

PT Neuro Exam and Treatment: The Basics and Beyond

Abby Park, PT, DPT, NCS and Brittany Kennedy, PT, DPT, NCS

Objectives:

Participants will:

- Be proficient in performing the neurologic exam
- Be able to interpret findings of exam and apply to various neurological conditions
- Be able to differentiate central and peripheral vestibular impairments
- Be able to identify gait impairments linked to neurologic disorders and verbalize appropriate treatments
- Be provided with resources to aide in selection of most appropriate outcome measures for their patients with neurologic disorders
- Analyze the various domains of balance in order to effectively guide treatment
- Evaluate examination findings and be able to determine if a patient needs referral to a medical provider due to the presence of “Red flags”
- Apply findings of the neuro exam to guide current evidence based treatment

Outline of Topics:

- The Neuro Exam
 - LAB
- Gait and Balance Examination
- Disease Specific Considerations
 - Parkinson’s Disease
 - Multiple Sclerosis
 - Stroke
 - Cerebellar Disorders
 - Peripheral neuropathies, myelopathies, and radiculopathies
 - General Balance and Increased Fall Risk
- Outcome Measures
- Vestibular Considerations
- Treatment Considerations and lab
 - Neuroplasticity
 - Motor Learning/Control
 - Disease Specific Considerations
 - Case Studies
 - Parkinson’s Disease
 - Balance
 - Stroke
 - Cerebellar

The Neuro Exam:

Gives you the following information:

- Info needed for general screen or referral
- Identification of "red flags"
- Range of impairments
- What you can treat vs. what affects treatment
- Localization for diagnosis
- Baseline impairments/function

Not all aspects of the neuro exam need to be tested with every patient! Choose most appropriate based on diagnosis and prioritize based on time available

Observation:

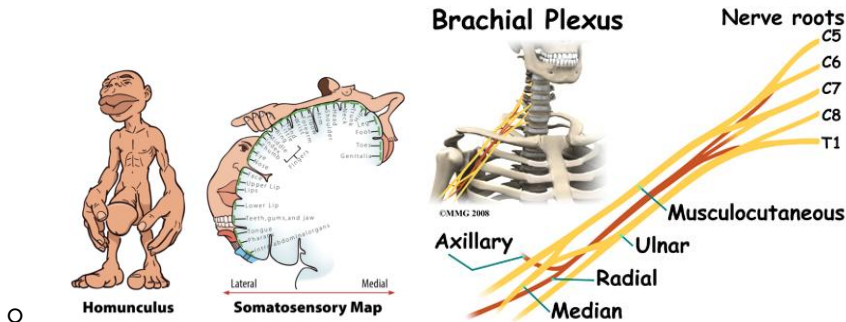
- Starts immediately when you walk into the room
- Examples (not inclusive list): Posture, posturing, tremor, devices, skin changes/bruising, muscle wasting, reliance on others, room set up, caregiver assist....
- Observation should help to guide your subjective and objective exam

Cognition and Alertness:

- Level of arousal
- Orientation: Person, place and time- may test with various dementias
- Do they follow directions?
- Sudden changes may indicate medical issues & need for further follow up
- Apraxia- included here as this may appear to be a cognitive problem, but it is actually a motor problem. Unable to select appropriate motor program to perform tasks on command. Result of brain damage

Sensation:

- Purpose of testing: Identify the need for further testing, can help in determining prognosis by giving you a range of impairments you are working with and can help with diagnosis when uncertain
- Sensation and motor function are strongly linked- sensation is used as feedback during movement to adjust & correct. It gives information about environment and relation of body to the environment
- Distributions: Gives information to localize problem
 - Cortical- follows sensory homunculus
 - Peripheral- follows peripheral nerve distribution
 - Spinal nerves- follows dermatomal distribution



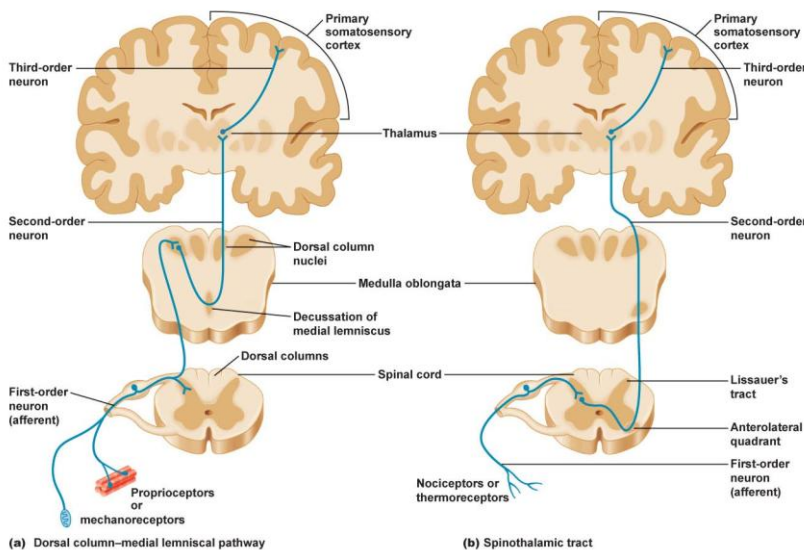
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- Sensory Tracts

- Dorsal Column/Medial Lemniscus

- Light touch
- Proprioception
- Vibration- typically first affected in diabetic neuropathy
- Two-point discrimination
- Crosses at the level of the medulla in the brainstem

- Spinothalamic Tract

- Sharp/dull
- Pain/temperature
- Crosses immediately upon entering spinal cord



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- Consider EXTINCTION testing

- Inattention to 1 side when sensory input is given bilaterally and simultaneously
- Occurs with damage to the sensory cortex- the side not noticed is opposite the side of cortical damage

- Testing Sensation

- Choose sensation tests which might give you the most information
- Make sure eyes are closed
- Move from distal to proximal or in a sequence (dermatomal, etc.)
- Test general body areas for light touch if suspect cortical damage

- Test dermatomes if you suspect nerve root damage
- Proprioception
 - Ability to feel where our body is in space
 - Largest effect on movement
 - Smallest joints have least amount of extraneous movement when testing
 - Testing: Be sure to have hands on the side of the joint so as not to give pressure cues

Reflexes:

- Deep Tendon Reflexes
 - Helps distinguish UMN vs LMN problem
 - UMN: hyperreflexia
 - LMN: diminished reflexes
 - Grading
 - 4+: very brisk, hyperactive
 - 3+: Brisker than average, possibly but not necessarily indicative of disease
 - 2+: Normal
 - 1+: Somewhat diminished/ low normal
 - 0: Absent
- Superficial Cutaneous Reflexes: Signs of upper motor neuron involvement
 - Clonus- move ankle quickly into dorsiflexion
 - Positive- beats into plantarflexion (1-2 beats may be normal)
 - Hoffman's- flick terminal phalanx of the middle or ring finger
 - Positive- terminal thumb phalanx flexion
 - Babinski- stimulate foot along lateral border
 - Positive- toes extend/move apart

Tone/Spasticity:

- Tone: Test by performing passive movement of upper and lower extremities
 - Everyone has some degree of normal tone
- Spasticity: Increased muscle tone
 - Velocity Dependent
 - UMN sign- lack of central inhibition
 - Can grade using Modified Ashworth Scale

Grade	Description
0	No increase in muscle tone
1	Slight increase in muscle tone, manifested by a catch and release or by minimal resistance at the end range of motion when the affected parties moved in flexion or extension
1+	Slight increase in muscle tone, manifested by a catch, followed by minimal resistance throughout the remainder (less than half) of the range of motion
2	More marked increase in muscle tone through most of the range of motion, but the affected part is easily moved
3	Considerable increase in muscle tone, passive movement is difficult
4	Affected part is rigid in flexion or extension

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- Flaccidity: decreased muscle tone
- Rigidity

- Sign of basal ganglia damage
- Test in distal aspects of limb (wrist and elbow flex/extension, ankle and knee flexion/extension)
- May be continuous or ratchety (cogwheeling)
- NOT velocity dependent
- To intensify add an activation maneuver with opposite UE

Range of Motion:

- Test to get an idea of strength (active ROM), tone (passive ROM), contractures and compensations used for function.
- Goniometers?

Strength:

- In UMN Lesion, strength deficit is a decreased force production because of inadequate input to alpha motor neuron
- Strength testing can give information on lesion location similar to sensory examination
- Other contributions to decreased strength:
 - Postural set
 - Decreased motor contribution from M1
 - Problems with sequencing
 - Disuse/atrophy
 - Sensory loss
 - Attention

Coordination:

- Ability to use parts of the body together smoothly and effectively
- Brain areas involved:
 - Motor and sensory cortices
 - Cerebellum
 - Basal Ganglia
- Test the following on exam:
 - Rapid alternating movements
 - Accuracy of movement
 - Finger to nose
 - Fixation/limb holding
 - Equilibrium/postural stability
 - Also note how it affects gait/function

Cranial Nerves:

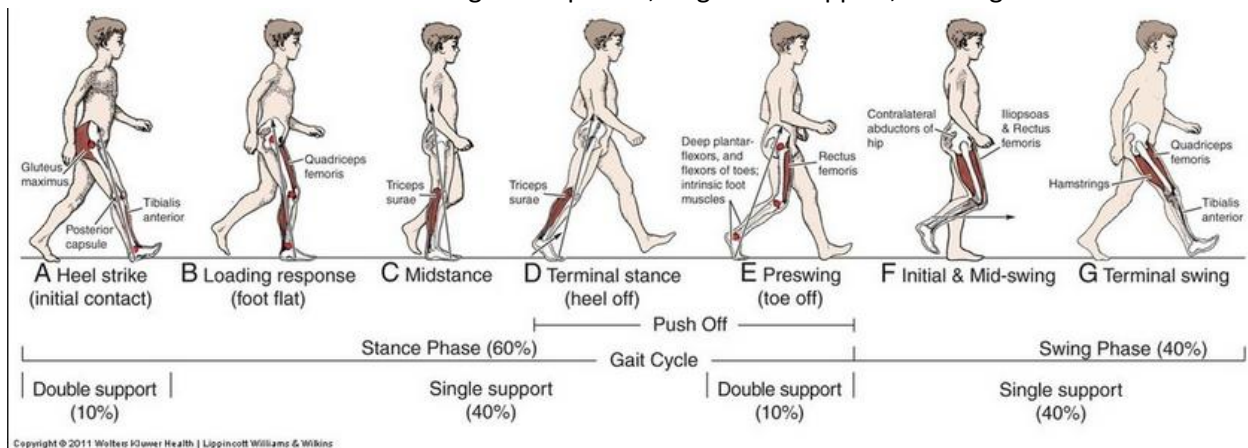
**Do not need to be tested for every neuro diagnosis. Test when you suspect damage to brainstem. Not all cranial nerves have an impact on function, therefore not all need to be tested if known brainstem lesion. May give more information to test all if diagnosis or lesion location is unknown.

No.	Name	S/M/B	Function	How to Test
1.	Olfactory	S	Smell	Identify smell
2	Optic	S	Vision	Pupillary reflex (sensory) Check vision
3	Oculomotor	M	Moves eye up/down/medial, raises upper eyelid, constricts pupil, adjusts lens shape	Check eyelids open equally Track finger Pupillary reflex (motor)
4	Trochlear	M	Moves eye medial/down	Track finger
5	Trigeminal	B	Facial sensation, chewing	Sensation of face Muscles of mastication Corneal reflex (Sensory)
6	Abducens	M	Abducts eye	Track finger
7	Facial	B	Facial expression, closes eye, tears, salivation, taste	Facial movements Corneal reflex (motor)
8	Vestibulocochlear	S	Hearing, head position relative to gravity & mvmt	Vestibular function Auditory function
9	Glossopharyngeal	B	Swallowing, salivation, taste	Say "ahh"
10	Vagus	B	Swallowing, speech, taste, regulates viscera	Say "ahh"
11	Spinal Accessory	M	Elevates shoulders, turns head	MMT sternocleidomastoid and upper trap
12	Hypoglossal	M	Moves tongue	Have patient stick out tongue

Gait and Balance Examination:

- Gait Examination
 - Rancho Los Amigos gait cycle evaluation:
 - Stance Phase

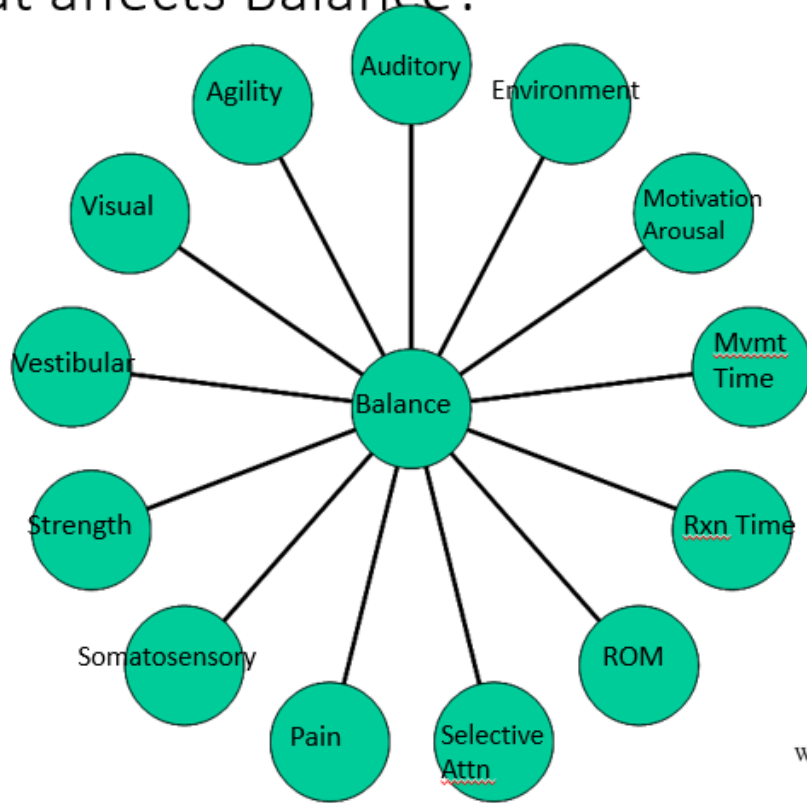
- Initial Contact
- Loading Response
- Mid stance
- Terminal stance
- Swing Phase
 - Pre-swing
 - Initial swing
 - Mid swing
 - Terminal Swing
- Considers: weight acceptance, single limb support, and single limb advancement



- Key Muscles to consider:
 - Trunk
 - Hip
 - Knee
 - Ankle
- System for Evaluation
 - Considerations: either look proximally to distally or distally to proximally
 - Look at trunk, pelvis, knee, and ankle - strength, ROM, tone, and coordination
 - Also look at: arm swing, head position, and overall posture
- Evaluating swing phase:
 - Limb advancement
 - Limb clearance
 - Coordination of hip, knee, and ankle
- Evaluating stance phase:
 - Stability of pelvis, trunk
 - Stability of knee
 - Weight Shift
 - Weight acceptance
- Balance Evaluation:
 - Normal Postural Control and Balance

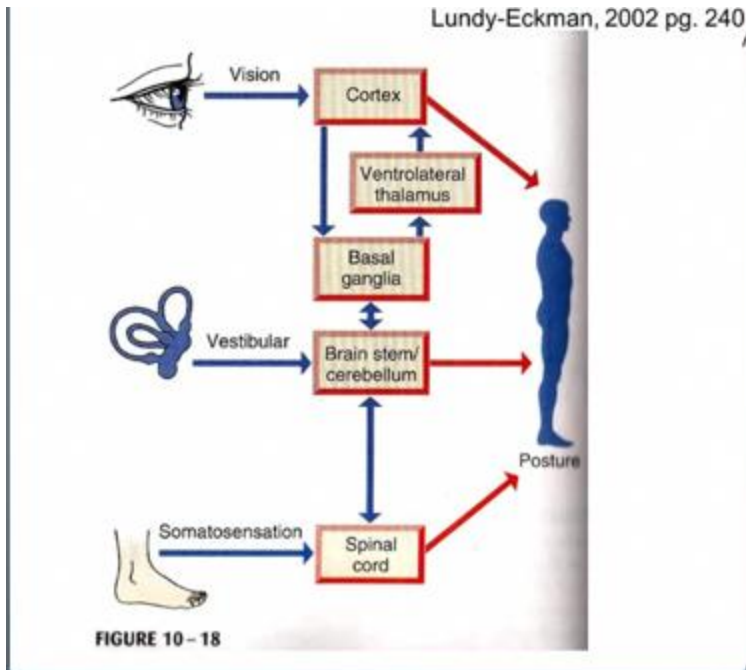
- Requires combination of consideration of the individual, the environment, and the task itself
- What affects balance?

What affects Balance?



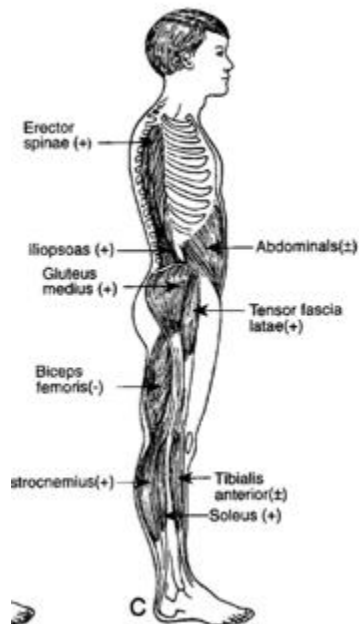
Whitney, 2002

- The basics of good balance
 - Sensory input leads to motor output
 - Sensory information
 - Visual
 - Vestibular
 - Somatosensory

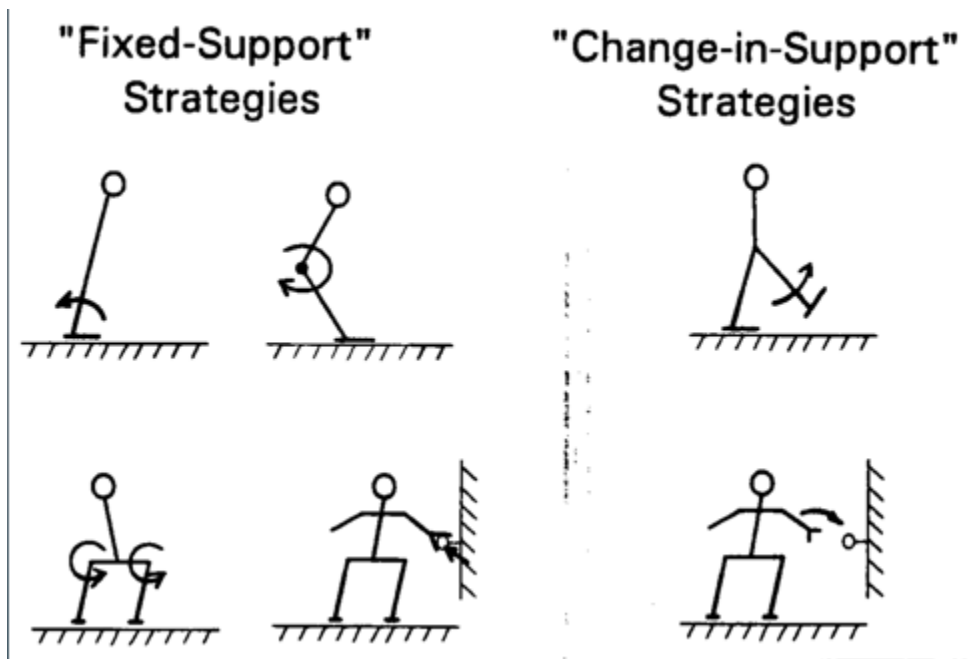


■ Motor Output

- Erector spinae
- Abdominals
- Iliopsoas
- Glute medius
- Tensor fascia latae
- Biceps femoris
- Gastrocnemius/soleus
- Tibialis anterior



- Balance Strategies
 - Anticipatory
 - Reactive
 - Fixed support (body stays stagnant)
 - ankle
 - hip
 - knee bend
 - reach for support
 - Change in support reactions (allowed to move body in space to regain balance)
 - stepping reaction
 - reach outside and move trunk for support
 - Feedback mechanisms
 - Feedforward mechanisms



- Abnormal postural control
 - Abnormal sequencing
 - delay in recruitment
 - decreased torque
 - co-contraction of muscles
 - timing of contraction
 - Scaling of balance reactions
 - Adaptation to balance challenges
- Systematic Evaluation of balance - Six Considerations evaluated in the BESTest (Appendix 1)
 - Biomechanical Constraints
 - Stability Limits and Verticality
 - Transitions and Anticipatory balance

- Reactive balance
- Sensory Orientation
- Stability in Gait

Disease Specific Considerations for Examination:

Parkinson's Disease

- Pathophysiology: Progressive loss of dopamine in the basal ganglia
- Basal ganglia's role: Initiates, stops, monitors and maintains movement. Functions as a "braking system" to inhibit undesired movement and permit desired ones.
- 4 Cardinal Signs
 - Tremor
 - Rigidity (Cog Wheeling)
 - Use activation maneuver
 - Bradykinesia
 - Detected in functional mobility, coordination testing
 - Postural Instability
 - Pull Test
- Coordination Testing
 - Finger Tapping
 - Mass grasp
 - Pronation/Supination ("turning door knob")
 - Toe tapping
 - Leg Agility
- Things to look for:
 - Rhythm broken/hesitations in movement
 - Slowing of movement
 - Decreased amplitude of movement
- Things not affected: strength, sensation, reflexes (<https://www.quora.com/Why-isnt-hyperreflexia-a-Parkinsons-sign-while-hypertonia-is-present> for more information), cranial nerves (though many have loss of smell as an early symptom)
- Balance Considerations:
 - Loss of balance reactions
 - Loss of automatic postural control
 - Abnormal sequencing
- Parkinsonian Gait:
 - Shuffling
 - Short step length bilaterally, mid foot contact, flexed forward at hips, often lack arm swing unilaterally
 - Festinating gait
 - Unable to control forward movement of trunk -->leads to falling
 - Freezing

Multiple Sclerosis:

- Pathophysiology: demyelination occurs in the central nervous system in the brain and/or spinal cord. Signs and symptoms will depend on the areas of demyelination
- Common Signs:
 - Sensory impairment with complaints of numbness or paresthesias in a cortical or dermatomal pattern
 - Motor impairment in cortical or myotomal pattern
 - Spasticity
 - Vision and oculomotor deficits including deficits in acuity, ocular alignment, and oculomotor
 - Coordination and ataxia
 - Dizziness
 - Fatigue - primary and secondary
 - Bowel and bladder impairment (spasticity)
 - Heat sensitivity
 - Balance deficits >> falls
- Examination considerations
 - Main points: UMN signs, localization in cortex, brainstem, cerebellum, or spinal cord
 - Objective findings may lead you to at least two localization points (historically or objectively)
 - To be diagnosed, must have demyelination in two different areas
 - Cranial nerve evaluation, especially oculomotor
 - Coordination testing: ataxic, dysmetric movements if cerebellum is involved
 - rapid alternating movements
 - finger to nose
 - heel to shin
 - Tone assessment: Modified Ashworth Scale - expect hypertonicity
 - Reflex assessment: expect hyperreflexia, presence of abnormal reflexes - babinski and clonus
 - Sensory Testing: light touch, sharp/dull, proprioceptive testing
 - Manual Muscle Testing
 - Cognitive Screen: alertness and orientation, MoCA
 - Fatigue assessment: Modified Fatigue Impact Scale (full and 5 item)
 - Complete vestibular exam as indicated
- Balance assessment
 - Important to consider static and dynamic balance
 - Likely to have poor sensory input (visual loss, vestibular loss, and poor somatosensation) as well as inability to produce good motor output - poor muscle strength, sequencing, and coordination
- Gait assessment
 - Impairments that will lead to gait deficits:
 - Weakness
 - Poor sensory input
 - Spasticity

