The Nervous System

- The nervous system controls virtually all of our body activities including reflex, voluntary and involuntary activities.
- Voluntary activities are action that we consciously perform (e.g., passing a dish).
- _____________ activities are actions that are not under our control (e.g., body functions).
- Body functions are controlled by the _____________ nervous system.

Nervous System

- 2 Anatomical Parts of the Nervous System:
  - 1. ________________ Nervous System: Nervous system that is covered and protected by bones.
  - 2. ________________ Nervous System: Cable of nerve fibers that link the CNS to the various organs of the body.

Central Nervous System

- Components of the Central Nervous System (CNS):
  - 1. The ________________
  - 2. The spinal ________________.

The Brain

- The Brain is the controlling ________________ of the body.
- Cerebrum: Largest area of the brain.
- Divided into 4 lobes: frontal, parietal, temporal, and occipital.
- One side controls activities of the ________________ side of the body.
- Controls ________________ functions: senses, motor activities, reasoning, memory and emotions.

The Brain

- ________________ "Little Brain"
- Controls posture, ________________, and coordination of skilled movements.
- Brain Stem
- Most ________________ part of the CNS
- Controls functions necessary for life:
  - respirations, digestion, etc.

The Spinal Cord

- Located in spinal ________________ created by the vertebrae of the spine.
- Transmits message between the ________________ and the body.

Protective Coverings of the Nervous System

- 3 Layers of Meninges:
  - 1. ________________ Mater: outer layer, tough & fibrous
  - 2. ________________ : middle layer.
3. Pia Mater: inner layer
• ______________ Fluid:
• Between arachnoid and pia mater
• Brain and spinal cord float in CSF
• Clear and watery

10 Protective Coverings

11 Cerebrospinal Fluid
• Produced in a chamber inside the brain called the third ______________
• Approximately 125 to 150 mL of CSF in the brain at one time
• Primarily acts as a ______________ absorber

12 Peripheral Nervous System
• PNS Consists of:
• 12 pair of ______________ nerves that serves the face and head
• 31 pair of ______________ nerves that connect the organs and muscles to the spinal cord
• Sensory nerves: senses of the body
• ______________ nerves: causes muscles to contract
• Connecting nerves: connects sensory and motor nerves

13 Functional Divisions of the Nervous System
• Somatic Nervous System
  • ______________ functions
• Autonomic Nervous System
  • ______________ functions

14 Divisions of the Autonomic Nervous System
• ______________ Nervous System
• ______________ Nervous System

15 Sympathetic Nervous System
• Body's response to stress and prepares body for threatening situations
• Called “Fight or ______________ ” phenomenon
• Blood vessels ______________ , heart rate rises, sweating occurs, pupils dilate

16 Parasympathetic Nervous System
• Non life threatening functions of the body
  • “______________ keeping functions”
  • ______________ heart and respiratory rate

17 Activities of the Nervous Systems
• Voluntary activity
  • requires ______________ effort
• Involuntary activity
  • requires no ______________ effort
Reflex activity

- impulse sent _______________________ from the sensory nerve to the motor nerve.

18 Sensory and Connecting Nerves

- The connecting nerves in the spinal cord form a reflex _______________________ .
- If a sensory nerve in this arc detects an irritating stimulus, it will bypass the brain and send a direct message to a _______________________ nerve.

19 The Skull (1 of 2)

- Composed of two groups of bones: the _______________________ , which protects the brain, and the _______________________ bones

20 The Skull (2 of 2)

- Cranium is composed of ______% brain tissue, ______% blood supply, and ______% CSF
- Four major bones make up the cranium: occiput, temples, parietal regions, and frontal region
- _________________ is composed of 14 bones

21 The Spinal Column

- Body’s central supporting structure
- Has _______ bones called vertebrae
- Divided into five sections:
  - ______________________
  - Thoracic
  - Lumbar
  - _________________
  - Coccygeal

22 Spinal Column

23 Head Injuries

- Traumatic insult to the head that may result in injury to _______________________ tissue, bony structures, or the brain
- 52,000 deaths occur annually in the United States as the result of severe head injury.
- Account for more than _______________________ of all traumatic deaths

24 Types of Head Injuries

- _______________________ lacerations
- Skull fractures
- _______________________ injuries
- _______________________ conditions
- Complications of head injuries

25 Scalp Lacerations

- Scalp has a rich blood supply and can lead to _______________________ shock.
- There may be more serious, deeper injuries.
• Severe lacerations can lead to _______________________ injury
• Fold skin flaps back down onto scalp.
• Control bleeding by _______________________ pressure.

