**Brain & Spinal Cord Injuries**

**Brain Anatomy**

**Brain Hemispheres**
The Brain is divided into two halves working together to command feelings, thoughts, and behaviors.

**Left Hemisphere Controls**
- Movement of Right Side of Body
- Reasoning
- Speaking
- Writing
- Number Skills

**Right Hemisphere Controls**
- Movement of Left Side of Body
- Insight
- Imagination
- Music/Art Skills
- Awareness of Three Dimensions
Brain Anatomy

Brain Lobes and Functions
Each hemisphere of the brain is divided into smaller sections called LOBES. Each LOBE is responsible for specific kinds of activity. Plus the base of the brain consists of two additional parts, the Cerebellum and the Brain Stem. Notice that the Cerebellum resides underneath the lobes. The Brain Stem connects the spinal cord to the rest of the brain.

- **Parietal Lobe**
  - Movement
  - Sensation
  - Thought
  - Reasoning
  - Behavior
  - Memory

- **Occipital Lobe**
  - Vision
  - Hearing
  - Emotion
  - Behavior
  - Memory

- **Temporal Lobe**
  - Smell
  - Hearing

- **Cerebellum**
  - Coordination
  - Balance

- **Brain Stem**
  - Breathing
  - Heart Rate

**Cerebellum**: resides underneath the lobes and is important for coordination and timing.

**Brain Stem**: connects the spinal cord to the rest of the brain and controls functions like breathing, blood pressure, and arousal (ability to respond to senses).
Spinal Cord Anatomy

The nervous system includes the BRAIN, SPINAL CORD, and NERVES. The spinal cord is a long column of nerves, and like the brain, is the consistency of a ripe banana. The spinal cord is much like a highway system: the nerves are like lanes of traffic and there are millions of lanes of traffic on the spinal cord. The brain sends and receives messages by way of the spinal cord and nerves (just like cars traveling north and south on a highway). The main messages are MOTOR and SENSORY. MOTOR messages help you do things like move your arms/legs, dance and balance. SENSORY messages help you feel things like pain, pressure, differentiate between hot and cold or rough and smooth. When someone sustains a spinal cord injury, it is like a wreck on the highway that closes down the system.

The spinal cord is surrounded by rings of bone called VERTEBRAE. Vertebrae are grouped into four sections along the spine.
Spinal Cord Anatomy

Cervical Section

7 Vertebrae

8 Pairs of Nerves

Nerves exiting from the cervical section control:

- Neck
- Face
- Diaphragm
  (Muscles Controlling Breathing)
- Elbows
- Wrists
- Fingers

An injury at the cervical level may also impact function to the nerves that exit below on the spinal column. An injury at the cervical level may also impact function in the chest and abdomen, the hips, knees, legs and bowel and bladder control. The higher the injury on the spinal column, the more severe the impact for the patient.

Thoracic Section

12 vertebrae

12 pairs of nerves

Nerves exiting for the thoracic section control:

- Chest
- Abdomen
- Back Muscles

An injury at the thoracic level may also impact function to the nerves that exit below on the spinal column. An injury at the thoracic level may also impact function in the hips, knees, legs and bowel and bladder control.
Spinal Cord Anatomy

Lumbar Section

5 vertebrae
5 pairs of nerves

Nerves exiting from the lumbar section control:

- Hips
- Knees
- Feet (movement upward)
- Toes

An injury at the lumbar level may also impact function to the nerves that exit below on the spinal column. An injury at the lumbar level may also impact function in the feet and bowel and bladder control.

Sacral Section

5 fused vertebrae
5 pairs of nerves

Nerves exiting from the sacral section control:

- Feet (movement downward)
- Bowel and bladder control
Task 1: Know Your Spine

1. What three parts of the body comprise the nervous system?

2. The brain sends and receives two kinds of messages. Describe what each kind of message helps the body to do:
   A. Motor messages:
   
   B. Sensory messages:

3. The spinal cord is like a highway system. It carries the messages to and from the __________. Its consistency is mushy like a __________.

4. Nerves within the spinal cord are much like traffic lanes on a highway. How many of these “traffic lanes” exist within the spinal cord? __________

5. The messages carried by the nerves are like __________ traveling north and south along the highway.

6. A spinal cord __________ is much like a car wreck on the highway because it
7. **The rings of bone that surround the spinal cord are called** ..........................................