- Impaired coordination
- Common deficits seen:
 - Poor foot clearance due to: foot drop, weak hip flexors, and/or spasticity in plantarflexors
 - steppage gait
 - circumduction
 - vaulting
 - Trendelenburg due to weak glute medius
 - Ataxia
 - Evidence of balance issues:
 - path deviation
 - wide BOS
 - Slow cadence

Stroke:

- Pathophysiology: vascular event leading to damage of brain tissue supplied by that vessel
- Signs and symptoms vary significantly depending on vessel affected (appendix 2)
 - Most common: MCA, ACA, PCA
 - Other common: lacunar, cerebellar, and vertebrobasilar
- Common impairments to examine:
 - Motor:
 - Loss in cortical distribution unilaterally >> hemiplegia
 - Consider proximal strength of scapular stabilizers, pelvis, and hip
 - UE often more affected than LE
 - LE muscles often affected: dorsiflexors, quadriceps, hamstrings, and gluteus maximus
 - Sensory
 - Loss in cortical distribution in unilateral
 - May be complete sensory loss or partial
 - Test light touch, proprioception, sharp/dull
 - Cranial Nerves
 - Oculomotor impairment
 - Palate and uvula deviation
 - Tongue deviation
 - Facial droop with forehead/eyebrow movement preserved
 - Reflexes
 - Hypertonicity unilaterally
 - Unilateral abnormal reflexes
 - Cognition
 - Executive dysfunction
 - Memory impairments
 - Emotional lability
 - Postural assessment: sitting and standing
 - Ability to sense upright

- Even weight distribution left to right
 - Signs of pusher syndrome
 - Speech deficits
 - Word finding deficits
 - Slurred speech
 - Non-sensical words/paraphrasing
 - aphasia
- Balance evaluation
 - Static and dynamic balance assessment is important
 - Deficits with co-contraction of muscles, torque, and sequencing
- Gait Evaluation
 - Swing Phase
 - Foot drop
 - Difficulty with limb advancement due to hip weakness
 - Limb external rotation with pelvic retraction
 - Compensations:
 - circumduction
 - steppage
 - vaulting
 - Ability to achieve positive step length
 - Stance Phase
 - Foot slap with initial contact
 - Decreased knee stability in midstance
 - Difficulty with weight acceptance and weight shift
 - Trendelenburg
 - Pelvic retraction
 - Time in single limb stance

Cerebellar Disorders:

- WIDE variety of various pathologies that can affect the cerebellum. Most common is cerebellar CVA or cerebellar degeneration, though there can be inherited conditions which also affect the cerebellum
- Function of the Cerebellum:
 - Motor Coordinator
 - Controls activity of multiple muscles across several joints
 - Regulates force, distance, timing, duration
 - Predicts to generate feed forward motor commands
 - Timer
 - Site of temporal representation of movements
 - Encodes sequencing of muscle activations
 - Motor Learning
 - Site of stored knowledge to generate predictive motor commands
 - Updates movement using error feedback
- Coordination Impairments

- Dysdiadochokinesia- rapid alternating movements
- Dysmetria- inaccurate movements
- Action Tremor
- Vestibular & Visual Changes
 - Oculomotor Impairments
 - Saccadic intrusions with smooth pursuit
 - Dysmetric saccades
 - Impaired VOR cancellation
 - Impaired VOR- unable to maintain gaze with head movement
- Gait & Postural Control
 - Ataxia: Difficulty initiating and controlling rate, rhythm and timing of responses
 - Dyssynergia
 - Multiple joint movements more difficult than single joint ones
 - Decomposition
 - Breaking down multiple joint movements into single joint ones
 - Over-corrections for loss of balance

Peripheral Neuropathies/Radiculopathies/Myelopathies

- Peripheral Neuropathy
 - Typically affects distal extremities
 - Glove/stocking distribution
 - Symptoms vary depending on whether sensory or motor nerves are damaged
 - Impaired/absent light touch
 - Impaired/absent proprioception
 - Muscle wasting/atrophy
 - Neuropathic pain
 - Balance: sensory integration issues
 - Gait
 - Weakness: may lead to drop foot, knee hyperextension
 - Sensory ataxia
- Radiculopathy: at nerve root site
 - Signs & Symptoms
 - Sensation
 - Follows dermatomal pattern
 - Weakness
 - Follows myotomal pattern
 - Consider testing muscles with similar innervations
 - Reflexes: diminished
 - Bowel/Bladder- not impaired
 - The following criteria are predictive for cervical radiculopathy:
 - Positive limb upper tension test A
 - Cervical rotation less than 60 degrees to involved side
 - Positive distraction test
 - Positive Spurling's Test

- Myelopathy: Spinal Cord Involvement
 - Reflexes: Hyperreflexia below level
 - Strength: impaired below level
 - Increased spasticity
 - + Babinski's and/or Hoffman's reflexes
 - Loss of bowel/bladder control
 - Coordination: impaired due to weakness

Outcome Measures:

Commonly Used:

- Balance Tests
 - Timed Up and Go
 - Assesses mobility, walking ability, fall risk/balance
 - Set up: 3 meter (9.8 feet) walkway
 - Starts with "go", ends when patient contacts the chair
 - Cut off scores indicating fall risk
 - Community dwelling: >13.5 sec
 - Cognitive TUG
 - Measure of dual task ability
 - Perform TUG + Cognitive task --> note time to perform
 - Perform cognitive task while seated for duration of TUG time
 - Dual Task Cost= ((individual - dual)/individual) x 100
 - Berg Balance Scale (appendix 3)
 - Measure of static balance and fall risk
 - In elderly, score of <45 indicates increased fall risk
 - See rehabmeasures.org for disease specific MDC's
 - Assistive device use?
 - Has a floor and ceiling effect
 - Functional Gait Assessment (Appendix 4)
 - Modification of DGI (appendix 5)- decreased ceiling effect, improved reliability
 - Assessment of dynamic balance
 - Can perform with or without device
 - Fall Risk Cut-off Scores
 - <22/30 or <20/30 in community dwelling adults
- Functional Strength
 - 5x Sit to Stand
 - Measure of functional lower limb strength
 - Perform without upper extremity assist, as quick as possible
 - Document modifications
 - Other variations exist (ex: counting repetitions in 30 sec time period)
 - Generally, cut-off for increased falls relating to lower limb strength is ~12.5 seconds (see rehabmeasures for disease specific)

- Special Considerations
 - Balance disorders: balance impairment upon standing (anticipatory balance control)
- Gait Measures
 - 2 Minute Walk Test/ 6 Minute Walk Test
 - Keep assistive devices consistent
 - Gait Speed
 - 10 meter walk test
 - Preferred and fast walking speeds
 - Keep device consistent
 - Not appropriate if they need assistance

Parkinson's Disease:

- Considerations for testing
 - Timing of medications
 - Practice effect - gait speed, 2 min walk
 - Note quality of movement, not just time
- Gait Measures
 - 2/6 min walk test
 - 10 m walk test
 - TUG
 - comfortable: >11.5 sec cutoff for fall risk
 - fast
 - cognitive
- Balance Measures
 - Mini Bestest (appendix 6)
 - Functional Gait Assessment
 - Fall risk cut off: <15/30
- Functional Strength
 - 5x sit to stand
 - note retropulsion, postural set with standing, hypokinesia
- Fine Motor:
 - 9 Hole Peg Test
- Subjective Outcome Measures
 - ABC scale (Appendix 7)
 - Parkinson's Disease Questionnaire - 8 or 39 (Appendix 8)
 - Freezing of Gait Questionnaire (Appendix 9)

Multiple Sclerosis:

- Considerations:
 - Fatigue and timing of tests
 - Environment factors: heat, time of day
- Gait Measures:

- 6 min walk test
- 2 min walk test
- Timed 25 foot walk
- Timed Up and Go with cognitive and manual components
- Balance Measures
 - Berg Balance Scale
 - Functional Gait Assessment
 - Dynamic Gait Index
- Fine Motor/Coordination
 - 9 Hole Peg Test
- Functional Strength
 - 5x sit to stand
- Subjective Measures
 - 12-item MS walking scale (Appendix 10)
 - Modified Fatigue Impact Scale (Appendix 11)
 - Fatigue Scale for Motor and Cognitive Functions
 - MS Impact Scale
 - MS Quality of Life
 - ABC Scale
 - Dizziness Handicap Inventory (Appendix 12)

Stroke:

- Considerations:
 - Keep assistive devices consistent
 - Aphasia for instructions
- Acute Care Specific
 - Orpington Prognostic Scale (Appendix 13)
 - NIH Stroke Scale (Appendix 14)
- Inpatient Rehab Specific
 - FIM
- Gait Measures
 - 6 min walk test
 - 2 min walk test
 - 10 m walk test
 - Stroke and Gait Speed
 - <0.4 m/s: Household ambulators
 - 0.4 - 0.8 m/s: Limited community
 - >0.8 m/s: Community
 - Timed Up and Go
 - Older stroke patients >14.5
- Stroke Specific Impairment Scales
 - Postural Assessment Scale for Stroke (PASS) (Appendix 15)
 - Stroke Rehabilitation Assessment of Movement (STREAM) (Appendix 16)
- Balance Measures

- Berg Balance Scale
- Functional Reach
- Dynamic Gait Index
- Functional Gait Assessment
- Functional Strength
 - 5x sit to stand
 - Note asymmetrical weight bearing/foot placement
- Subjective Measures
 - Goal Attainment Scale
 - Motor Activity Log
 - Stroke Impact Scale (full or 16 item version) (Appendix 17)

Cerebellar Disorders:

- Gait Measures
 - 6 min walk test
 - 2 min walk test
 - 10 m walk test
 - Timed Up and Go
- Balance Measures
 - Berg Balance Scale
 - Functional Gait Assessment
 - Dynamic Gait Index
 - mCTSIB
 - BESTest
 - 5x sit to stand (initial standing balance)
 - Single limb stance
 - 4 Square Step Test
- Ataxia
 - Scale for the Assessment and Rating of Ataxia (SARA) (Appendix 18)
 - International Cooperative Ataxia Rating Scale
- Other
 - Dizziness Handicap Inventory

Fall Risk and Balance:

- Static
 - Romberg - Eyes Open and Eyes Closed
 - Tandem Romberg (Sharpened) - Eyes Open and Eyes Closed
 - Single Limb Stance
- Dynamic
 - Dynamic Gait Index
 - Functional Gait Assessment
 - Community Balance and Mobility Scale
 - HiMAT

- Specific to sensory integration
 - Modified Clinical Sensory Integration Test of Balance
- Balance Evaluation - all components
 - BESTest - can help to determine where the balance problem lies
 - mini BESTest
 - brief BESTest
- Specific to fall risk
 - Berg Balance Scale
 - Denotes need for assistive device
 - <45/56
 - Functional Gait Assessment
 - Scores <23/30 indicate fall risk
 - TUG
 - Times <13 sec indicate fall risk
 - 5x sit to stand
 - Times <12 sec indicate fall risk
- Subjective
 - Activities Balance Confidence Scale

Resources:

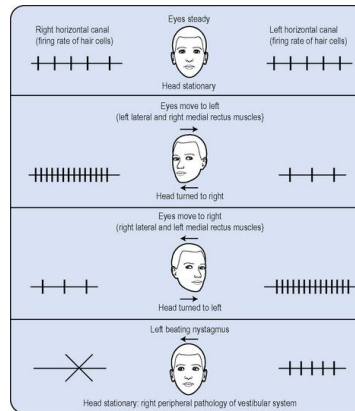
- Neurology Section Recommended Outcome Measures: <http://www.neuropt.org/professional-resources/neurology-section-outcome-measures-recommendations>
- Rehab Measures Database: rehabmeasures.org
- Stroke Engine Assessments: <http://www.strokingengine.ca/find-assessment/>

Vestibular Examination & Assessment:

Oculomotor Exam: Tests for CENTRAL vestibular problems since head is not moving (peripheral system is not being stimulated)

- Spontaneous Nystagmus: Have the patient look straight ahead and observe for nystagmus. Best performed with Frenzel lenses (fixation blocked). Stay to the patient's side without fixation.
 - Interpretation: (+) presence of nystagmus indicates a central lesion (brainstem or cerebellum) OR acute hypofunction

■ Couple with other tests to determine central vs. peripheral



- Gaze Evoked Nystagmus: Have patient look 30 degrees to the right, left, up and down pausing briefly at the end point to observe for nystagmus. Note direction of nystagmus
 - Do not test at ends of ocular ROM. End-point nystagmus is present in ~30% of healthy people and increased after 65 years old.
 - Interpretation: (+) is presence of nystagmus at 30 degrees. Direction changing = central
Non-direction changing = peripheral.
- Saccades: Hold a pen about 15 degrees to one side of your nose. Ask the patient to look at your nose, then at your finger, repeating. Be unpredictable. Test horizontally and vertically. You are looking for # of eye movements to target.
 - Saccades should be *quick, accurate* and *should not have latency*.
 - Interpretation: (+) >2 movements, dysmetric by 10 degrees (hypo or hyper) indicates CNS involvement. (Horizontal: pons, cerebellum; Vertical: midbrain, cerebellum)
- Smooth Pursuit/Eye ROM: Move a target held 18-24" from patient's face. Go all the way to the end range horizontally and vertically for ROM (smooth pursuit is only to 30 deg).
 - Look for smoothness/conjugate gaze
 - Ask about double vision
 - Interpretation: (+) decreased ROM, double vision; indicates cranial nerve problem (oculomotor III, trochlear IV, abducence VI).
 - (+) Saccadic pursuit indicates CNS involvement (pons, cerebellum, vestibular nuclei)

VOR

- Ability for eyes to stay stable on object while head is moving
- Have patient look at nose, turning head quickly side to side.
- <2Hz (1 Hz=1 rotation per second, metronome at 120)= using central smooth pursuit system
- >2Hz (2Hz is 2 rotations per second, metronome at 240) using VOR

VOR Cancellation

- Patient should look at your nose while you move their head side to side 30 degrees (you move with them)
 - Move at 1 Hz (1 rotation per second)
 - Positive is saccadic eye movements = central lesion

Head Thrust

- Best clinical test for vestibular hypofunction

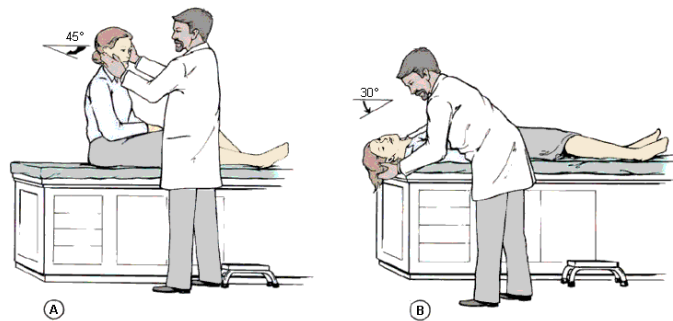
- Make sure to examine cervical ROM prior to testing
- QUICKLY and UNEXPECTEDLY move head within a small ROM (15 deg) to one side, instructing patient to keep eyes on nose
- Positive = corrective saccade, indicates vestibular hypofunction on that side

Dynamic Visual Acuity

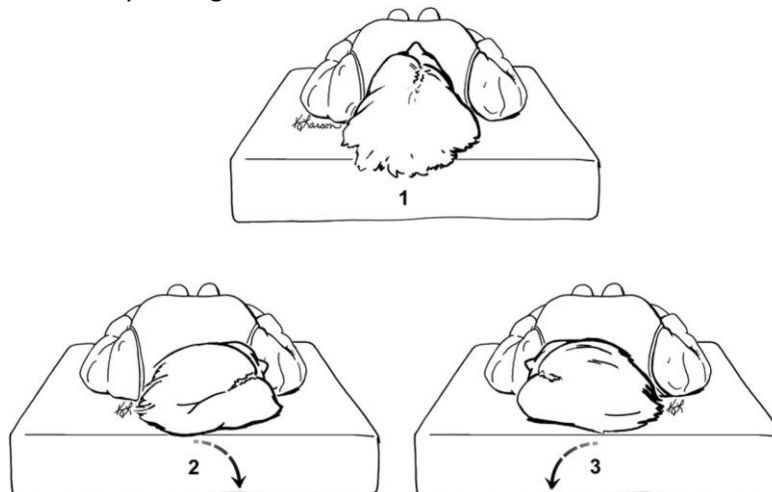
- Test to give an objective measurement for amount of hypofunction
- Patient sits in front of eye chair (wear glasses if needing distance correction)
- Read lowest line they can STATIC
- Read lowest line they can with head movement at 2 Hz
- Positive= likely hypofunction if greater or equal to 3 line difference

Positional Testing

- Dix-Hallpike
 - Gold standard for BPPV - must do this to actually diagnose!
 - Can also detect central problems
 - In each position, note the direction and duration of nystagmus + patient's symptoms
 - Turn head 45 degrees toward side you are testing, lay down and extend head 20 degrees



- Roll Test
 - Turn head fully right and left - look for direction of nystagmus
 - If limited by cervical rotation, roll entire body left/right keeping cervical spine flexed approximately 30 degrees



Central vs. Peripheral Findings (Generalizations)

	CENTRAL	PERIPHERAL
SUBJECTIVE REPORTS	Typically a more gradual, vague dizziness. May report dizziness while stationary. May report spinning sensation. Typically constant, lasts throughout day	Typically a sudden, memorable event. Occurs with movement or has triggers. May report spinning sensation. Typically intermittent based on movement.
OCULOMOTOR EXAM FINDINGS	Abnormal findings	Typically normal besides age related declines
VOR	May be abnormal at SLOW speeds	May be abnormal with hypofunction- at FAST speeds
NYSTAGMUS	Abnormal patterns: vertical, direction changing, may get nystagmus in dix-hallpike position (will typically not be torsional, will not resolve with treatment, will be less symptomatic)	<p>If BPPV, follows typical patterns- patient is symptomatic and symptoms are paroxysmal</p> <ul style="list-style-type: none"> ● Posterior Canal: Torsional Upbeating ● Anterior Canal: Torsional Downbeating ● Horizontal Canal: Horizontal Nystagmus Bilaterally <p>Follows Alexander's law with hypofunction</p>
OTHER	May find other central findings (ex: impaired coordination, swallowing difficulty)	
COURSE OF ACTION	Alert PCP, send to ER if acute. Wait for "ok" from PCP to begin vestibular rehab for habituation/balance training	Treat if able, refer if needed

HINTS to Diagnose Stroke in the Acute Vestibular Syndrome (Kattah et al., 2009)

- Acute brainstem lesions can present very similarly to peripheral hypofunctions, making early detection difficult when patients present to the ER

- A 3-step oculomotor examination was found to be more effective for distinguishing between the two than an MRI
 - MRI findings often don't show up until AFTER 3 days
 - Findings including 1 of 3 of these tests indicates brainstem lesion as cause of acute vestibular syndrome
 - NEGATIVE head impulse test
 - Positive test of skew
 - Direction changing, gaze-evoked nystagmus

Treatment:

Neuroplasticity:

- What is neuroplasticity?
 - The brain's ability to make short and long term changes based off of functional need and sensory input
 - Changes in synaptic connections indicate short term change and changes in neural networks indicating long term change
- The basics of neuroplasticity:
 - Brain Reorganization
 - Cortical Maps
 - Axonal Sprouting
 - Synaptic Plasticity
- How does neuroplasticity work in the damaged brain?
 - Driven by changes in behavioral, cognitive, and sensory experiences
 - After brain damage, you see:
 - clearance of damaged neurons and downregulation of excitatory neurons to protect surrounding neurons
 - Release of neurotrophins which encourage cell survival, strengthen synaptic connectivity, and promote axonal growth and sprouting
 - remodeling of neural processes
 - production of new synapses in the brain known as reactive synaptogenesis
 - Rehabilitation and neuroplasticity
 - Experience dependent - neural repair and remodeling are dependent upon a patient's experience after insult
 - Maladaptive Plasticity
 - Learned non-use
 - Encouraged compensation early in the rehab process may encourage expansion of the motor area of the non-injured hemisphere
 - Adaptive plasticity
 - expands the motor of the lesioned side of the brain
 - Constraint Induced Movement Therapy
- The Ten Principles of Neuroplasticity (Kleim, 2008)
 - Use it or lose it

- Use it and improve it
- Specificity
- Repetition Matters
- Intensity Matters
- Time Matters
- Salience Matters
- Age Matters
- Transference
- Interference

Motor Control & Learning:

- Motor Learning
 - Practice or training leads to the improvement and acquisition of skills
 - Stages of Learning
 - Cognitive Stage: "verbal, motor", learner understands what needs to be done, new skill, large improvements
 - Associative Stage: more subtle adjustments, smaller improvements
 - Autonomous Stage: appears automatic
 - Practice
 - Most important part of motor learning!
 - Part or whole practice?
 - If serial task, can practice parts
 - Continuous- mixed research
 - Practice Schedule
 - Blocked: may be best initially
 - Random: Better for learning and transfer over into real world experience
 - Feedback
 - Faded schedule is best (more early on, less late)
 - Intrinsic feedback: information about one's own movement
 - sensory feedback
 - Extrinsic feedback: augmented feedback
- Motor Control
 - Ability to regulate and direct the mechanisms needed for movement
 - Cerebellum: receives sensory information and uses this to fine-tune movement
 - Basal Ganglia: acts as a braking system, inhibiting and activating various motor systems
 - Problems with these areas mean less control, and more practice needed!