26 Scalp De-Gloving

27 Skull Fractures
• Indicates significant force
• Signs include:
  • Obvious _______________________
  • Visible crack in the skull
  • _______________________ eyes
  • _______________________ sign

28 Raccoon Eyes

29 Battle Signs

30 Linear Skull Fracture
• Most _______________________ skull fx
• Often shows no _______________________ signs

31 Compressed Skull Fracture
• High _______________________ impact
• Most commonly on the frontal and parietal bones
• _______________________ may be driven into brain

32 Basilar Skull Fracture
• High-energy trauma
• Usually following _______________________ impact to the head
• Signs include _______________________ drainage from the ears, raccoon eyes, and Battle’s sign

33 Open Skull Fracture
• Result when _______________________ forces are applied to the head
• Often associated with trauma to _______________________ body systems
• Brain tissue may be _______________________ to the environment

34 Traumatic Brain Injury (1 of 3)
• Most _______________________ of all head injuries
• Two broad categories: _______________________ (direct) injury and secondary (indirect) injury
• Primary brain injury results instantaneously from impact to the head.
• Secondary brain injury _______________________ the severity of the primary injury.

35 Traumatic Brain Injury (2 of 3)
• Secondary injury may be caused by:
  • _______________________
  • Hypotension
• Cerebral edema
• Intracranial hemorrhage
• Increased __________________ pressure
• Cerebral ischemia
• __________________________

36 Traumatic Brain Injury (3 of 3)
• The brain can be injured directly by a penetrating object or indirectly as a result of external forces.
• A __________________ -countercoup injury can result from striking a windshield.
  • Initial impact injures ______________________ part of brain
  • Head falling back against headrest injures ______________________ part of brain

37 Intracranial Pressure (ICP)
• Accumulations of blood within the skull or swelling of the brain can rapidly lead to an ____________________ in ICP.
• Increased ICP squeezes the ______________________ against bony prominences within the cranium
• Since the skull is rigid the brain is ______________________

38 Intracranial Bleeding
• Laceration or rupture of blood vessel in brain
  • ______________________ hematoma: Accumulation of blood between the skull and dura mater
  • ______________________ hematoma: Accumulation of blood beneath the dura mater but outside the brain
  • ______________________ hematoma: Bleeding within the brain tissue itself

39 Intracranial Bleeding
• Laceration or __________________ of blood vessel in brain
  • Subdural
  • Intracerebral
  • Epidural

40 Concussion (1 of 2)
• Brain can sustain __________________ when skull is struck
• There will be bleeding and __________________ .
• Bleeding will increase the __________________ within the skull.

41 Concussion (2 of 2)
• __________________ loss or alteration in brain function
• May result in unconsciousness, confusion, or __________________
• About ________% of patients do not experience a loss of consciousness

42 S/S of Concussion
• ____________________________

...
- Weakness
- Visual changes
- Nausea and vomiting
- Delay of motor functions
- Inappropriate emotional responses

43 **Other Brain Injuries**
- Brain injuries are not always caused by trauma.
- ________________ conditions may cause spontaneous bleeding in the brain.
- Signs and symptoms of nontraumatic injuries are the same as those of traumatic injuries.
  - There is no ________________ of injury.

44 **Complications of Head Injury**
- Cerebral ________________
- Convulsions and ________________
- Vomiting
- ________________ of cerebrospinal fluid

45 **Assessing Head Injuries**
- Common causes:
  - Motor vehicle crashes
  - ________________ blows
  - Falls from heights
  - ________________
  - Sports Injuries
- Evaluate and monitor level of ________________

46 **Types of Head Injuries**
- Closed:
  - Skull is ________________
  - Major concern is ________________
- Open:
  - Skull is penetrated or fractured
  - Causes less swelling
  - Causes massive damage to ________________ tissue

47 **Signs and Symptoms (1 of 4)**
- Lacerations, contusions, hematomas to scalp
- Soft areas or ________________ upon palpation
- Visible skull fractures or deformities
- ________________ around eyes and behind the ear
- Clear or pink CSF leakage

48 **Signs and Symptoms (2 of 4)**
• Failure of pupils to respond to ______________________
• Unequal pupils
• Loss of _______________________ and/or motor function
• Period of unconsciousness
• ______________________
• Seizures

49 Signs and Symptoms (3 of 4)
• _______________________ or tingling in the extremities
• Irregular respirations
• Dizziness
• _______________________ complaints
• Combative or abnormal behavior
• _______________________ or vomiting

50 Signs and Symptoms (4 of 4)
• Vital Signs of a closed head injury (_______________________ triad):
  • ________________ BP
  • ________________ Pulse
  • ________________ respirations
• An isolated head injury will NOT produce S/S of hypovolemic shock. If S/S of hypovolemic shock exists, look elsewhere!

51 Level of Consciousness
• Change in level of consciousness is the single most ______________________ observation.
• Use the ________________ scale or Glasgow Coma Scale (depending on local protocols)
• Reassess
  • Every 15 minutes if patient is stable.
  • Every 5 minutes if patient is ______________________.

52 Change in Pupil Size
• _______________________ pupil size may indicate increased pressure on one side of the brain.

53 Care of Head Injuries (1 of 2)
• Establish an adequate airway. Use jaw thrust maneuver
• Do not _______________________ the patient
• Provide high concentration of oxygen
• Control bleeding not ______________________
• Assess the patient’s ________________ level of consciousness.

