• Stroke

• Umphred
  Chapter 11

• RISK FACTORS

**Controllable:**
• HTN
• A-Fib
• Hyperlipidemia
• DM
• Atherosclerosis
• Circulation Problems
• Tobacco Use/Smoking
• Alcohol Use
• Physical Inactivity
• Obesity

**Uncontrollable:**
• Age
• Gender
• Race
• Family Hx
• Previous Stroke/TIA
• Fibromuscular Dysplasia
• Patent Foramen Ovale (PFO)

• Smoking
• 443,000 deaths, or nearly 1 in 5 deaths/yr
• > deaths than HIV, illegal drug use, alcohol use, MVA, suicides, & murders combined.\(^{2,4}\)
• 90% of lung CA deaths in men & 80% in women
• 90% of deaths from chronic obstructive lung disease
• [http://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/effects_cig_smoking/](http://www.cdc.gov/tobacco/data_statistics/fact_sheets/health_effects/effects_cig_smoking/)

• Side Effects of Smoking
• Cancers
• Lung diseases
• Heart disease
• CV diseases
• Stroke
• Osteoporosis & weakened bones
• Circulatory problems
• Ulcers
• Premature aging

• Damage to the fetus
• Low sperm count and impotence
• Erectile dysfunction
• Spontaneous abortion (miscarriage)
• Decreased lung function
• Bronchitis
• Infections
• COPD

• Types of Stroke
• Ischemic
• Lacunar & TIA
• More common
• Loss of blood supply to the brain
• Develops from a blockage of 1 or > arteries
• Causes:
  o atherosclerosis
  o embolus

• Hemorrhagic
• No energy storage in the brain so the brain is very dependent on blood supply for nutrition, O^2, etc.

• Ischemic
  o Ischemic necrosis within minutes
  o Cell damage is irreversible
  o Surrounding the area of necrosis is area where blood supply is diminished but not completely interrupted
    o diminished function but can return to normal if blood supply is restored quickly
    o if not then area of necrosis and damage will spread
  o Immediate medical attention is imperative

• Lacunar
  o Small strokes deep inside the brain
  o Name for their crescent shaped appearance
  o Common in the putamen, basal ganglia, thalamus, internal/external capsule
  o Damage depends on location and severity
• Transient Ischemic Attack
  • Temporary interruption in blood supply
  • Sudden onset of CVA-like symptoms
    ○ extremity weakness
    ○ sensory and motor deficits
    ○ decreased functional ability
• May vary in duration
• Most symptoms resolve in 1 hour
• Full recovery within 24 hours
• Practice stroke—high risk for a real CVA

• Hemorrhagic Stroke
• AKA – Aneurysm
• Lost circulation & blood leakage
• Increased ICP
• Leaked blood irritates adjacent tissues
• Chemical composition of blood is noxious to brain tissue

• Confounding Problems
• Focus
  ○ Medical care
  ○ Rehabilitation of impairments & functional limitations
• Extensive PMH:
  ○ HTN
  ○ CAD
  ○ MI
  ○ CABG
  ○ PVD
  ○ Musculoskeletal problems
  ○ Amputations
- DM
- COPD (O² supplementation?)
- Obesity
- Psychosocial issues

- Confounding Problems
- PT/PTA to monitor the cardiovascular status
- Important to know PLOF
- D/C disposition?

- Impairments & Functional Limitations
- Motor planning and apraxia
- Praxis is the performance of intentional actions or skills
- Apraxia acquired impairments in purposeful movement
- Appears from an inability to mentally formulate a plan of action for a motor task
- Several kinds

- Types of Apraxia
- Ideational
  - failure to think of an action either spontaneously or to command
- Ideomotor
  - pt may know and remember the planned action but cannot execute it with either hand
- Kinetic limb
  - clumsiness and maladroitness in performance of a skilled act that cannot be accounted for by paresis, ataxia, or sensory loss
- Facial-oral
  - unable to carry out facial movements to command
- Motor impersistence
  - inability to sustain a physical action, i.e. cannot close eyes, stick out tongue, or raise uninvolved UE

- Diminished Cardiopulmonary Capacity
- Impaired fitness from prior & immobility
• In IRF only 13% of pt’s day is spent moving
• Need to incorporate movement throughout the day
• Must also be aware of BP, HR, O₂

• Impaired vestibular sensation
• Normal vestibular sensation of head mvmt & positioning to COG interrupted
• Pt may experience:
  • Vertigo – illusion of movement
  • Nystagmus – involuntary back/forth of eyes
  • Disequilibrium – sense of imbalance
  • Ataxia – incoordination of mvmt
  • Nausea

• Impaired strength/Motor control
• 89% admitted have weakness
• Amt of weakness depends on severity & location
• Hemiparesis- weakness on one side
• Hemiplegia- one side weakness with loss of sensation
• Contralateral or ipsilateral weakness
• <15% will have full return of motor function

• Shoulder pain after a stroke
• 34%-84% have shoulder pain
• Development of muscle imbalance
• Adhesive capsulitis with inflammation
• Joint subluxation
• Inflammation-irritation or tears of rot. Cuff
• Poor handling of shoulder
  ◦ moving pt up in bed
  ◦ Dressing
  ◦ transfers
• Slings support but restrict mvmt
• Normalize tone in shoulder