Disease Specific Considerations:

Parkinson's Disease:

- Patients are classified into Hoehn & Yahr stages- treatments vary depending on progression of disease

- Hoehn & Yahr 1 & 2- limited postural instability, early diagnosis. Primarily ambulatory without device
- H&Y Stage 3: Begin to have postural instability by demonstrating lack of recovery on pull test
- H&Y Stages 4-5: Severe disability (Stage 4 can still ambulate, stage 5 is wheelchair bound)
- Goals:
 - Early stages of Parkinson’s Disease
 - DELAY progression through education and early mobility training
 - Educate on exercise and initiate program
 - Perform thorough examination of appropriate outcome measures for baseline and to detect areas needed for training
 - H&Y Stages 2-3
 - Treat specific impairments (Freezing, festination, shuffling, etc) as they become more prevalent
 - Continue high intensity training, aerobic exercise as able
 - H&Y Stages 4-5
 - Move toward compensation when outcome measures plateau
 - Caregiver education
 - Equipment as needed
 - General goals for all stages:
 - Forced use beyond self selected effort
 - Progressive aerobic exercise
 - Manage non-motor symptoms (apathy, impaired self-efficacy) and refer to other providers as needed
- Evidence Based Treatment Approaches:
 - Parkinson’s Disease Specific Home Exercise Programs
 - “Delaying Mobility Disability in People with PD Using a Sensorimotor Agility Exercise Program” (Horak & King, 2009)

Constraints	Impact on Mobility	Exercise Principles
I. Rigidity	Agonist/antagonist co-contraction Flexed alignment of trunk Reduced trunk rotation Reduced joint range of movement High axial tone (stiffness)	Trunk rotation Reciprocal movements Rhythmic movements Erect alignment Large CoM movements Increase limits of stability
II. Bradykinesia	Slow, small movements Narrow base of support Lack of arm swing	Fast, large steps CoM control Large arm swings
III. Freezing	Poor anticipatory postural adjustments Abnormal mapping of body and movement Abnormal visual-spatial maps Divided attention affects mobility	Improve weight shifting Understand role of external cues Exercise in small spaces Practice dual tasks
IV. Inflexible program selection (sequential coordination)	Poor rolling, sit-to-stand maneuvers, turns Difficult floor transfers Inability to change strategy quickly	Plan task in advance Quick change strategies Sequencing components of task
V. Impaired sensory integration	Inaccurate without vision Imbalance on unstable surface Poor alignment with environment	Kinesthetic awareness Decrease surface dependence Flexible orientation
VI. Reduced executive function and attention	Difficulty with dual tasks and sequences of actions	Practice gait and balance with secondary task and sequences of actions (ie, boxing, agility course)

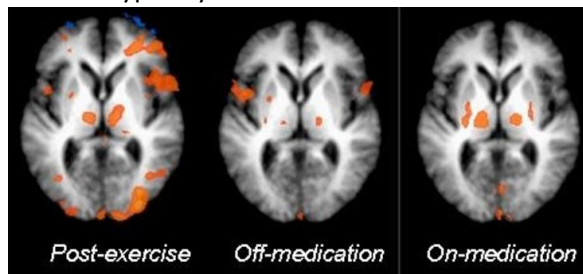
^a CoM=center of mass.

- Large Amplitude, whole body exercises

- LSVT BIG vs. PWR!
 - LSVT BIG: Protocol is 1 hour sessions, 4x/week for 4 weeks
 - Large amplitude exercise, gait tasks, functional activities
 - PWR!: Targets bradykinesia/hypokinesia through whole body exercises



- Not as strict as LSVT BIG
- Progressive Treadmill Training
 - Push intensity!
- Forced Use
 - Voluntary effort by the patient is augmented by a therapist or family member
 - Patient is NOT passive
 - Make sure that heart rate is sufficient to contribute to brain changes
 - 65-80% HR max typically used in studies



- Dual Task training
 - Not appropriate for late disease progression
- Coordination/Balance Training
- Freezing Management
 - Freezing is loss of rhythmic gait, automaticity
 - Loss of complete weight shift
 - Auditory and visual cues can assist
 - 4 S's
 - Stop
 - Standing tall
 - Sway
 - Step big
- Community Groups
- Sit to stand
 - Reteach postural adjustments
- Motor Learning Considerations
 - Within session learning improves with use of cues
 - Carryover depends on disease progression
 - Context specific training improves skills
 - Difficulty performing task when situation is different

- Start early and provide a lot of repetition to reach automaticity
 - Make task close to function at home
- Gait Training
 - Start early!
 - 6MWT may pick up on early deficits
 - Encourage dual task training initially
 - Vary environment, walking surface, etc.
 - Address asymmetry and hypokinesia
 - Cueing
 - Auditory
 - Visual

Multiple Sclerosis:

- Classification of Disease:
 - Relapsing Remitting: Individuals have relapses of symptoms and then recover
 - Also thought to have relapsing progressive: have instances of increased symptoms with partial but not complete recovery
 - Secondary Progressive: Initially have relapsing remitting but as the patient continues to progress in the disease course, have steady decline in function without periods of recovery
 - Primary Progressive: steady decline in function without periods of recovery from onset of disease
- Goals of treatment:
 - Relapsing Remitting
 - PT begins after steroids are initiated
 - Rehab focused on impairments and functional limitations that occur with relapse
 - Education on relapse prevention and recognition
 - Provide necessary compensatory and supportive equipment
 - FES
 - AFOs
 - Equipment
 - Fatigue Management
 - Primary Fatigue
 - Secondary Fatigue
 - Aerobic Exercise
 - Strength Training
 - Balance Training and Fall Risk Management
 - Secondary and Primary Progressive
 - Compensatory mechanisms
 - Equipment Needs
 - Caregiver training
 - Other considerations:
 - Spasticity management
 - Fatigue Management

- Cognitive Considerations
 - Vestibular and Dizziness complaints
 - Timing of treatment to allow for maximum functioning during day
- Evidence Based Treatment
 - Aerobic Exercise
 - Consider role that fatigue may play in aerobic exercise
 - Moderate intensity is best
 - Manage environment to prevent overheating, encourage fluids to prevent overheating
 - May be best done with walking, biking, or any aerobic medium patient feels comfortable
 - Can help with overall management of disease
 - Balance Treatment
 - Static and dynamic training
 - Very important to train to prevent falls
 - Fatigue may increase imbalance
 - Strengthening
 - Important to include strength training as part of program
 - Include full body strength training
 - Yoga and pilates are good options
 - Fatigue Management
 - Energy conservation techniques
 - maximize gait efficiency and assistive device use to prevent extra energy expenditure with gait
 - Regular exercise can decrease fatigue
 - Vestibular Treatment and MS
 - Can improve postural control and balance
 - Can improve fatigue
 - Progressive exercises that incorporate head movement, eye movement, and balance on various surfaces
 - General Rule of thumb: if a patient experiences excessive fatigue the next day, the exercise was too intense

Stroke:

- Goals of Treatment (for cortical MCA/ACA):
 - Early intervention
 - start rehab within first 24-48 hours unless medical conditions preclude
 - Remember to check hypertension and ICH protocols
 - Push neuroplasticity
 - Aerobic activity to prevent future strokes
 - Prevent learned non-use
 - Early gait and functional training, minimizing compensation early
 - Teach compensatory mechanisms later on as needed
- Gait Training:
 - Weight shift

- Weight acceptance
- Perceived upright posture
- Limb advancement and positive step length
- Common Impairments:
 - Drop foot
 - Knee hyperextension
 - Decreased hip extension in terminal stance
 - Decreased hip flexion in swing
 - Lack of weight shift/weight acceptance
- Evidence Based Practice:
 - High Intensity Training
 - Body Weight Support Treadmill Training

Cerebellar Disorders:

- Plays a LARGE role in motor learning
 - Responsible for practice-driven, feedforward adaptations
- Determine goal- are you working toward recovery or compensation? What is the prognosis?
 - Poor Prognosis:
 - Degenerative
 - Progressive
 - Evolving lesions
 - Hereditary
 - Work toward compensation primarily
 - Reduce degrees of freedom
 - Aerobic exercise/strength
 - Slower movements
 - Less distraction
 - Good Prognosis:
 - No other CNS regions involved
 - Mild ataxia
 - Static lesion
 - Work toward recovery primarily
 - Work toward improving multi-joint movements
 - Challenge balance
 - Dual-tasking
 - Error-based motor learning (allow more time, many repetitions)

Case Studies:

Gait Video #1: Diagnosis - basal ganglia CVA

Gait Video #2: Diagnosis - R MCA CVA with L Hemiplegia

Gait Video #3: Diagnosis - Fascioscapulohumeral dystrophy

*Consider gait deviations, outcome measures, and treatments for unfamiliar diagnoses based off principles discussed

Gait Video #4: Diagnosis - MS

Gait Video #5: Diagnosis - SCI

Gait Video #6: Diagnosis - cerebellar

Questions to consider for videos

1. What gait deviations do you see in the video?
2. What impairments might be contributing to the deviations? List all possible causes.
3. What treatment strategies can you think of to address these impairments?
 - a. Does knowing the prognosis, pathophysiology or disease process help you in treatment decision?
4. What outcome measures might you consider based on how this patient looks with ambulation?

References: List is available upon request at course

BESTest
Balance Evaluation – Systems Test
Fay Horak PhD Copyright 2008

TEST NUMBER/SUBJECT CODE _____ DATE _____

EXAMINER NAME _____

EXAMINER Instructions for BESTest

1. Subjects should be tested with flat heeled shoes or with shoes and socks off.
2. If subject must use an assistive device for an item, score that item one category lower

Tools Required

- Stop watch
- Measuring tape mounted on wall for Functional Reach test
- Approximately 60 cm x 60 cm (2 X 2 ft) block of 4-inch, medium-density, Tempur® foam
- 10 degree incline ramp (at least 2 x 2 ft) to stand on
- Stair step, 15 cm (6 inches) in height for alternate stair tap
- 2 stacked shoe boxes for obstacle during gait
- 2.5 Kg (5-lb) free weight for rapid arm raise
- Firm chair with arms with 3 meters in front marked with tape for Get Up and Go test
- Masking tape to mark 3 m and 6 m lengths on the floor for Get Up and Go

SUMMARY OF PERFORMANCE: CALCULATE PERCENT SCORE

Section I:	_____ /15 x 100 = _____	Biomechanical Constraints
Section II:	_____ /21 x 100 = _____	Stability Limits/Verticality
Section III:	_____ /18 x 100 = _____	Transitions/Anticipatory
Section IV	_____ /18 x 100 = _____	Reactive
Section V:	_____ /15 x 100 = _____	Sensory Orientation
Section VI:	_____ /21 x 100 = _____	Stability in Gait
TOTAL:	_____ /108 points = _____	Percent Total Score

BESTest- Inter-rater Reliability
Balance Evaluation – Systems Test

Subjects should be tested with flat heeled shoes or shoes and socks off. If subject must use an assistive device for an item, score that item one category lower. If subject requires physical assistance to perform an item score the lowest category (0) for that item.

I. BIOMECHANICAL CONSTRAINTS

SECTION I: _____/15 POINTS

1. BASE OF SUPPORT

- (3) Normal: Both feet have normal base of support with no deformities or pain
- (2) One foot has deformities and/or pain
- (1) Both feet has deformities OR pain
- (0) Both feet have deformities AND pain

2. COM ALIGNMENT

- (3) Normal AP and ML CoM alignment and normal segmental postural alignment
- (2) Abnormal AP OR ML CoM alignment OR abnormal segmental postural alignment
- (1) Abnormal AP OR ML CoM alignment AND abnormal segmental postural alignment
- (0) Abnormal AP AND ML CoM alignment

3. ANKLE STRENGTH & RANGE

- (3) Normal: Able to stand on toes with maximal height and to stand on heels with front of feet up
- (2) Impairment in either foot of either ankle flexors or extensors (i.e. less than maximum height)
- (1) Impairment in two ankle groups (eg; bilateral flexors or both ankle flexors and extensors in 1 foot)
- (0) Both flexors and extensors in both left and right ankles impaired (i.e. less than maximum height)

4. HIP/TRUNK LATERAL STRENGTH

- (3) Normal: Abducts both hips to lift the foot off the floor for 10 s while keeping trunk vertical
- (2) Mild: Abducts both hips to lift the foot off the floor for 10 s but without keeping trunk vertical
- (1) Moderate: Abducts only one hip off the floor for 10 s with vertical trunk
- (0) Severe: Cannot abduct either hip to lift a foot off the floor for 10 s with trunk vertical or without vertical

5. SIT ON FLOOR AND STANDUP

Time _____ *secs*

- (3) Normal: Independently sits on the floor and stands up
- (2) Mild: Uses a chair to sit on floor OR to stand up
- (1) Moderate: Uses a chair to sit on floor AND to stand up
- (0) Severe: Cannot sit on floor or stand up, even with a chair, or refuses

II. STABILITY LIMITS

SECTION II: _____/21 POINTS

6. SITTING VERTICALITY AND LATERAL LEAN

		<u>Lean</u>			<u>Verticality</u>
<u>Left</u>	<u>Right</u>		<u>Left</u>	<u>Right</u>	
(3)	(3)	Maximum lean, subject moves upper shoulders beyond body midline, very stable	(3)	(3)	Realigns to vertical with very SMALL or no OVERSHOOT
(2)	(2)	Moderate lean, subject's upper shoulder approaches body midline or some instability	(2)	(2)	Significantly Over- or under-shoots but eventually realigns to vertical
(1)	(1)	Very little lean, or significant instability	(1)	(1)	Failure to realign to vertical
(0)	(0)	No lean or falls (exceeds limits)	(0)	(0)	Falls with the eyes closed

7. FUNCTIONAL REACH FORWARD *Distance reached:* _____ *cm* OR _____ *inches*

- (3) Maximum to limits: >32 cm (12.5 in)
- (2) Moderate: 16.5 cm - 32 cm (6.5 – 12.5 in)
- (1) Poor: < 16.5 cm (6.5 in)
- (0) No measurable lean – or must be caught

8. FUNCTIONAL REACH LATERAL *Distance reached:* Left _____ *cm* (_____ *in*) Right _____ *cm* (_____ *in*)

Left Right

- (3) (3) Maximum to limit: > 25.5 cm (10 in)
- (2) (2) Moderate: 10-25.5 cm (4-10 in)
- (1) (1) Poor: < 10 cm (4 in)
- (0) (0) No measurable lean, or must be caught

III. TRANSITIONS- ANTICIPATORY POSTURAL ADJUSTMENT SECTION III. _____/18 POINTS

9. SIT TO STAND

- (3) Normal: Comes to stand without the use of hands and stabilizes independently
- (2) Comes to stand on the first attempt with the use of hands
- (1) Comes to stand after several attempts or requires minimal assist to stand or stabilize or requires touch of back of leg or chair
- (0) Requires moderate or maximal assist to stand

10. RISE TO TOES

- (3) Normal: Stable for 3 sec with good height
- (2) Heels up, but not full range (smaller than when holding hands so no balance requirement)
-OR- slight instability & holds for 3 sec
- (1) Holds for less than 3 sec
- (0) Unable

11. STAND ON ONE LEG

Left *Time in Sec:* _____ Right *Time in Sec:* _____

- | | |
|-------------------------------|------------------------------|
| (3) Normal: Stable for > 20 s | (3) Normal: Stable for > 20s |
| (2) Trunk motion, OR 10-20 s | (2) Trunk motion, OR 10-20 s |
| (1) Stands 2-10 s | (1) Stands 2-10s |
| (0) Unable | (0) Unable |

12. ALTERNATE STAIR TOUCHING *# of successful steps:* _____ *Time in seconds:* _____

- (3) Normal: Stands independently and safely and completes 8 steps in < 10 seconds
- (2) Completes 8 steps (10-20 seconds) AND/OR show instability such as inconsistent foot placement, excessive trunk motion, hesitation or arrhythmic
- (1) Completes < 8 steps – without minimal assistance (i.e. assistive device) OR > 20 sec for 8 steps
- (0) Completes < 8 steps, even with assistive device

13. STANDING ARM RAISE

- (3) Normal: Remains stable
- (2) Visible sway
- (1) Steps to regain equilibrium/unable to move quickly w/o losing balance
- (0) Unable, or needs assistance for stability

IV. REACTIVE POSTURAL RESPONSE

SECTION IV: _____/18 POINTS

14. IN PLACE RESPONSE- FORWARD

- (3) Recovers stability with ankles, no added arms or hips motion
- (2) Recovers stability with arm or hip motion
- (1) Takes a step to recover stability
- (0) Would fall if not caught OR requires assist OR will not attempt

15. IN PLACE RESPONSE- BACKWARD

- (3) Recovers stability at ankles, no added arm / hip motion
- (2) Recovers stability with some arm or hip motion
- (1) Takes a step to recover stability
- (0) Would fall if not caught -OR- requires assistance -OR- will not attempt

16. COMPENSATORY STEPPING CORRECTION- FORWARD

- (3) Recovers independently a single, large step (second realignment step is allowed)
- (2) More than one step used to recover equilibrium, but recovers stability independently OR 1 step with imbalance
- (1) Takes multiple steps to recover equilibrium, or needs minimum assistance to prevent a fall
- (0) No step, OR would fall if not caught, OR falls spontaneously

17. COMPENSATORY STEPPING CORRECTION- BACKWARD

- (3) Recovers independently a single, large step
- (2) More than one step used, but stable and recovers independently OR 1 step with imbalance
- (1) Takes several steps to recover equilibrium, or needs minimum assistance
- (0) No step, OR would fall if not caught, OR falls spontaneously

18. COMPENSATORY STEPPING CORRECTION- LATERAL

- | | |
|---|---|
| <u>Left</u> | <u>Right</u> |
| (3) Recovers independently with 1 step of normal length/width (crossover or lateral OK) | (3) Recovers independently with 1 step of normal length/width (crossover or lateral OK) |
| (2) Several steps used, but recovers independently | (2) Several steps used, but recovers independently |
| (1) Steps, but needs to be assisted to prevent a fall | (1) Steps, but needs to be assisted to prevent a fall |
| (0) Falls, or cannot step | (0) Falls, or cannot step |

V. SENSORY ORIENTATION

SECTION V: _____/15 POINTS

19. SENSORY INTEGRATION FOR BALANCE (MODIFIED CTSIB)

A -EYES OPEN, FIRM SURFACE	B -EYES <u>CLOSED</u>, FIRM SURFACE	C -EYES OPEN, FOAM SURFACE	D -EYES <u>CLOSED</u>, FOAM SURFACE
Trial 1 _____sec	Trial 1 _____sec	Trial 1 _____sec	Trial 1 _____sec
Trial 2 _____sec	Trial 2 _____sec	Trial 2 _____sec	Trial 2 _____sec
(3) 30s stable	(3) 30s stable	(3) 30s stable	(3) 30s stable
(2) 30s unstable	(2) 30s unstable	(2) 30s unstable	(2) 30s unstable
(1) < 30s	(1) < 30s	(1) < 30s	(1) < 30s
(0) Unable	(0) Unable	(0) Unable	(0) Unable

20. INCLINE- EYES CLOSED

Toes Up

- (3) Stands independently, steady without excessive sway, holds 30 sec, and aligns with gravity
- (2) Stands independently 30 SEC with greater sway than in item 19B -OR- aligns with surface
- (1) Requires touch assist -OR- stands without assist for 10-20 sec
- (0) Unable to stand >10 sec -OR- will not attempt independent stance

VI. STABILITY IN GAIT

SECTION V: _____/21 POINTS

21. GAIT – LEVEL SURFACE

Time _____secs.

- (3) Normal: walks 20 ft., good speed (≤ 5.5 sec), no evidence of imbalance.
- (2) Mild: 20 ft., slower speed (>5.5 sec), no evidence of imbalance.
- (1) Moderate: walks 20 ft., evidence of imbalance (wide-base, lateral trunk motion, inconsistent step path) – at any preferred speed.
- (0) Severe: cannot walk 20 ft. without assistance, or severe gait deviations OR severe imbalance

22. CHANGE IN GAIT SPEED

- (3) Normal: Significantly changes walking speed without imbalance
- (2) Mild: Unable to change walking speed without imbalance
- (1) Moderate: Changes walking speed but with signs of imbalance,
- (0) Severe: Unable to achieve significant change in speed AND signs of imbalance

23. WALK WITH HEAD TURNS – HORIZONTAL

- (3) Normal: performs head turns with no change in gait speed and good balance
- (2) Mild: performs head turns smoothly with reduction in gait speed,
- (1) Moderate: performs head turns with imbalance
- (0) Severe: performs head turns with reduced speed AND imbalance AND/OR will not move head within available range while walking.

24. WALK WITH PIVOT TURNS

- (3) Normal: Turns with feet close, FAST (≤ 3 steps) with good balance.
- (2) Mild: Turns with feet close SLOW (≥ 4 steps) with good balance
- (1) Moderate: Turns with feet close at any speed with mild signs of imbalance
- (0) Severe: Cannot turn with feet close at any speed and significant imbalance.

25. STEP OVER OBSTACLES

Time _____sec

- (3) Normal: able to step over 2 stacked shoe boxes without changing speed and with good balance
- (2) Mild: steps over 2 stacked shoe boxes but slows down, with good balance
- (1) Moderate: steps over shoe boxes with imbalance or touches box.
- (0) Severe: cannot step over shoe boxes AND slows down with imbalance or cannot perform with assistance.

26. TIMED “GET UP & GO”

Get Up & Go: Time _____sec

- (3) Normal: Fast (<11 sec) with good balance
- (2) Mild: Slow (>11 sec with good balance)
- (1) Moderate: Fast (<11 sec) with imbalance.
- (0) Severe: Slow (>11 sec) AND imbalance.

27. Timed “Get Up & Go” With Dual Task

Dual Task: Time _____sec

- (3) Normal: No noticeable change between sitting and standing in the rate or accuracy of backwards counting and no change in gait speed.
- (2) Mild: Noticeable slowing, hesitation or errors in counting backwards OR slow walking (10%) in dual task
- (1) Moderate: Affects on BOTH the cognitive task AND slow walking ($>10\%$) in dual task.
- (0) Severe: Can't count backward while walking or stops walking while talking

INSTRUCTIONS FOR BESTEST

BIOMECHANICAL CONSTRAINTS

1. BASE OF SUPPORT

Examiner Instructions: Closely examine both feet to look for deformities or complaints of pain such as abnormal pronation/supination, abnormal or missing toes, pain from plantar fasciitis, bursitis, etc).

Patient: Stand up in your bare feet and tell me if you currently have any pain in your feet or ankles or legs.

2. COM ALIGNMENT

Examiner Instructions: Look at the patient from the side and imagine a vertical line through their center of body mass (CoM) to their feet. (The CoM is the imaginary point inside or outside the body about which the body would rotate if floating in outer-space.) In an adult, standing erect, a vertical line through the CoM to the support surface is aligned in front of the vertebrae at the umbilicus and passes about 2 cm in front of the lateral malleolus, centered between the two feet. Abnormal segmental postural alignment such as scoliosis or kyphosis or asymmetries may or may not affect CoM alignment.

Patient: Stand relaxed, looking straight ahead

3. ANKLE STRENGTH & RANGE

Examiner Instructions: Ask the patient rest their fingertips in your hands for support while they stand on their toes as high as possible and then stand on their heels. Watch for height of heel and toe lift.

Patient: Rest your fingers in my hands for support while you stand on your toes. Now stand on your heels by lifting up your toes. Maintain each position for 3 sec.

4. HIP/TRUNK LATERAL STRENGTH

Examiner Instructions: Ask the patient to rest their fingertips in your hands while they lift their leg to the side off the floor and hold. Count for 10 sec while their foot is off the floor with a straight knee. If they must use moderate force on your hands to keep their trunk upright, score as without keeping trunk vertical.

Patient: Lightly rest your fingertips in my hands while you lift your leg out to the side and hold until I tell you to stop. Try to keep your trunk vertical while you hold your leg out.

5. SIT ON FLOOR AND STANDUP

Examiner Instructions: Start with the patient standing near a sturdy chair. The patient can be considered to be sitting when both buttocks are on the floor. If the task takes more than 2 minutes to complete the task, with or without a chair, score 0. If the patient requires any physical assistance, score 0.

Patient: Are you able to sit on the floor and then stand up, in less than 2 minutes? If you need to use a chair to help you go onto the floor or to stand up, go ahead but your score will be affected. Let me know if you cannot sit on the floor or stand up without my help.