On the left side of the chart below, label the four sections of the spinal cord, number the *vertebrae* within each section. On the right side of the diagram, list the main body parts affected by spinal cord injury within that section.
Task 2: Know Your Brain

1. The brain is divided into two halves. What is each half called and what general functions does each control?

2. Each brain is divided further into smaller sections called **lobes**. Label each lobe in the brain illustration below. Beside the illustration, describe the primary function of each lobe.

3. Where is the **cerebellum**, and what function does it perform?

4. Where is the **brain stem**, and what does it control?
**Spinal Cord and Brain Anatomy Terms**

**Magic Square**

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>E</td>
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<td>N</td>
<td>O</td>
<td>P</td>
</tr>
</tbody>
</table>

**Directions:** Match the word to its definition by placing the correct number of the definition in the square with the letter that represents the term it defines. When the magic square is correctly completed, each row, column, and diagonal will add to the number 34.

### Medical Terms

<table>
<thead>
<tr>
<th></th>
<th>Medical Terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Brain Stem</td>
</tr>
<tr>
<td>B</td>
<td>Nervous System</td>
</tr>
<tr>
<td>C</td>
<td>Cerebellum</td>
</tr>
<tr>
<td>D</td>
<td>Cervical Section</td>
</tr>
<tr>
<td>E</td>
<td>Frontal Lobe</td>
</tr>
<tr>
<td>F</td>
<td>Left Hemisphere</td>
</tr>
<tr>
<td>G</td>
<td>Lumbar Section</td>
</tr>
<tr>
<td>H</td>
<td>Nerve</td>
</tr>
<tr>
<td>I</td>
<td>Occipital Lobe</td>
</tr>
<tr>
<td>J</td>
<td>Parietal Lobe</td>
</tr>
<tr>
<td>K</td>
<td>Right Hemisphere</td>
</tr>
<tr>
<td>L</td>
<td>Sacral Section</td>
</tr>
<tr>
<td>M</td>
<td>Spinal Cord</td>
</tr>
<tr>
<td>N</td>
<td>Temporal Lobe</td>
</tr>
<tr>
<td>O</td>
<td>Thoracic Section</td>
</tr>
<tr>
<td>P</td>
<td>Vertebrae</td>
</tr>
</tbody>
</table>

### Definitions

1. Rings of bone surrounding the spinal cord
2. Brain, spinal cord and nerves; controls and coordinates activities of the body
3. Brain part that controls coordination and timing
4. About 18" long; the communication system between brain and body; carries messages that allow us to move and feel
5. Brain part that mainly controls memory, judgment, behavior
6. Brain half responsible for insight, imagination, music/art skills and awareness of three dimensions
7. Brain part that controls sensation, movement, sense of space
8. Each has a special job for movement and feeling; tell body parts how and when to move; also carry messages to the brain
9. Interprets what we see
10. Five (5) vertebrae in lower back; affect hips and legs
11. Brain half that controls reasoning skills, speaking, writing, and number skills
12. Comprised of 5 vertebrae at the end of the spinal column
13. Comprised of 8 vertebrae in the neck; affect arms, hands, trunk and legs
14. Brain part that controls language, emotion, memory skills
15. Twelve (12) vertebrae in the mid-back; affect trunk and legs
16. Connects brain to spinal cord; controls breathing, blood pressure and arousal
Introduction to Traumatic Brain Injury

What is a Traumatic Brain Injury?
Traumatic brain injury (TBI) is caused by a blow to the head or violent movement of the head. No open head wound or skull fracture or loss of consciousness is required for an injury to be classified as a TBI.

How Do Doctors Explain the Severity of a TBI?
Three factors help doctors explain the severity of a traumatic brain injury to patients and their families:

A. Location of the injury
B. Loss of consciousness
C. Level of response

A. Location of Injury
Injury can occur to any part of the four brain lobes, the cerebellum or the brain stem. The injury may result in brain bleeding, swelling, tearing of the nerve tissue, compression of the nerve tissue and increased intracranial pressure in the injured area.

B. Loss of Consciousness
Doctors classify traumatic brain injury as **Mild, Moderate, or Severe**. To determine the classification, doctors consider the length of time the patient lost consciousness and the mental status of the patient once consciousness is regained.