• Balance Deficits
• ↑ risk of fall
• Great need to regain balance
• 5% have Pusher syndrome
  ○ push towards hemi side with no compensation
• Be creative enough to figure out to train balance in the most normal yet entertaining ways possible
• Balance training should be graded from low to higher challenge

• Pusher Syndrome
• Misinterpretation of sensory and proprioception information
• Inaccurate midline

• Cognitive Impairment
  • Damage to the way the brain receives and processes information
  • Apraxia, anosognoisa and communication disorders
  • Perceptual difficulties
  • Unilateral Neglect (Neglect is strongly associated with poor outcome)
  • >R CVAs
  • May involve memory from R brain
  • Reintegrate L with R side > functional motor pattern
  • Issues with mvmt, transfers, dressing, watching TV

• Techniques to work with neglect
• Medications (neurotransmitters)
• Feedback – auditory, visual, tactile
• Activate mvmt of hemi limb
• Constraint induce therapy (CI)
• Optokinetic stimulation
• Vibration to posterior neck muscles
• Passive trunk rotation

• Anosognoisa
• Denial of ones own neurological symptoms such as weakness, functional limitations
• Poor insight into deficits
• Persistent
• Blaming others
• Include neglect, apraxia, anosognoisa
• 28%-85% in those who have R CVA
• 0%-17% for those with L CVA
• Symptoms usually resolve after 12-22 weeks but it is considered a poor prognostic indicator for functional recovery
• Communication Disorders
  • Dysphasia
    • communication disorder, may be receptive, expressive, or global
  • Receptive
    • Wernicke’s area – L cortex, comprehension of language
  • Expressive
    • Broca’s area – motor speech, L cortex
  • Global aphasia = both
  • Nonverbal communication
    • R hemisphere
• Other communication disorders
  • Anomia
    ◦ naming and word finding impairment
  • Dysarthria
    ◦ impaired articulation weakness of face/oral-facial M
  • Dyslexia or alexia
    ◦ impaired reading comprehension
  • Dysgraphia or agraphia
    ◦ impaired communication through writing
  • Paraphasia
    ◦ inappropriate substitution of words when speaking
• Affective Disorders
  • Mood or emotional component of behaviors
  • Sadness, denial, passivity, agitation, mood swings, indifference, unable to control impulsive or socially inappropriate behaviors
  • Loss of inhibitions = disinhibition
  • May touch or talk inappropriately
  • May need comprehensive behavioral shaping program—all team members participate
• Dysphagia
• Disorder of swallowing
• May be from incoordination or weak oral, pharyngeal, laryngeal, or esophageal muscles
• Diet restrictions
  - Thickened Liquids
  - NPO
• PTA must watch out for this as the pt may ask for water
• Impaired Somatosensation
• Impaired sensation from body to brain
• Can affect safety
• Unable to sense pain and withdraw from harm
• Impair coordination, balance
• Cause ataxia
• Learned non-use – when absence of sensation from limb contributes to relying on the good side and ignoring the bad until the brain basically forgets the involved side
• Rx---strong stim/facilitation of involved side
• Impaired vision
• Damage to vision ctrs or brain tissue near transmission pathways
• Homonymous Hemianopia
  - lost vision in the R or L half of the visual field
• Different from neglect but may happen together
• Vision stabilizer M in the brain stem
  - Blurred or diplopia
• Functional limitations
• Severity of loss of function
  - severity of the damage
  - Location
  - previous impairments
• Motor function, control & planning may be altered or disrupted
• Wide variety of therapeutic modalities, tasks, and techniques
• Symptoms vary for each pt
• Plasticity
• The expectation of recovery is what drives rehabilitation
• Hemispheric Dominance
• Left
• Processing verbally coded info
• Sequencing
• Written/spoken language
• Analytical
• Logical
• Rational
• Math calculations
• Positive emotions
• Right
• Nonverbal processing
• Artistic abilities
• Hand eye coordination
• Spatial relationships
• Kinesthetic awareness
• Music
• Nonverbal communication
• Math reasoning
• Negative emotions
• Body image
• Frontal Lobe
• Function
• Voluntary Mvmt
• Broca’s area
• Intellect
• Orientation
• Personality
• Judgment
• Reasoning
• Impairment
• Contralateral weakness
• Perseveration
• Personality changes
• Impaired concentration
• Expressive aphasia
• Emotional lability
• Parietal lobe
• Function
• Sensation
• Receives hearing, vision, motor, sensory & memory info
• Interprets language
• Spatial/visual perception
• Provides meaning for objects
• Impairment
• Dominant hemisphere (L)
  • Agraphia, alexia, agnosia
• Non-Dominant hemisphere
○ Dressing apraxia
○ constructional apraxia
○ Anosognosia
  • Contralateral sensory
  • Impaired language
  • Impaired taste