SITTING STABILITY LIMITS

6. VERTICALITY AND LATERAL LEAN

Examiner Instructions: Patient is sitting comfortably on a firm, level, armless surface (bench or chair) with feet flat on floor. It is okay to lift ischium or feet when leaning. Watch to see if the patient returns to vertical smoothly without over or undershooting. Score the worst performance to each side.

Patient: Cross your arms over your chest. Place feet shoulder width apart. I'll be asking you to close your eyes and lean to one side as far as you can. You'll keep your spine straight, and lean sideways as far as you can without losing your balance OR using your hands. Keeping your eyes closed, return to your starting position when you've leaned as far as you can. It's okay to lift your buttocks and feet. Close your eyes Lean now. (REPEAT other side)

7. FUNCTIONAL REACH FORWARD

Examiner Instructions: Examiner places the ruler at the end of the fingertips when the arms are out at 90 degrees. The patient may not lift heels, rotate trunk, or protract scapula excessively. Patient must keep their arms parallel to ruler and may use less involved arm. The recorded measure is the maximum horizontal distance reached by the patient. Record best reach.

Patient: Stand normally. Please lift both arms straight in front of you, with fingertips held even. Stretch your fingers and reach forward as far as you can. Don't lift your heels. Don't touch the ruler or the wall. Once you've reached as far forward as you can, please return to a normal standing position. I will ask you to do this two times. Reach as far as you can.

8. FUNCTIONAL REACH LATERAL

Examiner Instructions: Have subject align feet evenly so that the fingertips, when the arm is out at 90 degrees is at the start of the ruler. The recorded measure is the maximum horizontal distance reached by the patient. Record the best reach. Make sure the subject starts in neutral. The patient is allowed to lift one heel off the floor but not the entire foot.

Patient: Stand normally with feet shoulder width apart. Arms at your sides. Lift your arm out to the side. Your fingers should not touch the ruler. Stretch your fingers and reach out as far as you can. Do not lift your toes off the floor. Reach as far as you can. (REPEAT other side)

TRANSITIONS – ANTICIPATORY POSTURAL ADJUSTMENT

9. SIT TO STAND

Examiner Instructions: Note the initiation of the movement, and the use of hands on the arms of the chair or their thighs or thrusts arms forward

Patient: Cross arms across your chest. Try not to use your hands unless you must. Don't let your legs lean against the back of the chair when you stand. Please stand up now.

10. RISE TO TOES

Examiner Instructions: Allow the patient to try it twice. Record the best score. (If you suspect that subject is using less than their full height, ask them to rise up while holding the examiners' hands.) Make sure subjects look at a target 4-12 feet away.

Patient: Place your feet shoulder width apart. Place your hands on your hips. Try to rise as high as you can onto your toes. I'll count out loud to 3 seconds. Try to hold this pose for at least 3 seconds. Look straight ahead. Rise now.

11. STAND ON ONE LEG

Examiner Instructions: Allow the patient two attempts and record the best. Record the sec they can hold posture, up to a maximum of 30 sec. Stop timing when subject moves their hand off hips or puts

Patient: Look straight ahead. Keep your hands on your hips. Bend one leg behind you. Don't touch your raised leg on your other leg. Stay standing on one leg as long as you can. Look straight ahead. Lift

a foot down.

now. (REPEAT other side)

12. ALTERNATE STAIR TOUCHING

Examiner Instructions: Use standard stair height of 6 inches. Count the number of successful touches and the total time to complete the 8 touches. It's permissible for subjects to look at their feet.

Patient: Place your hands on your hips. Touch the ball of each foot alternately on the top of the stair. Continue until each foot touches the stair four times (8 total taps). I'll be timing how quickly you can do this. Begin now.

13. STANDING ARM RAISE

Examiner Instructions: Use 2.5 Kg (5 lb) weight. Have subjects stand and lift weight with both hands to shoulder height. Subjects should perform this as fast as they can. Lower score by 1 category if weight must be less than 2.5 Kg (5 lb) +/- lifts < 75 deg.

Patient: Lift this weight with both hands from a position in front of you to shoulder level. Please do this as fast as you can. Keep your elbows straight when you lift and hold. Hold for my count of 3. Begin now.

REACTIVE POSTURAL RESPONSES

14. IN PLACE RESPONSE- FORWARD

Examiner Instructions: Stand in front of the patient, place one hand on each shoulder and lightly push the patient backward until their anterior ankle muscles contract, (and toes just start to extend) then suddenly release. Do not allow any pre-leaning by patient. Score only the best of 2 responses if the patient is unprepared or you pushed too hard.

Patient: For the next few tests, I'm going to push against you to test your balance reaction. Stand in your normal posture with your feet shoulder width apart, arms at your sides. Do not allow my hands to push you backward. When I let go, keep your balance without taking a step

15. IN PLACE RESPONSE- BACKWARD

Examiner Instructions: Stand behind patient, place one hand on each scapula and isometrically hold against patient's backward push, until heels are about to be lifted, not allowing trunk motion. Suddenly release. Do not allow any pre-leaning by patient. Score the best of 2 responses if patient is unprepared, or you pushed too hard.

Patient: Stand with your feet shoulder width apart, arms at your sides. Do not allow my hands to push you forward. When I let go, keep your balance without taking a step

16. COMPENSATORY STEPPING CORRECTION-FORWARD

Examiner Instructions: Stand in front to the side of patient with one hand on each shoulder and ask them to push forward. (Make sure there is room for them to step forward). Require them to lean until their shoulders and hips are in front of their toes. Suddenly release your support when the subject is in place. The test must elicit a step. Be prepared to catch patient.

Patient: Stand with your feet shoulder width apart, arms at your sides. Lean forward against my hands beyond your forward limits. When I let go, do whatever is necessary, including taking a step, to avoid a fall.

17. COMPENSATORY STEPPING CORRECTION - BACKWARD

Examiner Instructions: Stand in back and to the side of the patient with one hand on each scapula and ask them to lean backward. (Make sure there is room for them to step backward.) Require them to lean until their shoulders and hips are in back of their heels. Release your support when the subject is in place.

Patient: Stand with your feet shoulder width apart, arms down at your sides. Lean backward against my hands beyond your backward limits. When I let go, do whatever is necessary, including taking a step, to avoid a fall.

Test must elicit a step.

NOTE: Be prepared to catch patient.

18. COMPENSATORY STEPPING CORRECTION- LATERAL

Examiner Instructions: Stand behind the patient, place one hand on either the right (or left) side of the pelvis, and ask them to lean their whole vertical body into your hand. Require them to lean until the midline of pelvis is over the right (or left) foot and then suddenly release your support.

Patient: Stand with your feet together, arms down at your sides. Lean into my hand beyond your sideways limit. When I let go, step if you need to, to avoid a fall.

NOTE: Be prepared to catch patient.

SENSORY ORIENTATION

19. SENSORY INTEGRATION FOR BALANCE (MODIFIED CTSIB)

Examiner Instructions: Do the tests in order. Record the time the patient was able to stand in each condition to a maximum of 30 seconds. Repeat condition if not able to stand for 30 s and record both trials (average for category). Use medium density Temper® foam, 4 inches thick. Assist subject in stepping onto foam. Have the subject step off the foam between trials. Include leaning or hip strategy during a trial as “instability.”

Patient: For the next 4 assessments, you'll either be standing on this foam or on the normal ground, with your eyes open or closed. Place your hands on your hips. Place your feet together until almost touching. Look straight ahead. Each time, stay as stable as possible until I say stop.

20. INCLINE EYES CLOSED

Examiner Instructions: Aid the patient onto the ramp. Once the patient closes their eyes, begin timing. Repeat condition if not able to stand for 30 s and average both trials/ Note if sway is greater than when standing on level surface with eyes closed (Item 15B) or if poor alignment to vertical. Assist includes use of a cane or light touch any time during the trial.

Patient: Please stand on the incline ramp with your toes toward the top. Place your feet shoulder width apart. Place your hands on your hips. I will start timing when you close your eyes.

STABILITY IN GAIT

21. GAIT – LEVEL SURFACE

Examiner Instructions: Place two markers 20 feet (6 meters) apart and visible to the patient on a level walkway. Use a stopwatch to time gait duration. Have subjects start with their toes on the mark. Start timing with the stopwatch when the first foot leaves the ground and stop timing when both feet stop beyond the next mark.

Patient: Walk at your normal speed from here past the next mark and stop.

22. CHANGE IN SPEED

Examiner Instructions: Allow the patient to take 2-3 steps at their normal speed, and then say “fast”, after 2-3 fast steps, say “slow”. Allow 2-3 slow steps before they stop walking.

Patient: Begin walking at your normal speed, when I tell you “fast” walk as fast as you can. When I say “slow”, walk very slowly.

23. WALK WITH HEAD TURNS – HORIZONTAL

Examiner Instructions: Ask the patient to turn their head and hold it so they are looking over their shoulder until you tell them to look over the opposite

Patient: Begin walking at your normal speed, when I say “right”, turn your head and look to the right. When I say “left” turn your head and look to the left. Try to

shoulder every 2-3 steps. If the patient has cervical restrictions allow combined head and trunk movements (enbloc).

24. WALK WITH PIVOT TURNS

Examiner Instructions: Demonstrate a pivot turn. Once the patient is walking at normal speed, say “turn and stop.” Count the steps from turn until the subject is stable. Instability is indicated by wide stance width, extra stepping or trunk and arm motion.

25. STEP OVER OBSTACLE

Examiner Instructions: Place the 2 stacked boxes (9” or 22.9 cm height) 10 ft. away from where the patient will begin walking. Use a stopwatch to time gait duration to calculate average velocity by dividing the number of seconds into 20 feet. Look for hesitation, short steps and touch on obstacle.

26. TIMED “GET UP & GO”

Examiner Instructions: Have the patient sit with their backs against the chair. Time the patient from the time you say “go” until they return to sitting in chair. Stop timing when the patient’s buttocks hit the chair bottom. The chair should be firm with arms to push from if necessary. **TOOLS: TAPE ON FLOOR 3 METERS FROM THE FRONT OF THE CHAIR LEGS.**

27. TIMED “GET UP & GO” WITH DUAL TASK

Examiner Instructions: Before beginning, practice with the patient how to count backward from a number between 90 and 100 by 3s, to make sure they can do the cognitive task. Then ask them to count backwards from a different number and after a few numbers say GO for the GET UP AND GO TASK. Time the patient from when you say “go” until they return to sitting. Stop timing when the patient’s buttocks touch the chair bottom. The chair should be firm with arms to push from if necessary.

keep yourself walking in a straight line.

Patient: Begin walking at your normal speed. When I tell you to “turn and stop”, turn as quickly as you can to face the opposite direction and stop. After the turn, your feet should be close together.

Patient: Begin walking at your normal speed. When you come to the shoe boxes, step over them, not around them and keep walking.

Patient: When I say “GO,” stand up from the chair, walk at your normal speed across the tape on the floor, turn around, and come back to sit in the chair. I will time how long it takes.

Patient: a) Count backwards by 3’s starting at 100 OR b) List random numbers and when I say “GO,” stand up from the chair, walk at your normal speed across the tape on the floor, turn around, and come back to sit in the chair but continue listing numbers.

Artery/Nerve Effected	Name of Syndrome	Impairments	Specific Areas of brain/Cranial Nerves effected
Sympathetic chain, T1 or higher (common with Pancoast tumor), brainstem lesions	Horner's Syndrome	Ipsilateral miosis (constricted pupil), anhidrosis, and ptosis	Lose sympathetic flow to CN III
Anterior Cerebral Artery : inferior frontal lobe, medial frontal and parietal lobe, anterior corpus callosum,	ACA Syndrome	LE affected > UE, sensory impairment, urinary incontinence, cognitive symptoms, lack of spontaneity, motor inaction, perseveration, amnesia, apraxia	Primary motor area (medial aspect of homonculus), primary sensory area (medial), internal capsule, corpus callosum
Middle Cerebral Artery: lateral frontal, temporal and parietal lobes, post internal capsule, corona radiata, outer portion of globus pallidus, caudate nucleus and putamen	MCA Syndrome	Contralateral paralysis and sensory (UE/face >LE), Broca's aphasia (motor aphasia), Wernicke's aphasia (receptive), or global aphasia, perceptual deficits (unilateral neglect, depth perception, spatial relations, agnosia), limb-kinetic apraxia, contralateral homonymous hemianopsia, loss of congruence gaze to opposite side	Primary motor and sensory cortex, Broca's cortical area (3 rd convolution of dominant hemisphere), Wernicke's cortical area (posterior portion of temporal gyrus in dominant hemi), parietal sensory association cortex in nondominant hemisphere, premotor or parietal cortex, optic radiation of internal capsule, FEF, parietal lobe, upper portion of posterior limb of internal capsule
Posterior Cerebral Artery : terminal branch of the basilar artery. Supplies occipital lobe, medial and inferior temporal lobe, upper brainstem, midbrain, and posterior diencephalon (most of thalamus)	Two components: Peripheral Territory and Central Territory	Peripheral: contralateral homonymous hemianopsia, bilateral homonymous hemianopsia with some degree of macular sparing, prosopagnosia, dyslexia, anomia, and color discrimination issues, memory defect, topographic disorientation	Primary visual cortex or optic radiation, calcarine cortex, left occipital lobe, visual association cortex, dominant calcarine lesion and posterior part of corpus callosum, temporal lobe, primary visual areas
		Central: thalamic pain, spontaneous pain and dyesthesias, involuntary	Ventral posterolateral nucleus of thalamus, STN, cerebral peduncle of midbrain, CN III, supranuclear

		movements (choreoathetosis, intention tremor, hemiballismus, contralateral hemiplegia, Weber's syndrome (see below), paresis of vertical eye movements, slight miosis and ptosis, and sluggish pupillary light response	fibers to CN III
Posterior Cerebral Artery – central territory	Weber's Syndrome	Oculomotor nerve palsy and contralateral hemiplegia	CN III and cerebral peduncle of midbrain
Vertebrobasilar Syndromes			
Superior Cerebellar Artery (arises from basilar artery): upper and lateral pons, superior cerebellar peduncle, most of superior cerebellar lobe	Lateral superior pontine syndrome (Ipsilateral: cerebellar ataxia of limbs and gait, dizziness, nausea, vomiting, horizontal nystagmus, ipsilateral paresis of conjugate gaze, loss of optokinetic nystagmus, ipsilateral Horner's syndrome. Contralateral: impaired pain and thermal sense of face, limbs, and trunk, impaired touch, vibration and proprioception	Middle and superior cerebellar peduncles, superior surface of cerebellum, dentate nucleus, vestibular nuclei, descending sympathetic fibers, spinothalamic tract, medial lemniscus
Anterior Inferior Cerebellar Artery: branch of basilar artery: inferior/lateral pons, middle cerebellar peduncle, strip of ventral, anterior cerebellum	AICA (lateral inferior pontine syndrome) – Marie-Foix Syndrome	ipsilateral: horizontal and vertical nystagmus, vertigo, nausea, vomiting, facial paralysis, paralysis of conjugate gaze to side of lesion, deafness, tinnitus, ataxia, impaired sensation over face. Contralateral: impaired pain and thermal sense over half the body	CN VIII, CN VII, pontine center for lateral gaze, middle cerebellar peduncle and cerebellar hemisphere, main sensory nucleus and descending tract of CN V, spinothalamic tract
Posterior Inferior Cerebellar Artery: last branch off of vertebral artery: lateral medulla, most of inferior cerebellum and vermis	PICA (lateral medullary syndrome) – Wallenberg Syndrome	Ipsilateral: decreased pain and temp sensation in face, cerebellar ataxia, vertigo, nausea, vomiting, nystagmus, Horner's Syndrome, Dysphagia and dysphonia,	Descending tract of CN V, cerebellum or inferior cerebellar peduncle, vestibular nuclei/connections, descending sympathetic tract, CN IX and CN X,

		sensory impairment. Contralateral: impaired pain and thermal sense over 50% of body	cuneate and gracile nuclei
Basilar Artery	Complete basilar artery syndrome – Locked in syndrome	Tetraplegia, bilateral cranial nerve palsy with upward gaze spared, coma, cognition is spared	Bilateral ventral pons: cortico spinal tracts bilaterally, long tracts to cranial nerve nuclei bilaterally, reticular activating system
Vertebral Artery, medullary branch	Medial Medullary Syndrome: Dejerine Syndrome	Ipsilateral: paralysis with atrophy of half the tongue with deviation to paralyzed side when tongue is protruded, contralateral: paralysis of UE and LE, impaired tactile and proprioceptive sense	CN XII, hypoglossal, corticospinal tract, medial lemniscus

Berg Balance Scale

The Berg Balance Scale (BBS) was developed to measure balance among older people with impairment in balance function by assessing the performance of functional tasks. It is a valid instrument used for evaluation of the effectiveness of interventions and for quantitative descriptions of function in clinical practice and research. The BBS has been evaluated in several reliability studies. *A recent study of the BBS, which was completed in Finland, indicates that a change of eight (8) BBS points is required to reveal a genuine change in function between two assessments among older people who are dependent in ADL and living in residential care facilities.*

Description:

14-item scale designed to measure balance of the older adult in a clinical setting.

Equipment needed: Ruler, two standard chairs (one with arm rests, one without), footstool or step, stopwatch or wristwatch, 15 ft walkway

Completion:

Time: 15-20 minutes

Scoring: A five-point 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

A change of 8 points is required to reveal a genuine change in function between 2 assessments.

Berg Balance Scale

Name: _____ Date: _____

Location: _____ Rater: _____

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 _____

GENERAL INSTRUCTIONS

Please document each task and/or give instructions as written. When scoring, please record the lowest response category that applies for each item.

In most items, the subject is asked to maintain a given position for a specific time. Progressively more points are deducted if:

- the time or distance requirements are not met
- the subject's performance warrants supervision
- the subject touches an external support or receives assistance from the examiner

Subject should understand that they must maintain their balance while attempting the tasks. The choices of which leg to stand on or how far to reach are left to the subject. Poor judgment will adversely influence the performance and the scoring.

Equipment required for testing is a stopwatch or watch with a second hand, and a ruler or other indicator of 2, 5, and 10 inches. Chairs used during testing should be a reasonable height. Either a step or a stool of average step height may be used for item # 12.

Berg Balance Scale

SITTING TO STANDING

INSTRUCTIONS: Please stand up. Try not to use your hand for support.

- 4 able to stand without using hands and stabilize independently
- 3 able to stand independently using hands
- 2 able to stand using hands after several tries
- 1 needs minimal aid to stand or stabilize
- 0 needs moderate or maximal assist to stand

STANDING UNSUPPORTED

INSTRUCTIONS: Please stand for two minutes without holding on.

- 4 able to stand safely for 2 minutes
- 3 able to stand 2 minutes with supervision
- 2 able to stand 30 seconds unsupported
- 1 needs several tries to stand 30 seconds unsupported
- 0 unable to stand 30 seconds unsupported

If a subject is able to stand 2 minutes unsupported, score full points for sitting unsupported. Proceed to item #4.

SITTING WITH BACK UNSUPPORTED BUT FEET SUPPORTED ON FLOOR OR ON A STOOL

INSTRUCTIONS: Please sit with arms folded for 2 minutes.

- 4 able to sit safely and securely for 2 minutes
- 3 able to sit 2 minutes under supervision
- 2 able to sit 30 seconds
- 1 able to sit 10 seconds
- 0 unable to sit without support 10 seconds

STANDING TO SITTING

INSTRUCTIONS: Please sit down.

- 4 sits safely with minimal use of hands
- 3 controls descent by using hands
- 2 uses back of legs against chair to control descent
- 1 sits independently but has uncontrolled descent
- 0 needs assist to sit

TRANSFERS

INSTRUCTIONS: Arrange chair(s) for pivot transfer. Ask subject to transfer one way toward a seat with armrests and one way toward a seat without armrests. You may use two chairs (one with and one without armrests) or a bed and a chair.

- 4 able to transfer safely with minor use of hands
- 3 able to transfer safely definite need of hands
- 2 able to transfer with verbal cuing and/or supervision
- 1 needs one person to assist
- 0 needs two people to assist or supervise to be safe

STANDING UNSUPPORTED WITH EYES CLOSED

INSTRUCTIONS: Please close your eyes and stand still for 10 seconds.

- 4 able to stand 10 seconds safely
- 3 able to stand 10 seconds with supervision
- 2 able to stand 3 seconds
- 1 unable to keep eyes closed 3 seconds but stays safely
- 0 needs help to keep from falling

STANDING UNSUPPORTED WITH FEET TOGETHER

INSTRUCTIONS: Place your feet together and stand without holding on.

- 4 able to place feet together independently and stand 1 minute safely
- 3 able to place feet together independently and stand 1 minute with supervision
- 2 able to place feet together independently but unable to hold for 30 seconds
- 1 needs help to attain position but able to stand 15 seconds feet together
- 0 needs help to attain position and unable to hold for 15 seconds

Berg Balance Scale continued...

REACHING FORWARD WITH OUTSTRETCHED ARM WHILE STANDING

INSTRUCTIONS: Lift arm to 90 degrees. Stretch out your fingers and reach forward as far as you can. (Examiner places a ruler at the end of fingertips when arm is at 90 degrees. Fingers should not touch the ruler while reaching forward. The recorded measure is the distance forward that the fingers reach while the subject is in the most forward lean position. When possible, ask subject to use both arms when reaching to avoid rotation of the trunk.)

- 4 can reach forward confidently 25 cm (10 inches)
- 3 can reach forward 12 cm (5 inches)
- 2 can reach forward 5 cm (2 inches)
- 1 reaches forward but needs supervision
- 0 loses balance while trying/requires external support

PICK UP OBJECT FROM THE FLOOR FROM A STANDING POSITION

INSTRUCTIONS: Pick up the shoe/slipper, which is in front of your feet.

- 4 able to pick up slipper safely and easily
- 3 able to pick up slipper but needs supervision
- 2 unable to pick up but reaches 2-5 cm(1-2 inches) from slipper and keeps balance independently
- 1 unable to pick up and needs supervision while trying
- 0 unable to try/needs assist to keep from losing balance or falling

TURNING TO LOOK BEHIND OVER LEFT AND RIGHT SHOULDERS WHILE STANDING

INSTRUCTIONS: Turn to look directly behind you over toward the left shoulder. Repeat to the right. (Examiner may pick an object to look at directly behind the subject to encourage a better twist turn.)

- 4 looks behind from both sides and weight shifts well
- 3 looks behind one side only other side shows less weight shift
- 2 turns sideways only but maintains balance
- 1 needs supervision when turning
- 0 needs assist to keep from losing balance or falling

TURN 360 DEGREES

INSTRUCTIONS: Turn completely around in a full circle. Pause. Then turn a full circle in the other direction.

- 4 able to turn 360 degrees safely in 4 seconds or less
- 3 able to turn 360 degrees safely one side only 4 seconds or less
- 2 able to turn 360 degrees safely but slowly
- 1 needs close supervision or verbal cuing
- 0 needs assistance while turning

PLACE ALTERNATE FOOT ON STEP OR STOOL WHILE STANDING UNSUPPORTED

INSTRUCTIONS: Place each foot alternately on the step/stool. Continue until each foot has touched the step/stool four times.