The chart below details these classifications.

<table>
<thead>
<tr>
<th>TBI Classifications</th>
<th>Often Called A Concussion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild TBI</td>
<td>Injured Person Experiences Any Of The Following:</td>
</tr>
<tr>
<td></td>
<td>Loss Of Consciousness For 15 Minutes Or Less</td>
</tr>
<tr>
<td></td>
<td>Any Memory Loss</td>
</tr>
<tr>
<td></td>
<td>Feeling Dazed, Disoriented, Or Confused</td>
</tr>
<tr>
<td>Moderate TBI</td>
<td>Loss Of Consciousness For 15 Minutes To A Few Hours</td>
</tr>
<tr>
<td></td>
<td>Days Or Weeks Of Confusion</td>
</tr>
<tr>
<td>Severe TBI</td>
<td>Loss Of Consciousness For 6 Hours Or Longer</td>
</tr>
<tr>
<td></td>
<td>May Be In A Coma</td>
</tr>
</tbody>
</table>
C. Level of Response

The Glasgow Coma Score (GCS) measures the responses or lack of responses of a person experiencing traumatic brain injury (TBI). The information this test provides also helps doctors determine the level of a brain injury.

Glasgow Coma Score (GCS)

<table>
<thead>
<tr>
<th>Body Function</th>
<th>Patient Response</th>
<th>Patient Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best Eye Response</td>
<td>1. No eye opening</td>
<td></td>
</tr>
<tr>
<td>(earn a score of 1 to 4)</td>
<td>2. Eye opening to pain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Eye opening to verbal command</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Eyes open spontaneously</td>
<td></td>
</tr>
<tr>
<td>Best Verbal Response</td>
<td>1. No verbal response</td>
<td></td>
</tr>
<tr>
<td>(earn a score of 1 to 5)</td>
<td>2. Incomprehensible sounds</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Inappropriate words</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Confused</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Oriented (knows time, date, location, and who you</td>
<td></td>
</tr>
<tr>
<td></td>
<td>are, etc)</td>
<td></td>
</tr>
<tr>
<td>Best Motor Response</td>
<td>1. No motor response</td>
<td></td>
</tr>
<tr>
<td>(earn a score from 1 to 6)</td>
<td>2. Extension to pain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Flexion to pain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Withdrawal from pain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Localizing pain</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. Obeys commands</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The patient’s response in each category is given a point value. These numbers are added together to get the patient’s total score. The total score is interpreted using the following scale:

13 or higher = Mild
9-12 = Moderate
8 or less = Severe

The GCS score combines with loss of consciousness (LOC) information to determine the patient’s TBI level.

GCS and LOC Prediction of Severity

<table>
<thead>
<tr>
<th>Severity Rating</th>
<th>GCS Score</th>
<th>LOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>13 or higher</td>
<td>15 minutes or less</td>
</tr>
<tr>
<td>Moderate</td>
<td>9 to 12</td>
<td>Over 15 minutes to a few hours</td>
</tr>
<tr>
<td>Severe</td>
<td>8 or less</td>
<td>6 hours or more</td>
</tr>
</tbody>
</table>
What are the Impacts of a Traumatic Brain Injury?

Traumatic brain injury patients experience a wide range of impacts. Each patient is different; each injury produces different results. The list below provides a general description of potential impacts. Patients do not necessarily experience all the impacts listed.

It is important to remember that, regardless of which specific impacts patients experience, the impacts of traumatic brain injury are serious and lasting.

**Physical:**
- Difficulty with
  - Movement
  - Speaking
  - Swallowing
  - Balance
  - Walking
- Regulations of vital signs – heart rate, blood pressure, breathing
- Difficulty with sensory perception
- Headaches
- Blurred vision/double vision
- Seizures
- Difficulty with bowel and bladder control – typically related to “aphasia,” meaning an inability to process information due to brain injury
- Changes in sleep patterns

**Emotional:**
- Lack of insight and understanding about the injury
- Depression
- Anger
- Anxiety
- Agitation/impatience
- Personality changes
- Mood swings

**Cognitive:**
- Confusion
- Memory impairments/forgetfulness
- Difficulty forming sentences/finding vocabulary
- Difficulty thinking logically/reasoning/focusing
- Difficulty concentrating

