The Nervous System
diseases and injuries

Brain Injuries
- Causes of damage
  - displacement or distortion of tissue at impact
  - increased intracranial pressure
  - infections
  - free radical damage after ischemia

Traumatic Brain Injuries
- Concussion—temporary loss of consciousness
  - headache, drowsiness, confusion, lack of concentration
  - Slight brain injury
  - No permanent brain damage
- Contusion—
  - bruising of brain (less than 5 min unconsciousness but blood in CSF)
  - Nervous tissue destruction occurs
  - Nervous tissue does not regenerate
- Laceration—tearing of brain (fracture or bullet)
  - increased intracranial pressure from hematoma
- Cerebral edema
  - Swelling from the inflammatory response
  - May compress and kill brain tissue

Cerebrovascular Accident (CVA)
- Third leading cause of death after heart attacks and cancer
- 2 types of strokes
  - ischemic due to decreased blood flow
  - hemorrhagic due to rupture of blood vessel
- Risk factors
  - high blood pressure, high cholesterol, heart disease, diabetes, smoking, obesity, alcohol
- Tissue plasminogen activator (t-PA) used within 3 hours of onset will decrease permanent disability of an ischemic attack

Transient Ischemic Attack (TIA)
- Episode of temporary cerebral dysfunction
- Cause
  - impaired blood flow to the brain
- Symptoms
  - dizziness, slurred speech, numbness, paralysis on one side, double vision
  - reach maximum intensity almost immediately
  - persists for 5-10 minutes & leaves no deficits
- Treatment is aspirin or anticoagulants; artery bypass grafting or carotid endarterectomy

Epilepsy
- The second most common neurological disorder
  - affects 1% of population
  - Characterized by short, recurrent attacks initiated by electrical discharges in the brain
• lights, noise, or smells may be sensed
• skeletal muscles may contract involuntarily
• loss of consciousness
• Epilepsy has many causes, including;
  • brain damage at birth, metabolic disturbances, infections, toxins, drug interactions, vascular disturbances, head injuries, and tumors

7  ■ **Aphasia**
  • Language areas are located in the left cerebral hemisphere of most people
  • Inability to use or comprehend words = aphasia
    • nonfluent aphasia = inability to properly form words
      ▪ know what want to say but can not speak
      ▪ damage to Broca’s speech area
    • fluent aphasia = faulty understanding of spoken or written words
      ▪ faulty understanding of spoken or written words
      ▪ word deafness = an inability to understand spoken words
      ▪ word blindness = an inability to understand written words
    • damage to common integrative area or auditory association area

8  ■ **Alzheimer Disease (AD)**
  • Dementia = loss of reasoning, ability to read, write, talk, eat & walk
  • Afflicts 11% of population over 65
  • Loss of neurons that release acetylcholine
  • Plaques of abnormal proteins outside neurons
  • Tangled protein filaments within neurons
  • Risk factors -- head injury, heredity
  • Beneficial effects of estrogen, vitamin E, ibuproofen & ginko biloba

9  ■ **Multiple Sclerosis (MS)**
  • Autoimmune disorder causing destruction of myelin sheaths in CNS
    • sheaths becomes scars or plaques
    • 1/2 million people in the United States
    • appears between ages 20 and 40
    • females twice as often as males
  • Symptoms include muscular weakness, abnormal sensations or double vision
  • Remissions & relapses result in progressive, cumulative loss of function

10 ■ **Parkinson’s disease**
  • a degenerative disorder of the central nervous system. It results from the death of dopamine-containing cells.
  • the most obvious symptoms are movement-related, including shaking, rigidity slowness of movement and difficulty with walking and gait.

11 ■ **Aging & the Nervous System**
  • Years 1 to 2
    • rapid increase in size due to increase in size of neurons, growth of neuroglia, myelination & development of dendritic branches
  • Early adulthood until death
    • brain weight declines until only 93% by age 80
    • number of synaptic contacts declines
- processing of information diminishes
- conduction velocity decreases
- voluntary motor movements slow down
- reflexes slow down

**Regeneration & Repair**

- Plasticity maintained throughout life
  - sprouting of new dendrites
  - synthesis of new proteins
  - changes in synaptic contacts with other neurons
- Limited ability for regeneration (repair)
  - PNS can repair damaged dendrites or axons
    - If myelin sheath remains intact regrowth of axons is possible.
  - CNS no repairs are possible
    - Nature of myelin sheath prevents regrowth of axons

**Repair within the PNS**

- Axons & dendrites may be repaired if
  - neuron cell body remains intact
  - schwann cells remain active and form a tube
  - scar tissue does not form too rapidly