- 4 able to stand independently and safely and complete 8 steps in 20 seconds
- 3 able to stand independently and complete 8 steps in > 20 seconds
- 2 able to complete 4 steps without aid with supervision
- 1 able to complete > 2 steps needs minimal assist
- 0 needs assistance to keep from falling/unable to try

STANDING UNSUPPORTED ONE FOOT IN FRONT

INSTRUCTIONS: (DEMONSTRATE TO SUBJECT) Place one foot directly in front of the other. If you feel that you cannot place your foot directly in front, try to step far enough ahead that the heel of your forward foot is ahead of the toes of the other foot. (To score 3 points, the length of the step should exceed the length of the other foot and the width of the stance should approximate the subject's normal stride width.)

- 4 able to place foot tandem independently and hold 30 seconds
- 3 able to place foot ahead independently and hold 30 seconds
- 2 able to take small step independently and hold 30 seconds
- 1 needs help to step but can hold 15 seconds
- 0 loses balance while stepping or standing

STANDING ON ONE LEG

INSTRUCTIONS: Stand on one leg as long as you can without holding on.

- 4 able to lift leg independently and hold > 10 seconds
- 3 able to lift leg independently and hold 5-10 seconds
- 2 able to lift leg independently and hold \geq 3 seconds
- 1 tries to lift leg unable to hold 3 seconds but remains standing independently.
- 0 unable to try of needs assist to prevent fall

TOTAL SCORE (Maximum = 56)

FUNCTIONAL GAIT ASSESSMENT

Appendix.

Functional Gait Assessment^a

Requirements: A marked 6-m (20-ft) walkway that is marked with a 30.48-cm (12-in) width.

1. GAIT LEVEL SURFACE

Instructions: *Walk at your normal speed from here to the next mark (6 m [20 ft]).*

Grading: Mark the highest category that applies.

- (3) Normal—Walks 6 m (20 ft) in less than 5.5 seconds, no assistive devices, good speed, no evidence for imbalance, normal gait pattern, deviates no more than 15.24 cm (6 in) outside of the 30.48-cm (12-in) walkway width.
- (2) Mild impairment—Walks 6 m (20 ft) in less than 7 seconds but greater than 5.5 seconds, uses assistive device, slower speed, mild gait deviations, or deviates 15.24–25.4 cm (6–10 in) outside of the 30.48-cm (12-in) walkway width.
- (1) Moderate impairment—Walks 6 m (20 ft), slow speed, abnormal gait pattern, evidence for imbalance, or deviates 25.4–38.1 cm (10–15 in) outside of the 30.48-cm (12-in) walkway width. Requires more than 7 seconds to ambulate 6 m (20 ft).
- (0) Severe impairment—Cannot walk 6 m (20 ft) without assistance, severe gait deviations or imbalance, deviates greater than 38.1 cm (15 in) outside of the 30.48-cm (12-in) walkway width or reaches and touches the wall.

2. CHANGE IN GAIT SPEED

Instructions: *Begin walking at your normal pace (for 1.5 m [5 ft]). When I tell you "go," walk as fast as you can (for 1.5 m [5 ft]). When I tell you "slow," walk as slowly as you can (for 1.5 m [5 ft]).*

Grading: Mark the highest category that applies.

- (3) Normal—Able to smoothly change walking speed without loss of balance or gait deviation. Shows a significant difference in walking speeds between normal, fast, and slow speeds. Deviates no more than 15.24 cm (6 in) outside of the 30.48-cm (12-in) walkway width.
- (2) Mild impairment—Is able to change speed but demonstrates mild gait deviations, deviates 15.24–25.4 cm (6–10 in) outside of the 30.48-cm (12-in) walkway width, or no gait deviations but unable to achieve a significant change in velocity, or uses an assistive device.
- (1) Moderate impairment—Makes only minor adjustments to walking speed, or accomplishes a change in speed with significant gait deviations, deviates 25.4–38.1 cm (10–15 in) outside the 30.48-cm (12-in) walkway width, or changes speed but loses balance but is able to recover and continue walking.
- (0) Severe impairment—Cannot change speeds, deviates greater than 38.1 cm (15 in) outside 30.48-cm (12-in) walkway width, or loses balance and has to reach for wall or be caught.

3. GAIT WITH HORIZONTAL HEAD TURNS

Instructions: *Walk from here to the next mark 6 m (20 ft) away. Begin walking at your normal pace. Keep walking straight; after 3 steps, turn your head to the right and keep walking straight while looking to the right. After 3 more steps, turn your head to the left and keep walking straight while looking left. Continue alternating looking right and left every 3 steps until you have completed 2 repetitions in each direction.*

Grading: Mark the highest category that applies.

- (3) Normal—Performs head turns smoothly with no change in gait. Deviates no more than 15.24 cm (6 in) outside 30.48-cm (12-in) walkway width.
- (2) Mild impairment—Performs head turns smoothly with slight change in gait velocity (eg, minor disruption to smooth gait path), deviates 15.24–25.4 cm (6–10 in) outside 30.48-cm (12-in) walkway width, or uses an assistive device.

- (1) Moderate impairment—Performs head turns with moderate change in gait velocity, slows down, deviates 25.4–38.1 cm (10–15 in) outside 30.48-cm (12-in) walkway width but recovers, can continue to walk.
- (0) Severe impairment—Performs task with severe disruption of gait (eg, staggers 38.1 cm [15 in] outside 30.48-cm [12-in] walkway width, loses balance, stops, or reaches for wall).

4. GAIT WITH VERTICAL HEAD TURNS

Instructions: *Walk from here to the next mark (6 m [20 ft]). Begin walking at your normal pace. Keep walking straight; after 3 steps, tip your head up and keep walking straight while looking up. After 3 more steps, tip your head down, keep walking straight while looking down. Continue alternating looking up and down every 3 steps until you have completed 2 repetitions in each direction.*

Grading: Mark the highest category that applies.

- (3) Normal—Performs head turns with no change in gait. Deviates no more than 15.24 cm (6 in) outside 30.48-cm (12-in) walkway width.
- (2) Mild impairment—Performs task with slight change in gait velocity (eg, minor disruption to smooth gait path), deviates 15.24–25.4 cm (6–10 in) outside 30.48-cm (12-in) walkway width or uses assistive device.
- (1) Moderate impairment—Performs task with moderate change in gait velocity, slows down, deviates 25.4–38.1 cm (10–15 in) outside 30.48-cm (12-in) walkway width but recovers, can continue to walk.
- (0) Severe impairment—Performs task with severe disruption of gait (eg, staggers 38.1 cm [15 in] outside 30.48-cm [12-in] walkway width, loses balance, stops, reaches for wall).

5. GAIT AND PIVOT TURN

Instructions: *Begin with walking at your normal pace. When I tell you, "turn and stop," turn as quickly as you can to face the opposite direction and stop.*

Grading: Mark the highest category that applies.

- (3) Normal—Pivot turns safely within 3 seconds and stops quickly with no loss of balance.
- (2) Mild impairment—Pivot turns safely in >3 seconds and stops with no loss of balance, or pivot turns safely within 3 seconds and stops with mild imbalance, requires small steps to catch balance.
- (1) Moderate impairment—Turns slowly, requires verbal cueing, or requires several small steps to catch balance following turn and stop.
- (0) Severe impairment—Cannot turn safely, requires assistance to turn and stop.

6. STEP OVER OBSTACLE

Instructions: *Begin walking at your normal speed. When you come to the shoe box, step over it, not around it, and keep walking.*

Grading: Mark the highest category that applies.

- (3) Normal—Is able to step over 2 stacked shoe boxes taped together (22.86 cm [9 in] total height) without changing gait speed; no evidence of imbalance.
- (2) Mild impairment—Is able to step over one shoe box (11.43 cm [4.5 in] total height) without changing gait speed; no evidence of imbalance.
- (1) Moderate impairment—Is able to step over one shoe box (11.43 cm [4.5 in] total height) but must slow down and adjust steps to clear box safely. May require verbal cueing.
- (0) Severe impairment—Cannot perform without assistance.

(Continued)

7. GAIT WITH NARROW BASE OF SUPPORT

Instructions: *Walk on the floor with arms folded across the chest, feet aligned heel to toe in tandem for a distance of 3.6 m [12 ft]. The number of steps taken in a straight line are counted for a maximum of 10 steps.*
Grading: Mark the highest category that applies.

- (3) Normal—Is able to ambulate for 10 steps heel to toe with no staggering.
- (2) Mild impairment—Ambulates 7–9 steps.
- (1) Moderate impairment—Ambulates 4–7 steps.
- (0) Severe impairment—Ambulates less than 4 steps heel to toe or cannot perform without assistance.

8. GAIT WITH EYES CLOSED

Instructions: *Walk at your normal speed from here to the next mark (6 m [20 ft]) with your eyes closed.*

Grading: Mark the highest category that applies.

- (3) Normal—Walks 6 m (20 ft), no assistive devices, good speed, no evidence of imbalance, normal gait pattern, deviates no more than 15.24 cm (6 in) outside 30.48-cm (12-in) walkway width. Ambulates 6 m (20 ft) in less than 7 seconds.
- (2) Mild impairment—Walks 6 m (20 ft), uses assistive device, slower speed, mild gait deviations, deviates 15.24–25.4 cm (6–10 in) outside 30.48-cm (12-in) walkway width. Ambulates 6 m (20 ft) in less than 9 seconds but greater than 7 seconds.
- (1) Moderate impairment—Walks 6 m (20 ft), slow speed, abnormal gait pattern, evidence for imbalance, deviates 25.4–38.1 cm (10–15 in) outside 30.48-cm (12-in) walkway width. Requires more than 9 seconds to ambulate 6 m (20 ft).
- (0) Severe impairment—Cannot walk 6 m (20 ft) without assistance, severe gait deviations or imbalance, deviates greater than 38.1 cm (15 in) outside 30.48-cm (12-in) walkway width or will not attempt task.

9. AMBULATING BACKWARDS

Instructions: *Walk backwards until I tell you to stop.*
Grading: Mark the highest category that applies.

- (3) Normal—Walks 6 m (20 ft), no assistive devices, good speed, no evidence for imbalance, normal gait pattern, deviates no more than 15.24 cm (6 in) outside 30.48-cm (12-in) walkway width.
- (2) Mild impairment—Walks 6 m (20 ft), uses assistive device, slower speed, mild gait deviations, deviates 15.24–25.4 cm (6–10 in) outside 30.48-cm (12-in) walkway width.
- (1) Moderate impairment—Walks 6 m (20 ft), slow speed, abnormal gait pattern, evidence for imbalance, deviates 25.4–38.1 cm (10–15 in) outside 30.48-cm (12-in) walkway width.
- (0) Severe impairment—Cannot walk 6 m (20 ft) without assistance, severe gait deviations or imbalance, deviates greater than 38.1 cm (15 in) outside 30.48-cm (12-in) walkway width or will not attempt task.

10. STEPS

Instructions: *Walk up these stairs as you would at home (ie, using the rail if necessary). At the top turn around and walk down.*

Grading: Mark the highest category that applies.

- (3) Normal—Alternating feet, no rail.
- (2) Mild impairment—Alternating feet, must use rail.
- (1) Moderate impairment—Two feet to a stair; must use rail.
- (0) Severe impairment—Cannot do safely.

TOTAL SCORE: _____ MAXIMUM SCORE 30

^a Adapted from Dynamic Gait Index.¹ Modified and reprinted with permission of authors and Lippincott Williams & Wilkins (<http://lww.com>).

Functional Gait Assessment

Watch Video at:

<https://www.youtube.com/watch?v=vxzB3ez3y14>

Grading: record the lowest category that applies.

1. Gait level surface. *Instructions: Walk at your normal speed from here to the next mark (20').*

- (3) Normal: walks 20', no assistive devices, good speed, no evidence for imbalance, normal gait pattern.
- (2) Mild impairment: walks 20', uses assistive devices, slower speed, mild gait deviations.
- (1) Moderate impairment: walks 20', slow speed, abnormal gait patterns, evidence for imbalance.
- (0) Severe impairment: cannot walk 20' without assistance, severe gait deviations or imbalance.

2. Change in gait speed. *Instructions: Begin walking at your normal pace (for 5'), when I tell you "go", walk as fast as you can (for 5'). When I tell you "slow", walk as slowly as you can (for 5').*

- (3) Normal: Able to smoothly change walking speed without loss of balance or gait deviation. Shows significant difference in walking speeds between normal, fast and slow paces.
- (2) Mild impairment: Is able to change speed but demonstrates mild gait deviations, or no gait deviations but unable to achieve a significant change in velocity, or uses an assistive device.
- (1) Moderate impairment: Makes only minor adjustments to walking speed, or accomplishes a change in speed with significant gait deviations, or changes speed but loses balance but is able to recover and continue walking.
- (0) Severe impairment: Cannot change speeds, or loss of balance and has to reach for a wall or be caught.

3. Gait with horizontal head turns. *Instructions: Begin walking at your normal pace. When I tell you to "look right", keep walking straight, but turn your head to the right. Keep looking to the right until I tell you "look left", then keep walking straight and turn your head to the left. Keep your head to the left until I tell you, "look straight", then keep walking straight, but return your head to the centre.*

- (3) Normal: Performs head turns smoothly with no change in gait.
- (2) Mild impairment: Performs head turns smoothly with slight change in gait velocity, i.e. minor disruption to smooth gait path or uses walking aid.
- (1) Moderate impairment: Performs head turns with moderate change in gait velocity, slows down, staggers, but recovers, can continue to walk.
- (0) Severe impairment: Performs task with severe disruption of gait, i.e. staggers outside 15" path, loses balance, stops, reaches for wall.

4. Gait with vertical head turns. *Instructions: Begin walking at your normal pace. When I tell you to "look up", keep walking straight, but tip your head and look up. Keep looking up until I tell you, "look down". Then keep walking straight and turn your head down. Keep looking down until I tell you, "look straight", then keep walking straight, but return your head to the centre.*

- (3) Normal: Performs head turns smoothly with no change in gait.
- (2) Mild impairment: Performs head turns smoothly with slight change in gait velocity, i.e. minor disruption to smooth gait path or uses walking aid.
- (1) Moderate impairment: Performs head turns with moderate change in gait velocity, slows down, staggers, but recovers, can continue to walk.
- (0) Severe impairment: Performs task with severe disruption of gait, i.e. staggers outside 15" path, loses balance, stops, reaches for wall.

5. Gait and pivot turn. *Instructions: Begin walking at your normal pace. When I tell you, “turn and stop”, turn as quickly as you can to face the opposite direction and stop.*

- (3) Normal: Pivot turns safely within 3 seconds and stops quickly with no loss of balance.
- (2) Mild impairment: pivot turns safely in >3 seconds and stops with no loss of balance.
- (1) Moderate impairment: Turns slowly, requires verbal cueing, requires several small steps to catch balance following turn and stop.
- (0) Severe impairment: Cannot turn safely, requires assistance to turn and stop.

6. Step over obstacle. *Instructions: Begin walking at your normal speed. When you come to the shoebox, step over it, not around it, and keep walking.*

- (3) Normal: Is able to step over box without changing gait speed; no evidence for imbalance.
- (2) Mild impairment: Is able to step over shoe box, but must slow down and adjust steps to clear box safely.
- (1) Moderate impairment: Is able to step over box but must stop, then step over. May require verbal cueing.
- (0) Severe impairment: Cannot perform without assistance.

7. Step around obstacles. *Instructions: Begin walking at normal speed. When you come to the first cone (about 6’ away), walk around the right side of it. When you come to the second cone (6’ past first cone), walk around it to the left.*

- (3) Normal: Is able to walk safely around cones safely without changing gait speed; no evidence of imbalance.
- (2) Mild impairment: Is able to step around both cones, but must slow down and adjust steps to clear cones.
- (1) Moderate impairment: Is able to clear cones but must significantly slow speed to accomplish task, or requires verbal cueing.
- (0) Severe impairment: Unable to clear cones, walks into one or both cones, or requires physical assistance.

8. Steps. *Instructions: Walk up these stairs as you would at home.(i.e. using a rail if necessary. At the top, turn around and walk down.*

- (3) Normal: Alternating feet, no rail.
- (2) Mild impairment: Alternating feet, must use rail.
- (1) Moderate impairment: Two feet to a stair, must use rail.
- (0) Severe impairment: Cannot do safely.

TOTAL SCORE

Admission: _____ Date: _____

Discharge: _____ Date: _____

Signature: _____ Designation: _____

Mini-BESTest: Balance Evaluation Systems Test

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ANTICIPATORY

SUB SCORE: /6

1. SIT TO STAND

Instruction: "Cross your arms across your chest. Try not to use your hands unless you must. Do not let your legs lean against the back of the chair when you stand. Please stand up now."

(2) Normal: Comes to stand without use of hands and stabilizes independently.

(1) Moderate: Comes to stand WITH use of hands on first attempt.

(0) Severe: Unable to stand up from chair without assistance, OR needs several attempts with use of hands.

2. RISE TO TOES

Instruction: "Place your feet shoulder width apart. Place your hands on your hips. Try to rise as high as you can onto your toes. I will count out loud to 3 seconds. Try to hold this pose for at least 3 seconds. Look straight ahead. Rise now."

(2) Normal: Stable for 3 s with maximum height.

(1) Moderate: Heels up, but not full range (smaller than when holding hands), OR noticeable instability for 3 s.

(0) Severe: ≤ 3 s.

3. STAND ON ONE LEG

Instruction: "Look straight ahead. Keep your hands on your hips. Lift your leg off of the ground behind you without touching or resting your raised leg upon your other standing leg. Stay standing on one leg as long as you can. Look straight ahead. Lift now."

Left: Time in Seconds Trial 1: _____ Trial 2: _____

Right: Time in Seconds Trial 1: _____ Trial 2: _____

(2) Normal: 20 s.

(2) Normal: 20 s.

(1) Moderate: < 20 s.

(1) Moderate: < 20 s.

(0) Severe: Unable.

(0) Severe: Unable

To score each side separately use the trial with the longest time.

To calculate the sub-score and total score use the side [left or right] with the lowest numerical score [i.e. the worse side].

REACTIVE POSTURAL CONTROL

SUB SCORE: /6

4. COMPENSATORY STEPPING CORRECTION- FORWARD

Instruction: "Stand with your feet shoulder width apart, arms at your sides. Lean forward against my hands beyond your forward limits. When I let go, do whatever is necessary, including taking a step, to avoid a fall."

(2) Normal: Recovers independently with a single, large step (second realignment step is allowed).

(1) Moderate: More than one step used to recover equilibrium.

(0) Severe: No step, OR would fall if not caught, OR falls spontaneously.

5. COMPENSATORY STEPPING CORRECTION- BACKWARD

Instruction: "Stand with your feet shoulder width apart, arms at your sides. Lean backward against my hands beyond your backward limits. When I let go, do whatever is necessary, including taking a step, to avoid a fall."

(2) Normal: Recovers independently with a single, large step.

(1) Moderate: More than one step used to recover equilibrium.

(0) Severe: No step, OR would fall if not caught, OR falls spontaneously.

6. COMPENSATORY STEPPING CORRECTION- LATERAL

Instruction: "Stand with your feet together, arms down at your sides. Lean into my hand beyond your sideways limit. When I let go, do whatever is necessary, including taking a step, to avoid a fall."

Left

Right

(2) Normal: Recovers independently with 1 step (crossover or lateral OK).

(2) Normal: Recovers independently with 1 step (crossover or lateral OK).

(1) Moderate: Several steps to recover equilibrium.

(1) Moderate: Several steps to recover equilibrium.

(0) Severe: Falls, or cannot step.

(0) Severe: Falls, or cannot step.

Use the side with the lowest score to calculate sub-score and total score.

SENSORY ORIENTATION

SUB SCORE: /6

7. STANCE (FEET TOGETHER); EYES OPEN, FIRM SURFACE

Instruction: "Place your hands on your hips. Place your feet together until almost touching. Look straight ahead. Be as stable and still as possible, until I say stop."

Time in seconds: _____

(2) Normal: 30 s.

(1) Moderate: < 30 s.

(0) Severe: Unable.

8. STANCE (FEET TOGETHER); EYES CLOSED, FOAM SURFACE

Instruction: "Step onto the foam. Place your hands on your hips. Place your feet together until almost touching. Be as stable and still as possible, until I say stop. I will start timing when you close your eyes."

Time in seconds: _____

- (2) Normal: 30 s.
- (1) Moderate: < 30 s.
- (0) Severe: Unable.

9. INCLINE- EYES CLOSED

Instruction: "Step onto the incline ramp. Please stand on the incline ramp with your toes toward the top. Place your feet shoulder width apart and have your arms down at your sides. I will start timing when you close your eyes."

Time in seconds: _____

- (2) Normal: Stands independently 30 s and aligns with gravity.
- (1) Moderate: Stands independently <30 s OR aligns with surface.
- (0) Severe: Unable.

DYNAMIC GAIT

SUB SCORE: _____ /10

10. CHANGE IN GAIT SPEED

Instruction: "Begin walking at your normal speed, when I tell you 'fast', walk as fast as you can. When I say 'slow', walk very slowly."

- (2) Normal: Significantly changes walking speed without imbalance.
- (1) Moderate: Unable to change walking speed or signs of imbalance.
- (0) Severe: Unable to achieve significant change in walking speed AND signs of imbalance.

11. WALK WITH HEAD TURNS – HORIZONTAL

Instruction: "Begin walking at your normal speed, when I say "right", turn your head and look to the right. When I say "left" turn your head and look to the left. Try to keep yourself walking in a straight line."

- (2) Normal: performs head turns with no change in gait speed and good balance.
- (1) Moderate: performs head turns with reduction in gait speed.
- (0) Severe: performs head turns with imbalance.

12. WALK WITH PIVOT TURNS

Instruction: "Begin walking at your normal speed. When I tell you to 'turn and stop', turn as quickly as you can, face the opposite direction, and stop. After the turn, your feet should be close together."

- (2) Normal: Turns with feet close FAST (≤ 3 steps) with good balance.
- (1) Moderate: Turns with feet close SLOW (≥ 4 steps) with good balance.
- (0) Severe: Cannot turn with feet close at any speed without imbalance.

13. STEP OVER OBSTACLES

Instruction: "Begin walking at your normal speed. When you get to the box, step over it, not around it and keep walking."

- (2) Normal: Able to step over box with minimal change of gait speed and with good balance.
- (1) Moderate: Steps over box but touches box OR displays cautious behavior by slowing gait.
- (0) Severe: Unable to step over box OR steps around box.

14. TIMED UP & GO WITH DUAL TASK [3 METER WALK]

Instruction TUG: "When I say 'Go', stand up from chair, walk at your normal speed across the tape on the floor, turn around, and come back to sit in the chair."

Instruction TUG with Dual Task: "Count backwards by threes starting at _____. When I say 'Go', stand up from chair, walk at your normal speed across the tape on the floor, turn around, and come back to sit in the chair. Continue counting backwards the entire time."

TUG: _____ seconds; Dual Task TUG: _____ seconds

- (2) Normal: No noticeable change in sitting, standing or walking while backward counting when compared to TUG without Dual Task.
- (1) Moderate: Dual Task affects either counting OR walking (>10%) when compared to the TUG without Dual Task.
- (0) Severe: Stops counting while walking OR stops walking while counting.

