles on one side, elongation on opposite side
Arms	Not used to maintain static upright posture Relaxed	Use of stronger arm to maintain upright posture Increased or decreased muscle tone in involved arm
Pelvis	Symmetrical weight bearing through both ischial tuberosities Neutral to slight anterior pelvic tilt Neutral rotation	Asymmetrical weight bearing Posterior pelvic tilt One hip angled forward
Legs	Hips at 90° flexion Knees aligned with hips; hips in neutral adduction or abduction and internal or external rotation Feet under knees Feet flat on floor, able to bear weight	Hips in more extension Hips adducted so that knees touch or involved hip externally rotated so that knees wide apart Feet in front of knees Feet not flat on floor, unable to bear weight

- Upper Extremity Function

- Achievement of skilled arm and hand function is a complex, often difficult process following stroke and involves interaction of several body functions and structures. Evaluation of the involved upper extremity should address sensation; the mechanical and physiological deterrents to movement; the presence and degree of active or voluntary movement; the quality of this movement, including strength, endurance, and coordination; and the extent of function resulting from movement.

Somatosensory Assessment

it is important to remember that sensation is a component of function that is only a focus for treatment when it relates to the ability to perform usual daily living tasks. When somatosensory disturbances are present, they usually accompany motor impairment in the same anatomic distribution.

Most tests of sensation require attention, recognition, and response to multiple stimuli; therefore, sensory testing is difficult in patients with aphasia, confusion, and other cognitive deficits. It is often necessary to determine the patient's level of comprehension and communication, including yes/no reliability. An expressively aphasic patient can nod, gesture, point to written or pictured cues, or select a stimulus object from an array of objects.

- When testing with standard procedures is not possible, information may still be gained from observing a patient's reactions to the testing. The presence of gross protective sensation (flinching when pricked with a sharp pin) can be documented even if discriminatory perception cannot be determined.
- Patients who have had mild CVAs and who have intact primary sensory awareness may need to be tested for more subtle discriminatory problems using two-point discrimination testing or the Moberg Pick-up Test Such testing is indicated when motor return is good, but hand dexterity remains impaired.

Mechanical and Physiological Components

- Factors that can interfere with movement and function of the hemiplegic upper extremity include limitations in PROM, joint malalignment, abnormal muscle tone, and pain. Passive movement restrictions in the joints and soft tissues of the extremity may result from an individual's anatomy and lifestyle or from premorbid conditions such as arthritis or injury. Limitations may result more directly from the stroke, with sudden and prolonged immobilization of joints caused by weakness or spasticity in muscles. Persistent stereotyped positioning of joints without counteracting movement results in the shortening and eventual contracture of muscles, tendons, and ligaments. Edema secondary to reduced circulation and loss of muscle action can further limit passive joint motion, particularly in the hand.

- Goniometric measurement of passive range of motion (PROM) is usually not indicated unless treatment is specifically aimed at increasing passive motion, such as when trying to eliminate an elbow flexion contracture. More useful in assessing patients with stroke is a comparison of the involved to the uninvolved arm to determine probable baseline joint motion.

- Shoulder subluxation , or malalignment of the glenohumeral joint, occurs in approximately 50% of stroke patients. This condition is probably caused by the weight of the arm pulling down the humerus when the supraspinatus and deltoid muscles are weak and by weakness of scapular muscles that allows the glenoid cavity to rotate downward.
- Shoulder subluxation can be identified by palpation: the seated patient's arm hangs freely with trunk stabilized while the examiner palpates the subacromial space for the separation between the acromion and the head of the humerus. The distance separating the two is measured in fi nger widths, that is, the number of fi ngers that can be inserted in the space

- The role of subluxation in the painful shoulder is controversial; in the shoulder, adhesive capsulitis, tendonitis, bursitis, rotator cuff tear, traction/compression neuropathy, and complex regional pain syndrome (CRPS) are common complications of hemiparesis, and all can result in pain and limited range of motion (ROM).
- Spasticity, defined as velocity-dependent hyperactivity of tonic stretch reflexes, can result in ROM limitations and pain, often leading to contractures and functional impairments. The Ashworth Scale/Modified Ashworth Scale