**Daily Living/Behavioral:**
- Socially inappropriate behavior
- Impulsivity
- Poor social skills
- Excessive talking
- Dependent on others for help and care
Task 4: Know How Doctors Talk About Traumatic Brain Injury

1. What causes a brain injury?

2. In order to have a brain injury there must be an open head wound or skull fracture. True or False

3. What three factors help doctors explain the severity of a TBI?
   A. ___________________________  B. ___________________________  C. ___________________________

4. Doctors classify TBI as mild, moderate or severe. The length of time an injured person loses consciousness is one factor that helps determine the level of severity. What is the LOC (loss of consciousness) time for each of the three levels?
   • Mild: __________________________________________
   • Moderate: ________________________________________
   • Severe: __________________________________________

5. The Glasgow Coma Score evaluates three kinds of responses for TBI patients. List the three kinds of responses tested:
   A. _____________________________________________
   B. _____________________________________________
   C. _____________________________________________

6. Consider the condition of the two patients described below. Identify the level of TBI for each. Remember to look at both the loss of consciousness time (LOC) and the Glasgow Coma Score to make this determination.
   A. John lost consciousness for 1 hour and has a GCS Score of 11. Is his TBI level mild, moderate, or severe?
      _____________________________________________
   B. Mary lost consciousness for 8 hours and has a GCS Score of 5. Is her TBI level mild, moderate, or severe?
      _____________________________________________
Introduction to Spinal Cord Injury

Introduction to Spinal Cord Injury
The nervous system includes the BRAIN, SPINAL CORD, and NERVES. The spinal cord is a long column of nerves, and, like the brain, is the consistency of a ripe banana. The spinal cord is much like a highway system, the nerves are like lanes of traffic and there are millions of lanes of traffic on the spinal cord. The brain sends and receives messages by way of the spinal cord and nerves (just like cars traveling north and south on a highway). The main messages are MOTOR and SENSORY. MOTOR messages help you do things like move your arms/legs, dance and balance. SENSORY messages help you feel things like pain, pressure, differentiate between hot and cold or rough and smooth. When someone sustains a spinal cord injury, it is like a wreck on the highway that closes down the system.

What is a Spinal Cord Injury?
Spinal cord injury is any damage to the spinal cord which blocks communication between the brain and the body. Because of the injury (like a wreck on the body’s highway system) sensory messages are not able to reach the brain and the brain cannot tell the muscles below the injury (or wreck) how or when to move.

How Do Doctors Explain the Severity of a SCI Injury?
Four descriptions of the patient’s injury help doctors explain the severity of a spinal cord injury to patients and their families:

A. The level (location on the spine) of the injury
B. The amount of damage to the spinal cord
C. Extent of paralysis
D. The ASIA Scale score

A. Level of Injury
The level of an injury is described according to the section of the spine where the damage occurs. This description consists of two details about the injury: 1) section of the spinal column; 2) number of the affected spinal nerve/vertebrae. Doctor Speak: Doctors describe an injury near the 3rd vertebrae/nerve as a “C3 cervical injury.”

Two important facts about vertebrae and nerves:

1. Vertebrae and nerve numbering: The spinal nerves branch out from each side of the vertebrae and these pairs of nerves are numbered according to the “vertebrae from which they extend. Each section of the spinal has an equal number of vertebrae and nerves except for the cervical section which has 8 pairs of nerves for its 7 vertebrae.

2. Nerve function: After an injury all nerves below the level of the injury are unable to communicate with the brain and can no longer do their work.
A. Level of Injury, continued

This figure at left shows the areas of the body affected by damage to each section of the spinal cord. Remember this damage is both motor and sensory.

The chart below describes the movements affected by an injury at each of the vertebrae in the spinal column. Remember the injury level (location) affects everything below that level. Notice the significant amount of movement affected by an injury at the cervical level.