When scoring item 14, if subject's gait speed slows more than 10% between the TUG without and with a Dual Task the score should be decreased by a point.

TOTAL SCORE: _____ /28

Mini-BESTest Instructions

Subject Conditions: Subject should be tested with flat-heeled shoes OR shoes and socks off.

Equipment: Temper® foam (also called T-foam™ 4 inches thick, medium density T41 firmness rating), chair without arm rests or wheels, incline ramp, stopwatch, a box (9" height) and a 3 meter distance measured out and marked on the floor with tape [from chair].

Scoring: The test has a maximum score of 28 points from 14 items that are each scored from 0-2.

"0" indicates the lowest level of function and "2" the highest level of function.

If a subject must use an assistive device for an item, score that item one category lower.

If a subject requires physical assistance to perform an item, score "0" for that item.

For **Item 3** (stand on one leg) and **Item 6** (compensatory stepping-lateral) only include the score for one side (the worse score).

For **Item 3** (stand on one leg) select the best time of the 2 trials [from a given side] for the score.

For **Item 14** (timed up & go with dual task) if a person's gait slows greater than 10% between the TUG without and with a dual task then the score should be decreased by a point.

1. SIT TO STAND	Note the initiation of the movement, and the use of the subject's hands on the seat of the chair, the thighs, or the thrusting of the arms forward.
2. RISE TO TOES	Allow the subject two attempts. Score the best attempt. (If you suspect that subject is using less than full height, ask the subject to rise up while holding the examiners' hands.) Make sure the subject looks at a non-moving target 4-12 feet away.
3. STAND ON ONE LEG	Allow the subject two attempts and record the times. Record the number of seconds the subject can hold up to a maximum of 20 seconds. Stop timing when the subject moves hands off of hips or puts a foot down. Make sure the subject looks at a non-moving target 4-12 feet ahead. Repeat on other side.
4. COMPENSATORY STEPPING CORRECTION-FORWARD	Stand in front of the subject with one hand on each shoulder and ask the subject to lean forward (Make sure there is room for them to step forward). Require the subject to lean until the subject's shoulders and hips are in front of toes. After you feel the subject's body weight in your hands, very suddenly release your support. The test must elicit a step. NOTE: Be prepared to catch subject.
5. COMPENSATORY STEPPING CORRECTION - BACKWARD	Stand behind the subject with one hand on each scapula and ask the subject to lean backward (Make sure there is room for the subject to step backward.) Require the subject to lean until their shoulders and hips are in back of their heels. After you feel the subject's body weight in your hands, very suddenly release your support. Test must elicit a step. NOTE: Be prepared to catch subject.
6. COMPENSATORY STEPPING CORRECTION- LATERAL	Stand to the side of the subject, place one hand on the side of the subject's pelvis, and have the subject lean their whole body into your hands. Require the subject to lean until the midline of the pelvis is over the right (or left) foot and then suddenly release your hold. NOTE: Be prepared to catch subject.
7. STANCE (FEET TOGETHER); EYES OPEN, FIRM SURFACE	Record the time the subject was able to stand with feet together up to a maximum of 30 seconds. Make sure subject looks at a non-moving target 4-12 feet away.
8. STANCE (FEET TOGETHER); EYES CLOSED, FOAM SURFACE	Use medium density Temper® foam, 4 inches thick. Assist subject in stepping onto foam. Record the time the subject was able to stand in each condition to a maximum of 30 seconds. Have the subject step off of the foam between trials. Flip the foam over between each trial to ensure the foam has retained its shape.
9. INCLINE EYES CLOSED	Aid the subject onto the ramp. Once the subject closes eyes, begin timing and record time. Note if there is excessive sway.
10. CHANGE IN SPEED	Allow the subject to take 3-5 steps at normal speed, and then say "fast". After 3-5 fast steps, say "slow". Allow 3-5 slow steps before the subject stops walking.
11. WALK WITH HEAD TURNS-HORIZONTAL	Allow the subject to reach normal speed, and give the commands "right, left" every 3-5 steps. Score if you see a problem in either direction. If subject has severe cervical restrictions allow combined head and trunk movements.
12. WALK WITH PIVOT TURNS	Demonstrate a pivot turn. Once the subject is walking at normal speed, say "turn and stop." Count the number of steps from "turn" until the subject is stable. Imbalance may be indicated by wide stance, extra stepping or trunk motion.
13. STEP OVER OBSTACLES	Place the box (9 inches or 23 cm height) 10 feet away from where the subject will begin walking. Two shoeboxes taped together works well to create this apparatus.
14. TIMED UP & GO WITH DUAL TASK	<i>Use the TUG time to determine the effects of dual tasking. The subject should walk a 3 meter distance. TUG: Have the subject sitting with the subject's back against the chair. The subject will be timed from the moment you say "Go" until the subject returns to sitting. Stop timing when the subject's buttocks hit the chair bottom and the subject's back is against the chair. The chair should be firm without arms. TUG With Dual Task: While sitting determine how fast and accurately the subject can count backwards by threes starting from a number between 100-90. Then, ask the subject to count from a different number and after a few numbers say "Go". Time the subject from the moment you say "Go" until the subject returns to the sitting position. Score dual task as affecting counting or walking if speed slows (>10%) from TUG and or new signs of imbalance.</i>

Patient Name: _____ Date: _____

The Activities-specific Balance Confidence (ABC) Scale*

Instructions to Participants: For each of the following activities, please indicate your level of confidence in doing the activity without losing your balance or becoming unsteady from choosing one of the percentage points on the scale from 0% to 100% If you do not currently do the activity in question, try and imagine how confident you would be if you had to do the activity. If you normally use a walking aid to do the activity or hold onto someone, rate your confidence as if you were using these supports.

0% 10 20 30 40 50 60 70 80 90 100%
No Confidence Completely Confident

How confident are you that you will not lose your balance or become unsteady when you...

1. ...walk around the house? _____%
2. ...walk up or down stairs? _____%
3. ...bend over and pick up a slipper from the front of a closet floor? _____%
4. ...reach for a small can off a shelf at eye level? _____%
5. ...stand on your tip toes and reach for something above your head? _____%
6. ...stand on a chair and reach for something? _____%
7. ...sweep the floor? _____%
8. ...walk outside the house to a car parked in the driveway? _____%
9. ...get into or out of a car? _____%
10. ...walk across a parking lot to the mall? _____%
11. ...walk up or down a ramp? _____%
12. ...walk in a crowded mall where people rapidly walk past you? _____%
13. ...are bumped into by people as you walk through the mall? _____%
14. ...step onto or off of an escalator while you are holding onto a railing? _____%
15. ...step onto or off an escalator while holding onto parcels such that you cannot hold onto the railing? _____%
16. ...walk outside on icy sidewalks? _____%

*Powell LE & Myers AM. The Activities-specific Balance Confidence (ABC) Scale. Journal of Gerontology Med Sci 1995; 50(1):M28-34.

Total ABC Score: _____

Scoring: _____ / 16 = _____ % of self confidence
Total ABC Score

MEDICARE PATIENTS ONLY

100% - _____% Function = _____% Impairment

Patient Signature: _____ Date: _____

Therapist Signature: _____ Date: _____



PDQ-39 QUESTIONNAIRE

Please complete the following

Please tick one box for each question

Due to having Parkinson's disease, how often during the last month have you....

		Never	Occasionally	Sometimes	Often	Always or cannot do at all
1	Had difficulty doing the leisure activities which you would like to do?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Had difficulty looking after your home, e.g. DIY, housework, cooking?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Had difficulty carrying bags of shopping?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Had problems walking half a mile?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Had problems walking 100 yards?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	Had problems getting around the house as easily as you would like?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	Had difficulty getting around in public?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	Needed someone else to accompany you when you went out?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	Felt frightened or worried about falling over in public?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	Been confined to the house more than you would like?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	Had difficulty washing yourself?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	Had difficulty dressing yourself?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13	Had problems doing up your shoe laces?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

*Please check that you have ticked **one box for each question** before going on to the next page*

Due to having Parkinson's disease, how often during the last month have you....

Please tick one box for each question

		Never	Occasionally	Sometimes	Often	Always or cannot do at all
14	Had problems writing clearly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15	Had difficulty cutting up your food?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16	Had difficulty holding a drink without spilling it?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17	Felt depressed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18	Felt isolated and lonely?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19	Felt weepy or tearful?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20	Felt angry or bitter?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21	Felt anxious?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22	Felt worried about your future?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23	Felt you had to conceal your Parkinson's from people?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24	Avoided situations which involve eating or drinking in public?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25	Felt embarrassed in public due to having Parkinson's disease?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26	Felt worried by other people's reaction to you?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27	Had problems with your close personal relationships?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28	Lacked support in the ways you need from your spouse or partner?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<i>If you do not have a spouse or partner tick here</i>		<input type="checkbox"/>			
29	Lacked support in the ways you need from your family or close friends?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

*Please check that you have ticked **one box for each question** before going on to the next page*

Due to having Parkinson's disease, how often during the last month have you....

Please tick one box for each question

	Never	Occasionally	Sometimes	Often	Always	
30	Unexpectedly fallen asleep during the day?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31	Had problems with your concentration, e.g. when reading or watching TV?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32	Felt your memory was bad?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33	Had distressing dreams or hallucinations?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34	Had difficulty with your speech?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
35	Felt unable to communicate with people properly?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36	Felt ignored by people?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
37	Had painful muscle cramps or spasms?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
38	Had aches and pains in your joints or body?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39	Felt unpleasantly hot or cold?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please check that you have ticked one box for each question before going on to the next page

Thank you for completing the PDQ 39 questionnaire

Appendix B

B.1. Freezing of Gait Questionnaire (FOGQ)

B.1.1. During your worst state—Do you walk:

- 0 Normally
- 1 Almost normally—somewhat slow
- 2 Slow but fully independent
- 3 Need assistance or walking aid
- 4 Unable to walk

B.1.2. Are your gait difficulties affecting your daily activities and independence?

- 0 Not at all
- 1 Mildly
- 2 Moderately
- 3 Severely
- 4 Unable to walk

B.1.3. Do you feel that your feet get glued to the floor while walking, making a turn or when trying to initiate walking (freezing)?

- 0 Never
- 1 Very rarely—about once a month
- 2 Rarely—about once a week
- 3 Often—about once a day
- 4 Always—whenever walking

B.1.4. How long is your longest freezing episode?

- 0 Never happened
- 1 1–2 s
- 2 3–10 s
- 3 11–30 s
- 4 Unable to walk for more than 30 s

B.1.5. How long is your typical start hesitation episode (freezing when initiating the first step)?

- 0 None
- 1 Takes longer than 1 s to start walking
- 2 Takes longer than 3 s to start walking

- 3 Takes longer than 10 s to start walking
- 4 Takes longer than 30 s to start walking

B.1.6. How long is your typical turning hesitation: (freezing when turning)

- 0 None
- 1 Resume turning in 1–2 s
- 2 Resume turning in 3–10 s
- 3 Resume turning in 11–30 s
- 4 Unable to resume turning for more than 30 s

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Twelve Item MS Walking Scale (MSWS-12)

Record form



Subject ID Number			Subject Initials		Date Questionnaire Completed		Day	Month	Year		

If you cannot walk at all, please tick this box

<i>In the past two weeks, how much has your MS . . .</i>	Not at all	A little	Moderately	Quite a lot	Extremely
1. Limited your ability to walk?	1	2	3	4	5
2. Limited your ability to run?	1	2	3	4	5
3. Limited your ability to climb up and down stairs?	1	2	3	4	5
4. Made standing when doing things more difficult?	1	2	3	4	5
5. Limited your balance when standing or walking?	1	2	3	4	5
6. Limited how far you are able to walk?	1	2	3	4	5
7. Increased the effort needed for you to walk?	1	2	3	4	5
8. Made it necessary for you to use support when walking indoors (eg holding on to furniture, using a stick, etc.)?	1	2	3	4	5
9. Made it necessary for you to use support when walking outdoors (eg using a stick, a frame, etc.)?	1	2	3	4	5
10. Slowed down your walking?	1	2	3	4	5
11. Affected how smoothly you walk?	1	2	3	4	5
12. Made you concentrate on your walking?	1	2	3	4	5

From the numbers you circle against these questions, your healthcare professional can calculate your MSWS-12 score. This is done by adding the numbers you have circled, giving a total out of 60, and then transforming this to a scale with a range from 0 to 100. Higher scores indicate a greater impact on walking than lower scores.

To be completed by the healthcare professional

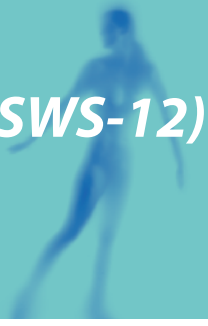
Total score _____ out of 60

Percentage _____ %



Twelve Item MS Walking Scale (MSWS-12)

Graph – Patient Progress Over Time



First Visit
Date:

Subject ID Number

Subject Initials

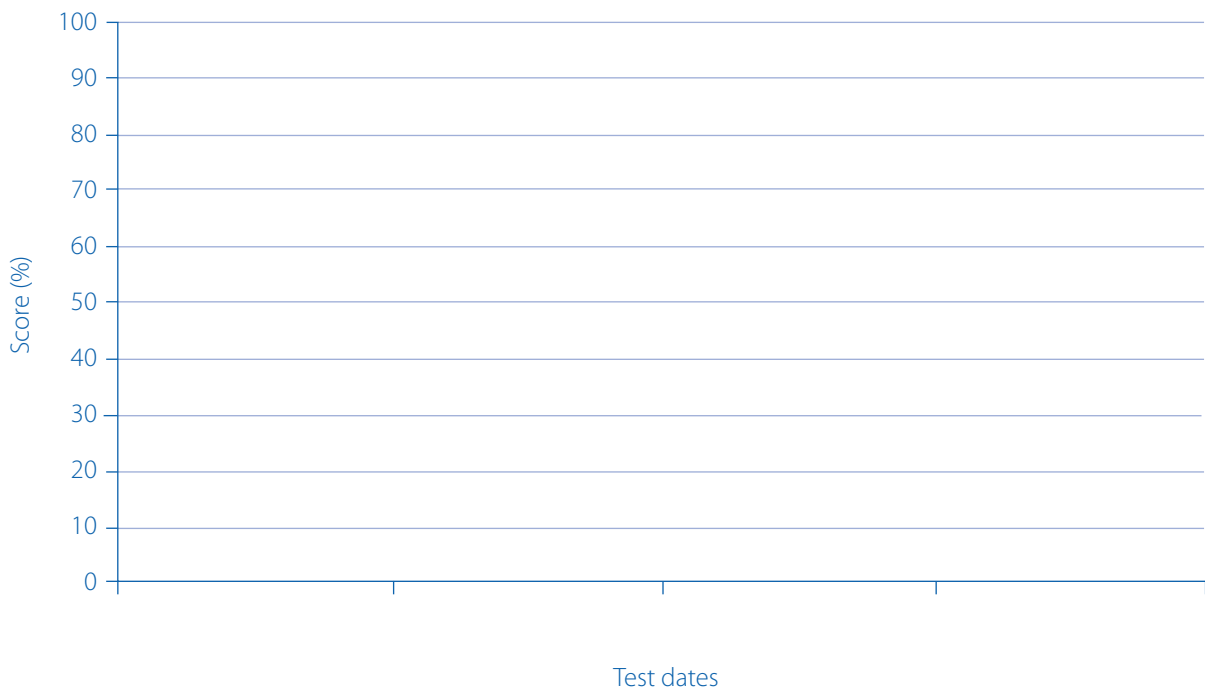
Day

Month

Year

Use the graphs below to plot the percentage score from the questionnaire at each visit. The higher the score/percentage, the greater the perceived impact MS is having on walking ability. A change will be indicated by a reduction or increase in the score over time.

Twelve Item MS Walking Scale



Modified Fatigue Impact Scale (MFIS)

Fatigue is a feeling of physical tiredness and lack of energy that many people experience from time to time. But people who have medical conditions like MS experience stronger feelings of fatigue more often and with greater impact than others.

Following is a list of statements that describe the effects of fatigue. Please read each statement carefully, the circle the one number that best indicates how often fatigue has affected you in this way during the past 4 weeks. (If you need help in marking your responses, tell the interviewer the number of the best response.) Please answer every question. If you are not sure which answer to select choose the one answer that comes closest to describing you. Ask the interviewer to explain any words or phrases that you do not understand.

Because of my fatigue during the past 4 weeks...

	Never	Rarely	Sometimes	Often	Almost Always
1. I have been less alert.	0	1	2	3	4
2. I have had difficulty paying attention for long periods of time.	0	1	2	3	4
3. I have been unable to think clearly.	0	1	2	3	4
4. I have been clumsy and uncoordinated.	0	1	2	3	4
5. I have been forgetful.	0	1	2	3	4
6. I have had to pace myself in my physical activities.	0	1	2	3	4
7. I have been less motivated to do anything that requires physical effort.	0	1	2	3	4
8. I have been less motivated to participate in social activities.	0	1	2	3	4
9. I have been limited in my ability to do things away from home.	0	1	2	3	4
10. I have trouble maintaining physical effort for long periods.	0	1	2	3	4
11. I have had difficulty making decisions.	0	1	2	3	4
12. I have been less motivated to do anything that requires thinking	0	1	2	3	4
13. My muscles have felt weak	0	1	2	3	4
14. I have been physically uncomfortable.	0	1	2	3	4
15. I have had trouble finishing tasks that require thinking.	0	1	2	3	4
16. I have had difficulty organizing my thoughts when doing things at home or at work.	0	1	2	3	4
17. I have been less able to complete tasks that require physical effort.	0	1	2	3	4

	Never	Rarely	Sometimes	Often	Almost Always
18. My thinking has been slowed down.	0	1	2	3	4
19. I have had trouble concentrating.	0	1	2	3	4
20. I have limited my physical activities.	0	1	2	3	4
21. I have needed to rest more often or for longer periods.	0	1	2	3	4

Instructions for Scoring the MFIS

Items on the MFIS can be aggregated into three subscales (physical, cognitive, and psychosocial), as well as into a total MFIS score. All items are scaled so that higher scores indicate a greater impact of fatigue on a person's activities.

Physical Subscale

This scale can range from 0 to 36. It is computed by adding raw scores on the following items: 4+6+7+10+13+14+17+20+21.

Cognitive Subscale

This scale can range from 0 to 40. It is computed by adding raw scores on the following items: 1+2+3+5+11+12+15+16+18+19.

Psychosocial Subscale

This scale can range from 0 to 8. It is computed by adding raw scores on the following items: 8+9.

Total MFIS Score

The total MFIS score can range from 0 to 84. It is computed by adding scores on the physical, cognitive, and psychosocial subscales.

The Dizziness Handicap Inventory (DHI)

P1. Does looking up increase your problem?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
E2. Because of your problem, do you feel frustrated?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F3. Because of your problem, do you restrict your travel for business or recreation?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
P4. Does walking down the aisle of a supermarket increase your problems?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F5. Because of your problem, do you have difficulty getting into or out of bed?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F6. Does your problem significantly restrict your participation in social activities, such as going out to dinner, going to the movies, dancing, or going to parties?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F7. Because of your problem, do you have difficulty reading?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
P8. Does performing more ambitious activities such as sports, dancing, household chores (sweeping or putting dishes away) increase your problems?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
E9. Because of your problem, are you afraid to leave your home without having someone accompany you?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
E10. Because of your problem have you been embarrassed in front of others?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
P11. Do quick movements of your head increase your problem?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F12. Because of your problem, do you avoid heights?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
P13. Does turning over in bed increase your problem?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F14. Because of your problem, is it difficult for you to do strenuous homework or yard work?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
E15. Because of your problem, are you afraid people may think you are intoxicated?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F16. Because of your problem, is it difficult for you to go for a walk by yourself?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
P17. Does walking down a sidewalk increase your problem?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
E18. Because of your problem, is it difficult for you to concentrate	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F19. Because of your problem, is it difficult for you to walk around your house in the dark?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No

E20. Because of your problem, are you afraid to stay home alone?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
E21. Because of your problem, do you feel handicapped?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
E22. Has the problem placed stress on your relationships with members of your family or friends?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
E23. Because of your problem, are you depressed?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
F24. Does your problem interfere with your job or household responsibilities?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No
P25. Does bending over increase your problem?	<input type="radio"/> Yes <input type="radio"/> Sometimes <input type="radio"/> No

Used with permission from GP Jacobson.

Jacobson GP, Newman CW: The development of the Dizziness Handicap Inventory. *Arch Otolaryngol Head Neck Surg* 1990;116: 424-427

DHI Scoring Instructions

The patient is asked to answer each question as it pertains to dizziness or unsteadiness problems, specifically considering their condition during the last month. Questions are designed to incorporate functional (F), physical (P), and emotional (E) impacts on disability.

To each item, the following scores can be assigned:

No=0 Sometimes=2 Yes=4

Scores:

Scores greater than 10 points should be referred to balance specialists for further evaluation.

16-34 Points (mild handicap)

36-52 Points (moderate handicap)

54+ Points (severe handicap)

Orpington Prognostic Score

Motor deficit in arm	Score
MRC Grade 5	0
MRC Grade 4	0.4
MRC Grade 3	0.8
MRC Grade 2	1.2
MRC Grade 1	1.6

Proprioception (eyes closed) - Locates affected thumb	Score
Accurately	0
Slight difficulty	0.4
Finds thumb via arm	0.8
Unable to find thumb	1.2

Balance	Score
Walks 10 feet without help	0
Maintains standing position	0.4
Maintains sitting position	0.8
No sitting balance	1.2

Cognition (Hodkinson's Mental Test)	Score
Mental Test Score 10	0
Mental Test Score 8-9	0.4
Mental Test Score 5-7	0.8
Mental Test Score 0-4	1.2

TOTAL SCORE = 1.6 + motor + proprioception + balance + cognition _____

Reference

Kalra L, Crome P. The role of prognostic scores in targeting stroke rehabilitation in elderly patients. [J Am Geriatr Soc 1993 Apr;41\(4\):396-400.](#)

Medical Research Council Grading for Power

Greatest power in the extensors of the affected limb	Score
Normal power	5
Diminished power	4
Movement against gravity	3
Movement with gravity eliminated	2
Flicker when attempting movement	1
No movement	0

Hodkinson's Mental Test Score

One point for each correct answer	Score
1. Age of the patient	1
2. Time (to nearest hour)	1
3. Address of the patient	1
4. Name of the hospital	1
5. Year	1
6. Date of birth of patient	1
7. Month	1
8. Years of First World War	1
9. Name of Monarch	1
10. Count backwards from 20 to 1	1
TOTAL SCORE	_____

N I H STROKE SCALE

Patient Identification. _____-_____-_____

Pt. Date of Birth ____/____/____

Hospital _____(____-____)

Date of Exam ____/____/____

Interval: Baseline 2 hours post treatment 24 hours post onset of symptoms ±20 minutes 7-10 days
 3 months Other _____(____)

Time: ____:____ []am []pm

Person Administering Scale _____

Administer stroke scale items in the order listed. Record performance in each category after each subscale exam. Do not go back and change scores. Follow directions provided for each exam technique. Scores should reflect what the patient does, not what the clinician thinks the patient can do. The clinician should record answers while administering the exam and work quickly. Except where indicated, the patient should not be coached (i.e., repeated requests to patient to make a special effort).