• Temporal Lobe
• Function
• Auditory processing
• Wernicke’s area
• Interpreting other’s emotions & reactions
• Impairments
• Learning deficits
• Receptive aphasia
• Antisocial/aggressive behavior
• facial recognition
• memory
• Inability to categorize objects
• Occipital Lobe
• Function
• Visual processing
• Judgment of distance
• 3D
• Impairments
• Homonymous hemianopsia
• Color recognition
• vision
• reading/writing
• Cortical blindness with B lobes
• Anterior Cerebral Artery
• Incontinence
• Frontal lobe symptoms
• B occlusion causes paraplegia
• MCA
• Wernicke’s or Broca’s aphasia
• Contralateral Hemiplegia
• Contralateral sensory
• PCA
• Thalamic pain syndrome
Abnormal sensation of pain, temp, touch & proprioception

- Cortical blindness
- Vertebral-basilar artery
- Locked-in syndrome
- Coma
- Vegetative state
- Left Hemisphere
- R weakness
- ↑frustration
- ↓processing
- Aphasia
- Dysphagia
- Motor apraxia (ideomotor/ideational)
- ↓ L/R discrimination
- R hemianopsia
- Right hemisphere
- L weakness
- ↓ attention span
- L Hemianopsia
- ↓ awareness/judgment
- Memory deficits
- L inattention
- ↓ abstract reasoning
- Emotional lability
- Impulsivity
- ↓ spatial orientation
- Brainstem
- Unstable vital signs
- ↓ consciousness
- ↓ swallow
- B weakness
- Cerebellum
- ↓ balance
- Ataxia
- ↓ coordination
- Nausea
- ↓ postural adjustment
- Nystagmus
- UE Synergy
- Flexor
  - Elevation, retraction
  - ABD, ER
- Flex
- Sup
- Flex
- Flex, ADD
- Flex, ADD

- Extensor
- Depression, protraction
- IR, ADD
- Ext
- Pron
- Ext
- Flex, ADD
- Flex, ADD
- LE Synergy
- Flexor
- ABD, ER
- Flex
- DF & sup
- Ext

- Extensor
- Ext, IR, ADD
- Ext
- PF & INV
- Flex, ADD
- Brunnstrom Stages
  - No volitional movement initiated
  - Appearance of synergies & spasticity
• Synergies performed voluntarily & spasticity ↑
• Spasticity ↓, mvmt not dictated solely by synergies
• Independence from synergies
• Isolatedjt mvmts with coordination
• Normal function

• Brunnstrom examples
  • Stage 2- involuntary mvmts
    ◦ Pt yawns LE synergy
  • Stage 3- voluntary mvmts
    ◦ Ask for df & hip and knee flex
  • Stage 4- knee flex, pt can df/pf
  • Stage 5- knee ext, pt can df/pf
  • Stage 6- alt df/pf
  • Examination tools
  • Barthel Index
  • Fugl-Meyer Assessment
    ◦ http://pt.usc.edu/uploadedFiles/1_Public_Site/1_Subject_Pages/1d_Research_and_Labs/1dg_Clinical_Trials/LEAPS%20Fugl-Meyer%20Instructions.pdf
  • FIM
  • Assessments
  • Strength vs. spasticity
  • Measure strength functionally
  • Flexibility
  • Generational expectations
  • Functional limitations

• Balance Measures
  • Collect data about balance to determine Rx
  • Timed up and go (TUG)
  • Berg Balance Scale
  • Functional Reach Test
  • Single leg stance
  • Balance in sitting, standing & walking
  • Valid & Reliable
• Endurance

• Exercise capacity is very limited
• 1 month s/p stroke the exercise capacity $\downarrow 60\%$
• Be cautious of reps, sets, weight, number of transfers, rest times...
• Measure HR, BP, and $O^2$ sat
• Amb distance is great goal & functional.

• Interventions

• Coordination of services
  • Physiatrist, PT, OT, SP, RN, neuropsychologist
• Share information
• Rx/instruction/training should be pt & caregiver specific
• Use the WHOLE bag of tools!

• Strategies for Therapeutic Exercise

• Interpret POC and apply it to individual’s needs
• Fell chart 11-1 pg186
• Need to rigorously collect data
• Rx implemented with individualized context

• Interventions for Aerobic Training
• NMES
• Consider early on for weak muscles
• Consider developmental progression
  • Therapeutic Functional Progression Chart
• Task specific Rx with Task analysis
• The pt needs success
• Interventions for Motor Learning

• Practice strategies
• Attention
• Feedback
• Environmental progression
• Factors relating to the movement or task
  • Amplitude- amt of mvt
○ Velocity of mvmt – slow to fast
○ Amt of work – ↑ frequency, intensity, duration
○ Patient’s capacity - what can THIS pt do
○ Progression – may be based on area of the body—distal vs. proximal

• Additional Interventions
• BWSTT
• Wt reduced reciprocal motion devices (Light Gait)
• Constraint-induced mvmt therapy (CIMT)

• Conclusion

• Reduce confusion
• Improve motivation
• Encourage consistency of performance
• Moderate level of arousal to optimize learning
• Provide ↑ levels of SPV early
• Progress may be slower with cognitive impairments
• Improve attention
• Improve problem-solving ability
• Encourage declarative as well as procedural learning