54 Care of Head Injuries (2 of 2)
• Be prepared for ______________________
• Control cervical spine
• Move patient as little as possible
• If patient is ________________ , contact Paramedic backup to sedate the patient (if allowed)
• Rapid ________________

55 Spine Injuries

• ________________ injuries occur from a fall.
• Motor vehicle crashes or other types of trauma can overextend, flex, or rotate the spine.
• ________________ : When spine is pulled along its length; causes injuries.
  • Hangings are an example.

56 Significant Mechanisms of Injury (MOI)

• Motor vehicle ________________
• Pedestrian-motor vehicle collisions
• ________________
• Blunt or penetrating trauma
• Motorcycle crashes
• ________________
• Diving accidents
• Recreational accidents

57 Questions to Ask Responsive Patients

• Does your neck or ________________ hurt?
• What happened?
• ________________ does it hurt?
• Can you move your hands and feet?
• Can you feel me touching your ________________ ? Your toes?

58 Signs and Symptoms of Spinal Injury

• Pain or tenderness of spine
• ________________ of spine
• Tingling in the extremities
• Loss of sensation or ________________
• Incontinence
• Injuries to the head
• ________________ in males

59 Location of Spinal Injuries

• Paralysis around ________________ level and below indicates injury at C5-C6 area (Quadraplegia)
• Paralysis around ________________ and below indicate injury at the L1 area (Paraplegia)

60 Care of Spinal Injuries

• Follow BSI precautions.
• Manage the ________________ .
- Perform the jaw-thrust maneuver to open the airway.
- Consider inserting an _______________________ airway.
- Administer oxygen.
- _______________________ the cervical spine.

61 When to Immobilize??
- The most important indicator of a possible spinal injury is the _______________________.
- If the MOI is _______________________ of causing a spinal injury, immobilize the patient.
- When in doubt……??????

62 Applying a Cervical Collar (1 of 2)
- One EMT-B provides continuous manual _______________________ support of the head.
- Measure the _______________________ size collar.

63 Applying a Cervical Collar (2 of 2)
- Place the chin support snugly under the chin.
- _______________________ the collar around the neck.
- Ensure that the collar _______________________.

64 Stabilization of the Cervical Spine (1 of 2)
- Hold head firmly with both hands.
- _______________________ the lower jaw.
- Move to eye-_____________________ position.
- Support head while partner places cervical collar.
- Maintain the position until patient is secured to a _______________________.

65 Stabilization of the Cervical Spine (2 of 2)
- Do not _______________________ the head into a neutral, in-line position if:
  - Muscles _______________________.
  - Pain increases
  - Numbness, tingling, or weakness develop
  - There is a _______________________ airway or breathing

66 Preparation for Transport: Supine Patients (1 of 2)
- Maintain in-line stabilization.
- Have the other team members _______________________ the immobilization device.
- _______________________ roll patient.

67 Preparation for Transport: Supine Patients (2 of 2)
- _______________________ patient to backboard.
- _______________________ pulse, motor, and sensory function in each extremity and continue to do so periodically.
68 Preparation for Transport: Sitting Patients (1 of 2)
- Maintain manual in-line stabilization.
- Apply a _______________________ collar.
- Place a short board behind patient.
- Position device _______________________ patient.

69 Preparation for Transport: Sitting Patients (2 of 2)
- Turn patient and _______________________ to long backboard.
- Secure short and long backboards _______________________ .
- Reassess the pulse, motor function, and _______________________ .

70 Preparation for Transport: Standing Patients
- _______________________ the head and neck and apply a c-collar.
- Position board _______________________ patient.
- Carefully lower the patient to the ground.

71 Backboards
- _______________________ backboards
  - Used on patients found in a sitting position
- _______________________ backboards
  - Provide full-body immobilization

72 Helmet Removal (1 of 4)
- Is the airway clear and is the patient _______________________ adequately?
- Can airway be maintained and ventilations assisted with helmet in place?
- How well does the helmet _______________________ ?
- Can the patient move _______________________ the helmet?
- Can the spine be immobilized in a neutral position with the helmet on?

73 Helmet Removal (2 of 4)
- A helmet that fits well _______________________ the head from moving and should be left on, as long as:
  - There are no impending airway or breathing problems
  - It does not _______________________ with assessment and treatment of the airway
  - You can properly _______________________ the spine

74 Helmet Removal (3 of 4)
- _______________________ the face shield.
- Prevent head _______________________ .
- Partner places hands.
- Gently slip helmet off _______________________ .

75 Helmet Removal (4 of 4)
- Partner slides hands from _______________________ to back of head.
- Remove helmet.
• Stabilize spine.
• Apply cervical collar.
• ______________________ as needed.
• Transport ______________________ and safety devices

76 Pediatric Needs
• Immobilize a child in the ______________________ seat, if possible.
• Children may need extra ______________________ to maintain immobilization.
• C-collar not ______________________ with small children