<table>
<thead>
<tr>
<th>INJURY LEVEL</th>
<th>AFFECTED MUSCLES/MOVEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>C-1 to C-2</td>
<td>Neck and face movement</td>
</tr>
<tr>
<td>(Cervical)</td>
<td></td>
</tr>
<tr>
<td>C-3 to C-4</td>
<td>Diaphragm movement (breathing muscle)</td>
</tr>
<tr>
<td>C-5</td>
<td>Elbow bending</td>
</tr>
<tr>
<td>C-6</td>
<td>Wrist extension (bending wrist upward)</td>
</tr>
<tr>
<td>C-7</td>
<td>Elbow straightening</td>
</tr>
<tr>
<td>C-8</td>
<td>Finger movement</td>
</tr>
<tr>
<td>T-1 to T-12</td>
<td>Control of chest, abdomen (stomach area) &amp; back muscles</td>
</tr>
<tr>
<td>(Thoracic)</td>
<td></td>
</tr>
<tr>
<td>L-1 to L-2</td>
<td>Hip bend (flex)</td>
</tr>
<tr>
<td>(Lumbar)</td>
<td></td>
</tr>
<tr>
<td>L-3</td>
<td>Knee straightening</td>
</tr>
<tr>
<td>L-4</td>
<td>Bend foot upward</td>
</tr>
<tr>
<td>L-5</td>
<td>Extends toes</td>
</tr>
<tr>
<td>S-1</td>
<td>Bend foot down toward floor</td>
</tr>
<tr>
<td>(Sacral)</td>
<td></td>
</tr>
<tr>
<td>S-2 thru S-4</td>
<td>Areas for urinating &amp; bowel movements</td>
</tr>
</tbody>
</table>
B. Damage to the Spinal Cord

Doctors describe the amount of damage to the spinal cord using two terms: **COMPLETE** or **INCOMPLETE**.

**COMPLETE**

**INCOMPLETE**

**Complete Injuries:** Complete injuries cause damage that extends through the entire spinal cord. This would be like a wreck that shuts down ALL lanes of traffic. No messages are able to get around the injury. This type of injury means the patient has no movement (motor ability) or feeling (sensory ability) below the injury, and is unable to control bowel or bladder.

**Incomplete Injuries:** Incomplete injuries cause partial damage to the spinal cord. This would be like a wreck on the highway that shuts down a few lanes of traffic, but not all. Some messages may be able to get around the injury. This type of injury means the patient may have some movement or feeling below the injury. Incomplete injuries vary greatly from patient to patient depending on the degree of damage to the spinal cord.

**Example of injury differences:** Two patients can have an incomplete injury at the same location, perhaps at C3. The first patient may be able to walk, use their hands and control their bladder and bowel while another patient with an incomplete C3 injury may have no feeling or movement below their neck. Again, it depends on which “lanes” in the spinal cord “highway” are closed down completely.
Paralysis
Paralysis is defined as loss of voluntary movement as a result of damage or injury. Spinal cord injuries result in two types of paralysis.

Tetraplegia/Quadruplegia:
An injury to the cervical region will result in tetraplegia/quadruplegia. This will result in loss of movement and sensation in both arms and both legs, and loss of control over bowel and bladder.

The areas of the body that are affected are shaded.

Paraplegia:
An injury to the thoracic, lumbar, or sacral region will result in paraplegia. This will result in loss of movement and sensation in both legs, and loss of control over bowel and bladder.

The areas of the body that are affected are shaded.
D. The ASIA Scale Score

The American Spinal Cord Injury Association (ASIA) has five classifications describing the extent of spinal cord injury described by the chart below.

These classifications are called an ASIA Scale score. The patient’s motor and sensory functions determine the patient’s score on the scale. Patients with the most severe injury have a score of “A.” Patients with no injury have a score of “E.”

**ASIA SCALE**

<table>
<thead>
<tr>
<th>Asia</th>
<th>Description</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia A</td>
<td>The patient has no feeling or movement below the level of the injury.</td>
<td>Classified as a Complete Spinal Cord Injury</td>
</tr>
<tr>
<td>Asia B</td>
<td>The patient has some feeling below the level of the injury but no ability to control movement.</td>
<td></td>
</tr>
<tr>
<td>Asia C</td>
<td>The patient has feeling or movement in less than 50% of the body below the level of the injury.</td>
<td>Classified as an Incomplete SCI</td>
</tr>
<tr>
<td>Asia D</td>
<td>The patient has feeling or movement in more than 50% of the body below the level of the injury.</td>
<td></td>
</tr>
<tr>
<td>Asia E</td>
<td>The patient has ability to feel and move throughout the body.</td>
<td></td>
</tr>
</tbody>
</table>

**Describing a Spinal Cord Injury – Looking at real cases:**

1. When doctors talked to a young girl named Mary and her parents, they explained that Mary had a complete C3 Cervical injury classified as an ASIA A level. They said that Mary’s injuries have resulted in tetraplegia. Her condition is not likely to change for the rest of her life.