Instructions	Scale Definition	Score
<p>1a. Level of Consciousness: The investigator must choose a response if a full evaluation is prevented by such obstacles as an endotracheal tube, language barrier, orotracheal trauma/bandages. A 3 is scored only if the patient makes no movement (other than reflexive posturing) in response to noxious stimulation.</p>	<p>0 = Alert; keenly responsive. 1 = Not alert; but arousable by minor stimulation to obey, answer, or respond. 2 = Not alert; requires repeated stimulation to attend, or is obtunded and requires strong or painful stimulation to make movements (not stereotyped). 3 = Responds only with reflex motor or autonomic effects or totally unresponsive, flaccid, and areflexic.</p>	_____
<p>1b. LOC Questions: The patient is asked the month and his/her age. The answer must be correct - there is no partial credit for being close. Aphasic and stuporous patients who do not comprehend the questions will score 2. Patients unable to speak because of endotracheal intubation, orotracheal trauma, severe dysarthria from any cause, language barrier, or any other problem not secondary to aphasia are given a 1. It is important that only the initial answer be graded and that the examiner not "help" the patient with verbal or non-verbal cues.</p>	<p>0 = Answers both questions correctly. 1 = Answers one question correctly. 2 = Answers neither question correctly.</p>	_____
<p>1c. LOC Commands: The patient is asked to open and close the eyes and then to grip and release the non-paretic hand. Substitute another one step command if the hands cannot be used. Credit is given if an unequivocal attempt is made but not completed due to weakness. If the patient does not respond to command, the task should be demonstrated to him or her (pantomime), and the result scored (i.e., follows none, one or two commands). Patients with trauma, amputation, or other physical impediments should be given suitable one-step commands. Only the first attempt is scored.</p>	<p>0 = Performs both tasks correctly. 1 = Performs one task correctly. 2 = Performs neither task correctly.</p>	_____
<p>2. Best Gaze: Only horizontal eye movements will be tested. Voluntary or reflexive (oculocephalic) eye movements will be scored, but caloric testing is not done. If the patient has a conjugate deviation of the eyes that can be overcome by voluntary or reflexive activity, the score will be 1. If a patient has an isolated peripheral nerve paresis (CN III, IV or VI), score a 1. Gaze is testable in all aphasic patients. Patients with ocular trauma, bandages, pre-existing blindness, or other disorder of visual acuity or fields should be tested with reflexive movements, and a choice made by the investigator. Establishing eye contact and then moving about the patient from side to side will occasionally clarify the presence of a partial gaze palsy.</p>	<p>0 = Normal. 1 = Partial gaze palsy; gaze is abnormal in one or both eyes, but forced deviation or total gaze paresis is not present. 2 = Forced deviation, or total gaze paresis not overcome by the oculocephalic maneuver.</p>	_____

N I H STROKE SCALE

Patient Identification. _____-_____-_____

Pt. Date of Birth ____/____/____

Hospital _____(____-____)

Date of Exam ____/____/____

Interval: Baseline 2 hours post treatment 24 hours post onset of symptoms ±20 minutes 7-10 days
 3 months Other _____(____)

<p>3. Visual: Visual fields (upper and lower quadrants) are tested by confrontation, using finger counting or visual threat, as appropriate. Patients may be encouraged, but if they look at the side of the moving fingers appropriately, this can be scored as normal. If there is unilateral blindness or enucleation, visual fields in the remaining eye are scored. Score 1 only if a clear-cut asymmetry, including quadrantanopia, is found. If patient is blind from any cause, score 3. Double simultaneous stimulation is performed at this point. If there is extinction, patient receives a 1, and the results are used to respond to item 11.</p>	<p>0 = No visual loss. 1 = Partial hemianopia. 2 = Complete hemianopia. 3 = Bilateral hemianopia (blind including cortical blindness).</p>	<p>_____</p>
<p>4. Facial Palsy: Ask – or use pantomime to encourage – the patient to show teeth or raise eyebrows and close eyes. Score symmetry of grimace in response to noxious stimuli in the poorly responsive or non-comprehending patient. If facial trauma/bandages, orotracheal tube, tape or other physical barriers obscure the face, these should be removed to the extent possible.</p>	<p>0 = Normal symmetrical movements. 1 = Minor paralysis (flattened nasolabial fold, asymmetry on smiling). 2 = Partial paralysis (total or near-total paralysis of lower face). 3 = Complete paralysis of one or both sides (absence of facial movement in the upper and lower face).</p>	<p>_____</p>
<p>5. Motor Arm: The limb is placed in the appropriate position: extend the arms (palms down) 90 degrees (if sitting) or 45 degrees (if supine). Drift is scored if the arm falls before 10 seconds. The aphasic patient is encouraged using urgency in the voice and pantomime, but not noxious stimulation. Each limb is tested in turn, beginning with the non-paretic arm. Only in the case of amputation or joint fusion at the shoulder, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice.</p>	<p>0 = No drift; limb holds 90 (or 45) degrees for full 10 seconds. 1 = Drift; limb holds 90 (or 45) degrees, but drifts down before full 10 seconds; does not hit bed or other support. 2 = Some effort against gravity; limb cannot get to or maintain (if cued) 90 (or 45) degrees, drifts down to bed, but has some effort against gravity. 3 = No effort against gravity; limb falls. 4 = No movement. UN = Amputation or joint fusion, explain: _____</p> <p>5a. Left Arm</p> <p>5b. Right Arm</p>	<p>_____ _____</p>
<p>6. Motor Leg: The limb is placed in the appropriate position: hold the leg at 30 degrees (always tested supine). Drift is scored if the leg falls before 5 seconds. The aphasic patient is encouraged using urgency in the voice and pantomime, but not noxious stimulation. Each limb is tested in turn, beginning with the non-paretic leg. Only in the case of amputation or joint fusion at the hip, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice.</p>	<p>0 = No drift; leg holds 30-degree position for full 5 seconds. 1 = Drift; leg falls by the end of the 5-second period but does not hit bed. 2 = Some effort against gravity; leg falls to bed by 5 seconds, but has some effort against gravity. 3 = No effort against gravity; leg falls to bed immediately. 4 = No movement. UN = Amputation or joint fusion, explain: _____</p> <p>6a. Left Leg</p> <p>6b. Right Leg</p>	<p>_____</p>

N I H STROKE SCALE

Patient Identification. _____-_____-_____

Pt. Date of Birth ____/____/____

Hospital _____(____-____)

Date of Exam ____/____/____

Interval: Baseline 2 hours post treatment 24 hours post onset of symptoms ±20 minutes 7-10 days
 3 months Other _____(____)

<p>7. Limb Ataxia: This item is aimed at finding evidence of a unilateral cerebellar lesion. Test with eyes open. In case of visual defect, ensure testing is done in intact visual field. The finger-nose-finger and heel-shin tests are performed on both sides, and ataxia is scored only if present out of proportion to weakness. Ataxia is absent in the patient who cannot understand or is paralyzed. Only in the case of amputation or joint fusion, the examiner should record the score as untestable (UN), and clearly write the explanation for this choice. In case of blindness, test by having the patient touch nose from extended arm position.</p>	<p>0 = Absent.</p> <p>1 = Present in one limb.</p> <p>2 = Present in two limbs.</p> <p>UN = Amputation or joint fusion, explain: _____</p>	<p>_____</p>
<p>8. Sensory: Sensation or grimace to pinprick when tested, or withdrawal from noxious stimulus in the obtunded or aphasic patient. Only sensory loss attributed to stroke is scored as abnormal and the examiner should test as many body areas (arms [not hands], legs, trunk, face) as needed to accurately check for hemisensory loss. A score of 2, "severe or total sensory loss," should only be given when a severe or total loss of sensation can be clearly demonstrated. Stuporous and aphasic patients will, therefore, probably score 1 or 0. The patient with brainstem stroke who has bilateral loss of sensation is scored 2. If the patient does not respond and is quadriplegic, score 2. Patients in a coma (item 1a=3) are automatically given a 2 on this item.</p>	<p>0 = Normal; no sensory loss.</p> <p>1 = Mild-to-moderate sensory loss; patient feels pinprick is less sharp or is dull on the affected side; or there is a loss of superficial pain with pinprick, but patient is aware of being touched.</p> <p>2 = Severe to total sensory loss; patient is not aware of being touched in the face, arm, and leg.</p>	<p>_____</p>
<p>9. Best Language: A great deal of information about comprehension will be obtained during the preceding sections of the examination. For this scale item, the patient is asked to describe what is happening in the attached picture, to name the items on the attached naming sheet and to read from the attached list of sentences. Comprehension is judged from responses here, as well as to all of the commands in the preceding general neurological exam. If visual loss interferes with the tests, ask the patient to identify objects placed in the hand, repeat, and produce speech. The intubated patient should be asked to write. The patient in a coma (item 1a=3) will automatically score 3 on this item. The examiner must choose a score for the patient with stupor or limited cooperation, but a score of 3 should be used only if the patient is mute and follows no one-step commands.</p>	<p>0 = No aphasia; normal.</p> <p>1 = Mild-to-moderate aphasia; some obvious loss of fluency or facility of comprehension, without significant limitation on ideas expressed or form of expression. Reduction of speech and/or comprehension, however, makes conversation about provided materials difficult or impossible. For example, in conversation about provided materials, examiner can identify picture or naming card content from patient's response.</p> <p>2 = Severe aphasia; all communication is through fragmentary expression; great need for inference, questioning, and guessing by the listener. Range of information that can be exchanged is limited; listener carries burden of communication. Examiner cannot identify materials provided from patient response.</p> <p>3 = Mute, global aphasia; no usable speech or auditory comprehension.</p>	<p>_____</p>
<p>10. Dysarthria: If patient is thought to be normal, an adequate sample of speech must be obtained by asking patient to read or repeat words from the attached list. If the patient has severe aphasia, the clarity of articulation of spontaneous speech can be rated. Only if the patient is intubated or has other physical barriers to producing speech, the examiner should record the score as untestable (UN), and clearly write an explanation for this choice. Do not tell the patient why he or she is being tested.</p>	<p>0 = Normal.</p> <p>1 = Mild-to-moderate dysarthria; patient slurs at least some words and, at worst, can be understood with some difficulty.</p> <p>2 = Severe dysarthria; patient's speech is so slurred as to be unintelligible in the absence of or out of proportion to any dysphasia, or is mute/anarthric.</p> <p>UN = Intubated or other physical barrier, explain: _____</p>	<p>_____</p>

NIH STROKE SCALE

Patient Identification. ____-____-____

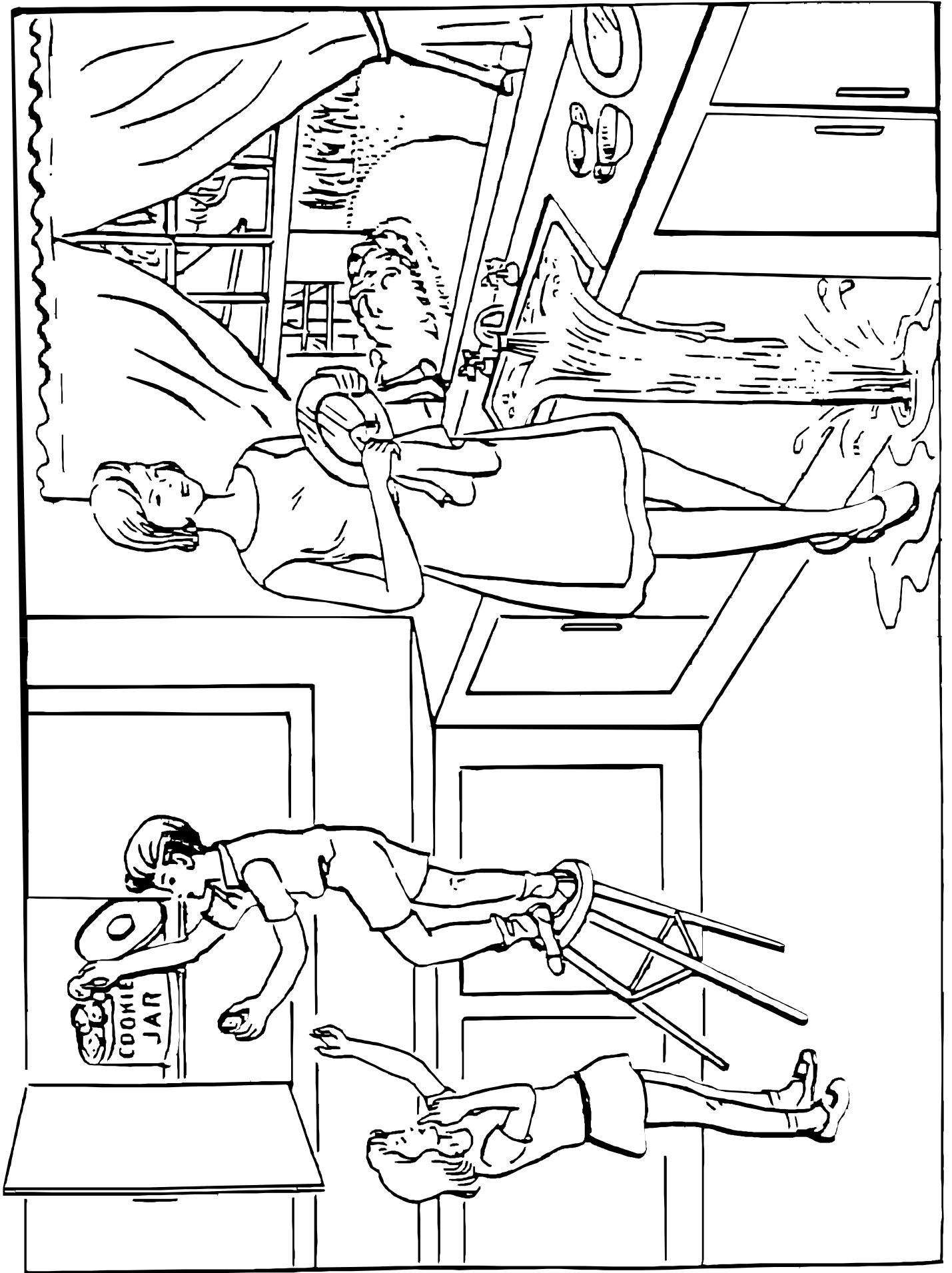
Pt. Date of Birth ____/____/____

Hospital _____(____-____)

Date of Exam ____/____/____

Interval: Baseline 2 hours post treatment 24 hours post onset of symptoms \pm 20 minutes 7-10 days
 3 months Other _____(____)

<p>11. Extinction and Inattention (formerly Neglect): Sufficient information to identify neglect may be obtained during the prior testing. If the patient has a severe visual loss preventing visual double simultaneous stimulation, and the cutaneous stimuli are normal, the score is normal. If the patient has aphasia but does appear to attend to both sides, the score is normal. The presence of visual spatial neglect or anosagnosia may also be taken as evidence of abnormality. Since the abnormality is scored only if present, the item is never untestable.</p>	<p>0 = No abnormality.</p> <p>1 = Visual, tactile, auditory, spatial, or personal inattention or extinction to bilateral simultaneous stimulation in one of the sensory modalities.</p> <p>2 = Profound hemi-inattention or extinction to more than one modality; does not recognize own hand or orients to only one side of space.</p>	<p>_____</p>
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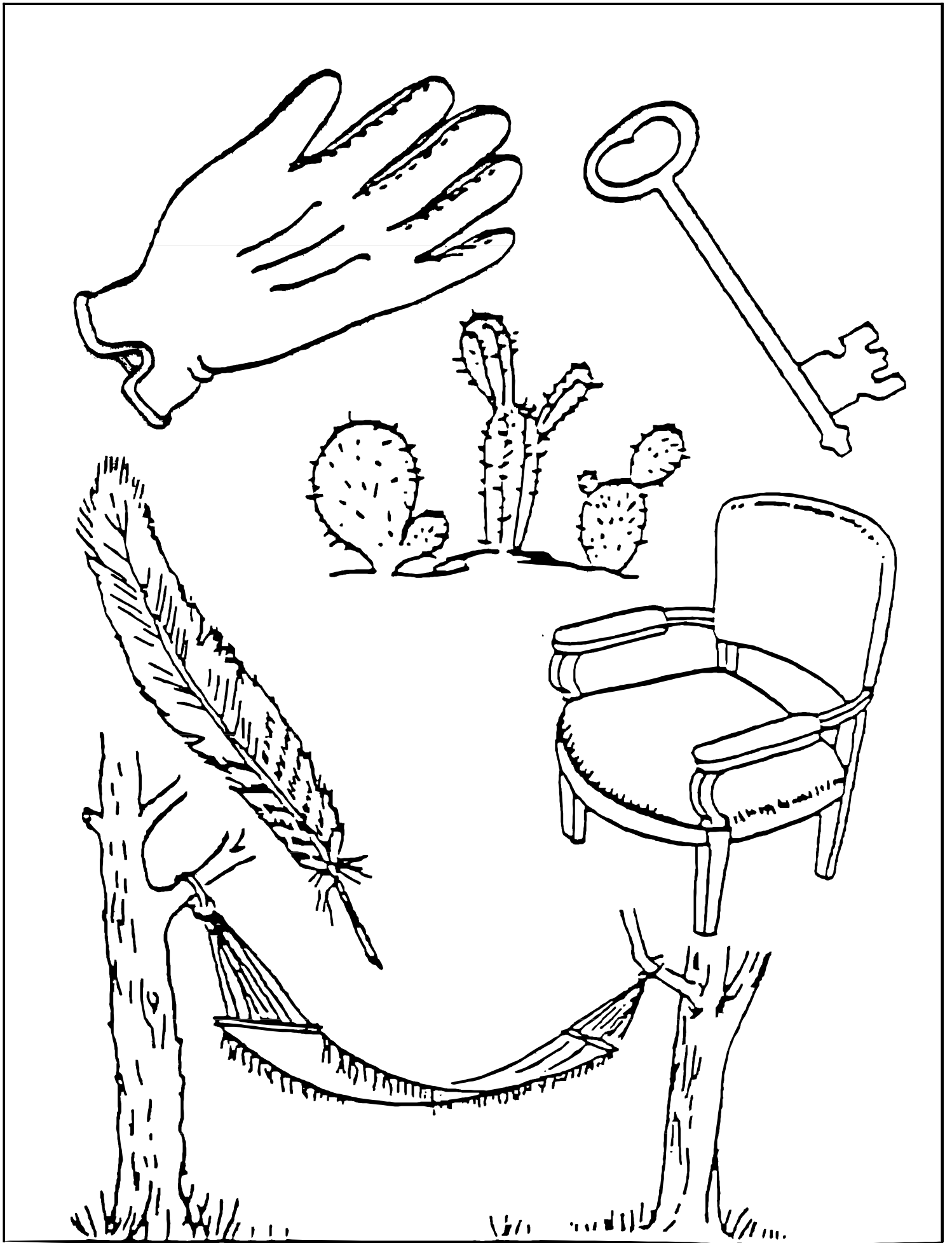
You know how.

Down to earth.

I got home from work.

**Near the table in the dining
room.**

**They heard him speak on the
radio last night.**



MAMA

TIP – TOP

FIFTY – FIFTY

THANKS

HUCKLEBERRY

BASEBALL PLAYER

Postural Assessment Scale for Stroke Patients (PASS) Scoring Form

Maintaining a Posture

Give the subject instructions for each item as written below. When scoring the item, record the lowest response category that applies for each item.

1. Sitting Without Support

Examiner: Have the subject sit on a bench/mat without back support and with feet flat on the floor.

- ___ (3) Can sit for 5 minutes without support
- ___ (2) Can sit for more than 10 seconds without support
- ___ (1) Can sit with slight support (for example, by 1 hand)
- ___ (0) Cannot sit

2. Standing With Support

Examiner: Have the subject stand, providing support as needed. Evaluate only the ability to stand with or without support. Do not consider the quality of the stance.

- ___ (3) Can stand with support of only 1 hand
- ___ (2) Can stand with moderate support of 1 person
- ___ (1) Can stand with strong support of 2 people
- ___ (0) Cannot stand, even with support

3. Standing Without Support

Examiner: Have the subject stand without support. Evaluate only the ability to stand with or without support. Do not consider the quality of the stance.

- ___ (3) Can stand without support for more than 1 minute and simultaneously perform arm movements at about shoulder level
- ___ (2) Can stand without support for 1 minute or stands slightly asymmetrically
- ___ (1) Can stand without support for 10 seconds or leans heavily on 1 leg
- ___ (0) Cannot stand without support

4. Standing on Nonparetic Leg

Examiner: Have the subject stand on the nonparetic leg. Evaluate only the ability to bear weight entirely on the nonparetic leg. Do not consider how the subject accomplishes the task.

- ___ (3) Can stand on nonparetic leg for more than 10 seconds
- ___ (2) Can stand on nonparetic leg for more than 5 seconds
- ___ (1) Can stand on nonparetic leg for a few seconds
- ___ (0) Cannot stand on nonparetic leg

5. Standing on Paretic Leg

Examiner: Have the subject stand on the paretic leg. Evaluate only the ability to bear weight entirely on the paretic leg. Do not consider how the subject accomplishes the task.

- ___ (3) Can stand on paretic leg for more than 10 seconds
- ___ (2) Can stand on paretic leg for more than 5 seconds
- ___ (1) Can stand on paretic leg for a few seconds
- ___ (0) Cannot stand on paretic leg

Maintaining Posture SUBTOTAL _____

Changing a Posture

6. Supine to Paretic Side Lateral

Examiner: Begin with the subject in supine on a treatment mat. Instruct the subject to roll to the paretic side (lateral movement). Assist as necessary. Evaluate the subject's performance on the amount of help required. Do not consider the quality of performance.

- ___ (3) Can perform without help
- ___ (2) Can perform with little help
- ___ (1) Can perform with much help
- ___ (0) Cannot perform

7. Supine to Nonparetic Side Lateral

Examiner: Begin with the subject in supine on a treatment mat. Instruct the subject to roll to the nonparetic side (lateral movement). Assist as necessary. Evaluate the subject's performance on the amount of help required. Do not consider the quality of performance.

- ___ (3) Can perform without help
- ___ (2) Can perform with little help
- ___ (1) Can perform with much help
- ___ (0) Cannot perform

8. Supine to Sitting Up on the Edge of the Mat

Examiner: Begin with the subject in supine on a treatment mat. Instruct the subject to come to sitting on the edge of the mat. Assist as necessary. Evaluate the subject's performance on the amount of help required. Do not consider the quality of performance.

- ___ (3) Can perform without help
- ___ (2) Can perform with little help
- ___ (1) Can perform with much help
- ___ (0) Cannot perform

9. Sitting on the Edge of the Mat to Supine

Examiner: Begin with the subject sitting on the edge of a treatment mat. Instruct the subject to return to supine. Assist as necessary. Evaluate the subject's performance on the amount of help required. Do not consider the quality of performance.

- ___ (3) Can perform without help
- ___ (2) Can perform with little help
- ___ (1) Can perform with much help
- ___ (0) Cannot perform

10. Sitting to Standing Up

Examiner: Begin with the subject sitting on the edge of a treatment mat. Instruct the subject to stand up without support. Assist if necessary. Evaluate the subject's performance on the amount of help required. Do not consider the quality of performance.

- ___ (3) Can perform without help
- ___ (2) Can perform with little help
- ___ (1) Can perform with much help
- ___ (0) Cannot perform

11. Standing Up to Sitting Down

Examiner: Begin with the subject standing by the edge of a treatment mat. Instruct the subject to sit on edge of mat without support. Assist if necessary. Evaluate the subject's performance on the amount of help required. Do not consider the quality of performance.

- ___ (3) Can perform without help
- ___ (2) Can perform with little help
- ___ (1) Can perform with much help
- ___ (0) Cannot perform

12. Standing, Picking Up a Pencil from the Floor

Examiner: Begin with the subject standing. Instruct the subject to pick up a pencil from the floor without support. Assist if necessary. Evaluate the subject's performance on the amount of help required. Do not consider the quality of performance.

- ___ (3) Can perform without help
- ___ (2) Can perform with little help
- ___ (1) Can perform with much help
- ___ (0) Cannot perform

Changing Posture SUBTOTAL _____

TOTAL _____

Appendix. *Stroke REhabilitation Assessment of Movement (STREAM)^a*

Assessment Dates (Y/M/D) Patient's Name: _____

1. Date of CVA: _____ Sex: M F Age: _____

2. Side of Lesion: L R Side of Hemiplegia: L R

3. Comorbid Conditions: _____

4. Type of aid(s) used: _____

Physiotherapist(s): _____

General Comments: _____

STREAM SCORING

I. VOLUNTARY MOVEMENT OF THE LIMBS

- 0 unable to perform the test movement through any appreciable range (includes flicker or slight movement)
- 1 a. able to perform only **part** of the movement, and with **marked deviation** from normal pattern
- b. able to perform only **part** of the movement, but in a manner that is **comparable to the unaffected side**
- c. able to **complete** the movement, but only with **marked deviation** from normal pattern
- 2 able to **complete** the movement in a manner that is **comparable to the unaffected side**
- X *activity not tested (specify why; ROM, Pain, Other (reason))*

II. BASIC MOBILITY

- 0 unable to perform the test activity through any appreciable range (ie, minimal active participation)
- 1 a. able to perform only **part** of the activity independently (requires partial assistance or stabilization to complete), with or without an aid, and with **marked deviation** from normal pattern
- b. able to perform only **part** of the activity independently (requires partial assistance or stabilization to complete), with or without an aid, but with a grossly **normal** movement pattern
- c. able to **complete** the activity independently, with or without an aid, but only with **marked deviation** from normal pattern
- 2 able to **complete** the activity independently with a grossly **normal** movement pattern, but **requires an aid**
- 3 able to **complete** the activity independently with a grossly **normal** movement pattern, **without an aid**
- X *activity not tested (specify why; ROM, Pain, Other (reason))*

AMPLITUDE OF ACTIVE MOVEMENT

		None	Partial	Complete
MOVEMENT QUALITY	Marked Deviation	0	1 a	1 c
	Grossly Normal	0	1 b	2 (3)

SCORE				
4	3	2	1	
				SUPINE
				1. PROTRACTS SCAPULA IN SUPINE /2 <i>"Lift your shoulder blade so that your hand moves towards the ceiling"</i> Note: therapist stabilizes arm with shoulder 90° flexed and elbow extended.
				2. EXTENDS ELBOW IN SUPINE (starting with elbow fully flexed) /2 <i>"Lift your hand towards the ceiling, straightening your elbow as much as you can"</i> Note: therapist stabilizes arm with shoulder 90° flexed; strong associated shoulder extension and/or abduction=marked deviation (score 1a or 1c).
				3. FLEXES HIP AND KNEE IN SUPINE (attains half crook lying) /2 <i>"Bend your hip and knee so that your foot rests flat on the bed"</i>
				4. ROLLS ONTO SIDE (starting from supine) /3 <i>"Roll onto your side"</i> Note: may roll onto <u>either</u> side; pulling with arms to turn over=aid (score 2).
				5. RAISES HIPS OFF BED IN CROOK LYING (BRIDGING) /3 <i>"Lift your hips as high as you can"</i> Note: therapist may stabilize foot, but if knee pushes strongly into extension with bridging=marked deviation (score 1a or 1c); if requires aid (external or from therapist) to maintain knees in midline=aid (score 2).
				6. MOVES FROM LYING SUPINE TO SITTING (with feet on the floor) /3 <i>"Sit up and place your feet on the floor"</i> Note: may sit up to <u>either</u> side using any functional and safe method; longer than 20 seconds=marked deviation (score 1a or 1c); pulling up using bedrail or edge of plinth=aid (score 2).
				SITTING (feet supported; hands resting on pillow on lap for items 7-14)
				7. SHRUGS SHOULDERS (SCAPULAR ELEVATION) /2 <i>"Shrug your shoulders as high as you can"</i> Note: both shoulders are shrugged simultaneously.
				8. RAISES HAND TO TOUCH TOP OF HEAD /2 <i>"Raise your hand to touch the top of your head"</i>
				9. PLACES HAND ON SACRUM /2 <i>"Reach behind your back and as far across toward the other side as you can"</i>
				10. RAISES ARM OVERHEAD TO FULLEST ELEVATION /2 <i>"Reach your hand as high as you can towards the ceiling"</i>

SCORE

4	3	2	1		
				/2	11. SUPINATES <u>AND</u> PRONATES FOREARM (elbow flexed at 90°) <i>"Keeping your elbow bent and close to your side, turn your forearm over so that your palm faces up, then turn your forearm over so that your palm faces down"</i> Note: movement in one direction only=partial movement (score 1a or 1b).
				/2	12. CLOSES HAND FROM FULLY OPENED POSITION <i>"Make a fist, keeping your thumb on the outside"</i> Note: must extend wrist slightly (ie, wrist cocked) to obtain full marks; full fist with lack of wrist extention=partial movement (score 1a or 1b).
				/2	13. OPENS HAND FROM FULLY CLOSED POSITION <i>"Now open your hand all the way"</i>
				/2	14. OPPOSES THUMB TO INDEX FINGER (tip to tip) <i>"Make a circle with your thumb and index finger"</i>
				/2	15. FLEXES HIP IN SITTING <i>"Lift your knee as high as you can"</i>
				/2	16. EXTENDS KNEE IN SITTING <i>"Straighten your knee by lifting your foot up"</i>
				/2	17. FLEXES KNEE IN SITTING <i>"Slide your foot back under you as far as you can"</i> Note: start with affected foot forward (heel in line with toes of other foot).
				/2	18. DORSIFLEXES ANKLE IN SITTING <i>"Keep your heel on the ground and lift your toes off the floor as far as you can"</i> Note: affected foot is placed slightly forward (heel in line with toes of other foot).
				/2	19. PLANTAR FLEXES ANKLE IN SITTING <i>"Keep your toes on the ground and lift your heel off the floor as far as you can"</i>
				/2	20. EXTENDS KNEE <u>AND</u> DORSIFLEXES ANKLE IN SITTING <i>"Straighten your knee and bring your toes towards you"</i> Note: extension of knee without dorsiflexion of ankle=partial movement (score 1a or 1b).
				/3	21. RISES TO STANDING FROM SITTING <i>"Stand up; try to take equal weight on both legs"</i> Note: pushing up with hand(s) to stand=aid (score 2); asymmetry such as trunk lean, Trendelenburg position, hip retraction, or excessive flexion or extension of the affected knee = marked deviation (score 1a or 1c).

SCORE					
4	3	2	1		
				/3	STANDING 22. MAINTAINS STANDING FOR 20 COUNTS <i>"Stand on the spot while I count to twenty"</i>
				/2	STANDING (holding onto a stable support to assist balance for items 23-25) 23. ABDUCTS AFFECTED HIP WITH KNEE EXTENDED <i>"Keep your knee straight and your hips level, and raise your leg to the side"</i>
				/2	24. FLEXES AFFECTED KNEE WITH HIP EXTENDED <i>"Keep your hip straight, bend your knee back and bring your heel towards your bottom"</i>
				/2	25. DORSIFLEXES AFFECTED ANKLE WITH KNEE EXTENDED <i>"Keep your heel on the ground and lift your toes off the floor as far as you can"</i> Note: affected foot is placed slightly forward in position of a small step (heel in line with toes of other foot).
				/3	STANDING AND WALKING ACTIVITIES 26. PLACES AFFECTED FOOT ONTO FIRST STEP (or stool 18=cm high) <i>"Lift your foot and place it onto the first step (or stool) in front of you"</i> Note: returning the foot to the ground is not scored; use of handrail =aid (score 2).
				/3	27. TAKES 3 STEPS <u>BACKWARDS</u> (one and a half gait cycles) <i>"Take three average sized steps backwards, placing one foot behind the other"</i>
				/3	28. TAKES 3 STEPS <u>SIDWAYS TO AFFECTED SIDE</u> <i>"Take three average sized steps sideways towards your weak side"</i>
				/3	29. WALKS <u>10 METERS</u> INDOORS (on smooth, obstacle-free surface) <i>"Walk in a straight line over to ... (a specified point 10 meters away) "</i> Note: orthotic=aid (score 2); longer than 20 seconds =marked deviation (score 1c).
				/3	30. WALKS <u>DOWN 3 STAIRS ALTERNATING FEET</u> <i>"Walk down three stairs; place only one foot at a time on each step if you can"</i> Note: handrail=aid (score 2); non-alternating feet=marked deviation (score 1a or 1c).

"The STREAM scoring form and criteria are presented verbatim. CVA=cerebrovascular accident, ROM=range of motion.

Stroke Impact Scale

VERSION 3.0

The purpose of this questionnaire is to evaluate how stroke has impacted your health and life. We want to know from **YOUR POINT OF VIEW** how stroke has affected you. We will ask you questions about impairments and disabilities caused by your stroke, as well as how stroke has affected your quality of life. Finally, we will ask you to rate how much you think you have recovered from your stroke.

Stroke Impact Scale

These questions are about the physical problems which may have occurred as a result of your stroke.

1. In the past week, how would you rate the strength of your....	A lot of strength	Quite a bit of strength	Some strength	A little strength	No strength at all
a. Arm that was <u>most affected</u> by your stroke?	5	4	3	2	1
b. Grip of your hand that was <u>most affected</u> by your stroke?	5	4	3	2	1
c. Leg that was <u>most affected</u> by your stroke?	5	4	3	2	1
d. Foot/ankle that was <u>most affected</u> by your stroke?	5	4	3	2	1

These questions are about your memory and thinking.

2. In the past week, how difficult was it for you to...	Not difficult at all	A little difficult	Somewhat difficult	Very difficult	Extremely difficult
a. Remember things that people just told you?	5	4	3	2	1
b. Remember things that happened the day before?	5	4	3	2	1
c. Remember to do things (e.g. keep scheduled appointments or take medication)?	5	4	3	2	1
d. Remember the day of the week?	5	4	3	2	1
e. Concentrate?	5	4	3	2	1
f. Think quickly?	5	4	3	2	1
g. Solve everyday problems?	5	4	3	2	1

These questions are about how you feel, about changes in your mood and about your ability to control your emotions since your stroke.

3. In the past week, how often did you...	None of the time	A little of the time	Some of the time	Most of the time	All of the time
a. Feel sad?	5	4	3	2	1
b. Feel that there is nobody you are close to?	5	4	3	2	1
c. Feel that you are a burden to others?	5	4	3	2	1
d. Feel that you have nothing to look forward to?	5	4	3	2	1
e. Blame yourself for mistakes that you made?	5	4	3	2	1
f. Enjoy things as much as ever?	5	4	3	2	1
g. Feel quite nervous?	5	4	3	2	1
h. Feel that life is worth living?	5	4	3	2	1
i. Smile and laugh at least once a day?	5	4	3	2	1

The following questions are about your ability to communicate with other people, as well as your ability to understand what you read and what you hear in a conversation.

4. In the past week, how difficult was it to...	Not difficult at all	A little difficult	Somewhat difficult	Very difficult	Extremely difficult
a. Say the name of someone who was in front of you?	5	4	3	2	1
b. Understand what was being said to you in a conversation?	5	4	3	2	1
c. Reply to questions?	5	4	3	2	1
d. Correctly name objects?	5	4	3	2	1
e. Participate in a conversation with a group of people?	5	4	3	2	1
f. Have a conversation on the telephone?	5	4	3	2	1
g. Call another person on the telephone, including selecting the correct phone number and dialing?	5	4	3	2	1

**The following questions ask about activities you might do
during a typical day.**

5. In the past 2 weeks, how difficult was it to...	Not difficult at all	A little difficult	Somewhat difficult	Very difficult	Could not do at all
a. Cut your food with a knife and fork?	5	4	3	2	1
b. Dress the top part of your body?	5	4	3	2	1
c. Bathe yourself?	5	4	3	2	1
d. Clip your toenails?	5	4	3	2	1
e. Get to the toilet on time?	5	4	3	2	1
f. Control your bladder (not have an accident)?	5	4	3	2	1
g. Control your bowels (not have an accident)?	5	4	3	2	1
h. Do light household tasks/chores (e.g. dust, make a bed, take out garbage, do the dishes)?	5	4	3	2	1
i. Go shopping?	5	4	3	2	1
j. Do heavy household chores (e.g. vacuum, laundry or yard work)?	5	4	3	2	1

**The following questions are about your ability to be mobile,
at home and in the community.**

6. In the past 2 weeks, how difficult was it to...	Not difficult at all	A little difficult	Somewhat difficult	Very difficult	Could not do at all
a. Stay sitting without losing your balance?	5	4	3	2	1
b. Stay standing without losing your balance?	5	4	3	2	1
c. Walk without losing your balance?	5	4	3	2	1
d. Move from a bed to a chair?	5	4	3	2	1
e. Walk one block?	5	4	3	2	1
f. Walk fast?	5	4	3	2	1
g. Climb one flight of stairs?	5	4	3	2	1
h. Climb several flights of stairs?	5	4	3	2	1
i. Get in and out of a car?	5	4	3	2	1

**The following questions are about your ability to use your hand that was
MOST AFFECTED by your stroke.**

7. In the past 2 weeks, how difficult was it to use your hand that was most affected by your stroke to...	Not difficult at all	A little difficult	Somewhat difficult	Very difficult	Could not do at all
a. Carry heavy objects (e.g. bag of groceries)?	5	4	3	2	1
b. Turn a doorknob?	5	4	3	2	1
c. Open a can or jar?	5	4	3	2	1
d. Tie a shoe lace?	5	4	3	2	1
e. Pick up a dime?	5	4	3	2	1

The following questions are about how stroke has affected your ability to participate in the activities that you usually do, things that are meaningful to you and help you to find purpose in life.

8. During the past 4 weeks, how much of the time have you been limited in...	None of the time	A little of the time	Some of the time	Most of the time	All of the time
a. Your work (paid, voluntary or other)	5	4	3	2	1
b. Your social activities?	5	4	3	2	1
c. Quiet recreation (crafts, reading)?	5	4	3	2	1
d. Active recreation (sports, outings, travel)?	5	4	3	2	1
e. Your role as a family member and/or friend?	5	4	3	2	1
f. Your participation in spiritual or religious activities?	5	4	3	2	1
g. Your ability to control your life as you wish?	5	4	3	2	1
h. Your ability to help others?	5	4	3	2	1

9. Stroke Recovery

On a scale of 0 to 100, with 100 representing full recovery and 0 representing no recovery, how much have you recovered from your stroke?

_____ 100 Full Recovery

—
_____ 90

—
_____ 80

—
_____ 70

—
_____ 60

—
_____ 50

—
_____ 40

—
_____ 30

—
_____ 20

—
_____ 10

_____ 0 No Recovery

Item Clarifications

1. If patient says “I don’t have an affected side”, then instruct them to score using their perceived weaker side. If they still insist there is no affected, or weaker, side instruct them to score using their dominant side.
4. If patient says s/he does not do any or all of the items listed, code item(s) as *Extremely Difficult*.
 - (Item f) If patient does not call but is handed the phone this is OK.
 - (Item g) If patient cannot hold a phone book, if they can read it this is OK. This item addresses whether the patient is able to initiate a phone call, look up the number, and dial this number correctly.
5. If patient says s/he does not do any or all of the items listed, code item(s) as *Cannot do at all*.
 - (Item a) If person is on pureed food, even if they feel they could cut the food, code as *Cannot do at All (1/5/98)*
 - (Item c) Bathing oneself does not include getting into the tub.
 - (Item e) This question is associated with movement. Does the person have the physical ability to get to the bathroom quickly enough?
 - (Item f) Losing a little urine/dribbling is considered an accident.
 - If person has intermittent catheter and is having no leaking problems code them as per report. (1/5/98)
 - If person has an in-dwelling Foley catheter, code as *Cannot do at all. (1/5/98)*
 - (Item g) Constipation is not counted here, person has to have an accident.
 - (Item i) “Shopping” means any type of shopping and does not include driving.
6. If patient hasn’t done any of the items in the past two weeks code as *Cannot do at all*.
 - (Item h) If patient hasn’t “climbed several flights of stairs” in two weeks, they may be prompted by saying “have you gone up and down one flight of stairs a couple of times in a row.” If they still say they have not done it then they must be coded as *Cannot do at all*.
 - (Item i) If the patient wants to know what kind of car say “your car” or “the car you ride in most.”
7. If patient says “I don’t have an affected side”, then instruct them to score using their perceived weaker side. If they still insist there is no affected, or weaker, side instruct them to score using their dominant side.
 - (Item a) If the patient says s/he has not been to the grocery store say “have you carried anything heavy with that hand.”
 - (Item d) This item is to tie a shoelace/bow using both hands.
8. If patient does not do any of the specific items (and has never done), code interference as *None of the time*.

Scale for the assessment and rating of ataxia (SARA)

<p>1) Gait</p> <p>Proband is asked (1) to walk at a safe distance parallel to a wall including a half-turn (turn around to face the opposite direction of gait) and (2) to walk in tandem (heels to toes) without support.</p> <ul style="list-style-type: none"> 0 Normal, no difficulties in walking, turning and walking tandem (up to one misstep allowed) 1 Slight difficulties, only visible when walking 10 consecutive steps in tandem 2 Clearly abnormal, tandem walking >10 steps not possible 3 Considerable staggering, difficulties in half-turn, but without support 4 Marked staggering, intermittent support of the wall required 5 Severe staggering, permanent support of one stick or light support by one arm required 6 Walking > 10 m only with strong support (two special sticks or stroller or accompanying person) 7 Walking < 10 m only with strong support (two special sticks or stroller or accompanying person) 8 Unable to walk, even supported 	<p>2) Stance</p> <p>Proband is asked to stand (1) in natural position, (2) with feet together in parallel (big toes touching each other) and (3) in tandem (both feet on one line, no space between heel and toe). Proband does not wear shoes, eyes are open. For each condition, three trials are allowed. Best trial is rated.</p> <ul style="list-style-type: none"> 0 Normal, able to stand in tandem for > 10 s 1 Able to stand with feet together without sway, but not in tandem for > 10s 2 Able to stand with feet together for > 10 s, but only with sway 3 Able to stand for > 10 s without support in natural position, but not with feet together 4 Able to stand for >10 s in natural position only with intermittent support 5 Able to stand >10 s in natural position only with constant support of one arm 6 Unable to stand for >10 s even with constant support of one arm 				
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<p>3) Sitting</p> <p>Proband is asked to sit on an examination bed without support of feet, eyes open and arms outstretched to the front.</p> <ul style="list-style-type: none"> 0 Normal, no difficulties sitting >10 sec 1 Slight difficulties, intermittent sway 2 Constant sway, but able to sit > 10 s without support 3 Able to sit for > 10 s only with intermittent support 4 Unable to sit for >10 s without continuous support 	<p>4) Speech disturbance</p> <p>Speech is assessed during normal conversation.</p> <ul style="list-style-type: none"> 0 Normal 1 Suggestion of speech disturbance 2 Impaired speech, but easy to understand 3 Occasional words difficult to understand 4 Many words difficult to understand 5 Only single words understandable 6 Speech unintelligible / anarthria 				
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Score</td> <td style="width: 50%;"></td> </tr> </table>	Score		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Score</td> <td style="width: 50%;"></td> </tr> </table>	Score	
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<p>5) Finger chase</p> <p>Rated separately for each side Proband sits comfortably. If necessary, support of feet and trunk is allowed. Examiner sits in front of proband and performs 5 consecutive sudden and fast pointing movements in unpredictable directions in a frontal plane, at about 50 % of proband's reach. Movements have an amplitude of 30 cm and a frequency of 1 movement every 2 s. Proband is asked to follow the movements with his index finger, as fast and precisely as possible. Average performance of last 3 movements is rated.</p> <p>0 No dysmetria 1 Dysmetria, under/ overshooting target <5 cm 2 Dysmetria, under/ overshooting target < 15 cm 3 Dysmetria, under/ overshooting target > 15 cm 4 Unable to perform 5 pointing movements</p>			<p>6) Nose-finger test</p> <p>Rated separately for each side Proband sits comfortably. If necessary, support of feet and trunk is allowed. Proband is asked to point repeatedly with his index finger from his nose to examiner's finger which is in front of the proband at about 90 % of proband's reach. Movements are performed at moderate speed. Average performance of movements is rated according to the amplitude of the kinetic tremor.</p> <p>0 No tremor 1 Tremor with an amplitude < 2 cm 2 Tremor with an amplitude < 5 cm 3 Tremor with an amplitude > 5 cm 4 Unable to perform 5 pointing movements</p>		
Score	Right	Left	Score	Right	Left
mean of both sides (R+L)/2			mean of both sides (R+L)/2		
<p>7) Fast alternating hand movements</p> <p>Rated separately for each side Proband sits comfortably. If necessary, support of feet and trunk is allowed. Proband is asked to perform 10 cycles of repetitive alternation of pro- and supinations of the hand on his/her thigh as fast and as precise as possible. Movement is demonstrated by examiner at a speed of approx. 10 cycles within 7 s. Exact times for movement execution have to be taken.</p> <p>0 Normal, no irregularities (performs <10s) 1 Slightly irregular (performs <10s) 2 Clearly irregular, single movements difficult to distinguish or relevant interruptions, but performs <10s 3 Very irregular, single movements difficult to distinguish or relevant interruptions, performs >10s 4 Unable to complete 10 cycles</p>			<p>8) Heel-shin slide</p> <p>Rated separately for each side Proband lies on examination bed, without sight of his legs. Proband is asked to lift one leg, point with the heel to the opposite knee, slide down along the shin to the ankle, and lay the leg back on the examination bed. The task is performed 3 times. Slide-down movements should be performed within 1 s. If proband slides down without contact to shin in all three trials, rate 4.</p> <p>0 Normal 1 Slightly abnormal, contact to shin maintained 2 Clearly abnormal, goes off shin up to 3 times during 3 cycles 3 Severely abnormal, goes off shin 4 or more times during 3 cycles 4 Unable to perform the task</p>		
Score	Right	Left	Score	Right	Left
mean of both sides (R+L)/2			mean of both sides (R+L) / 2		