2. When doctors talked with a young man named Max and his parents, they explained that Max had an incomplete T7 Thoracic injury classified as an ASIA C. Thus, Max’s injuries have resulted in paraplegia; however, the doctors said they cannot predict how much functional improvement Max might experience.

Notice: Each explanation above references the four conditions that describe spinal cord injuries.

A. The level (location on the spine) of the injury  
B. The amount of damage to the spinal cord  
C. Extent of paralysis  
D. The ASIA Scale score
What are the Impacts of a Spinal Cord Injury?

Spinal cord injury patients experience a wide range of impacts. Each patient is different; each injury produces different results. The list below provides a general list of potential impacts. Patients do not necessarily experience all the impacts listed.

Impacts can be categorized as physical, emotional, and daily living.

It is important to remember that, regardless of which specific impacts patients experience, the impacts of spinal cord injury are serious and lasting.

Physical:
- Paralysis – inability to control motor and sensory function
- Weakened muscles above the location of the injury
- Weakened breathing or inability to breathe without a machine called a ventilator
- Inability to cough – must have assistance to do so
- Inability to control bowel and bladder – must have assistance to do so
- Inability to control body temperature and blood pressure – requires constant monitoring

Emotional:
- Depression
- Anger
- Anxiety

Daily Living:
- Requiring a wheelchair for the rest of life
- Dependent on others for personal grooming and toilet use
- Dependent on others for dressing
- Dependent on others for food

Task 5: Know How Doctors Talk About Spinal Cord Injury

1. A spinal cord injury is caused by any damage that blocks ____________________________

2. **Level of Injury** is described using a letter and a number. Explain what the letter and number represent in each of the following examples.

   C-5 ____________________________

   T-8 ____________________________
3. The level of injury also affects the patient's ability to move below that level. Use the Injury Level/Affected Movement chart to respond to the following:

- C4 injury will affect the patient's ability to breathe. 
- T5 injury will affect the patient's ability to bend at the hips. 
- L5 injury will affect the patient's ability to move the fingers. 
- All injuries will affect the patient's bowel and bladder function.

4. Doctors also describe the degree of injury to the spinal cord. Describe the difference between the two types of spinal cord damage.

   Complete
   __________________________________________________________________________

   Incomplete
   __________________________________________________________________________

5. The ASIA Scale Score has five levels of classification describing the extent of motor and sensory impairment.

   All patients with a complete spinal cord injury have an ASIA grade of ____________ . This grade means the patient has no ________________________________ .

   Patients with an incomplete spinal cord injury could have an ASIA grade from _____________ to ________________________________ .

   Explain the difference between a grade B and a grade C on the ASIA:
   __________________________________________________________________________
   __________________________________________________________________________
   __________________________________________________________________________
Use the case studies you are given to answer the following questions.

**Task 6. Determining Severity of TBI Injury**

A. **Location of the injury:** Indicate where the patient’s injury is located on the lobes image below by drawing arrows to the site of the injury. Remember more than one lobe may be involved. Then list the injured lobes beside the image:

![Image of brain lobes]

B. **Loss of consciousness:** Describe the patient’s loss of consciousness reported from the trauma center.

________________________________________________________________________

________________________________________________________________________

C. **GCS Score:** Using the results described in “What the Doctors Found” in the case study, circle the description in each category that matches the patient’s reported condition and then enter the number of that description in the Patient Score column. Then add the numbers to derive the total GCS score.

<table>
<thead>
<tr>
<th>Body Function</th>
<th>Patient Response</th>
<th>Patient Score</th>
</tr>
</thead>
</table>
| Best Eye Response (earn a score of 1 to 4) | 1. No eye opening  
                                       | 2. Eye opening to pain  
                                       | 3. Eye opening to verbal command  
                                       | 4. Eyes open spontaneously       |   |
| Best Verbal Response (earn a score of 1 to 5) | 1. No verbal response  
                                             | 2. Incomprehensible sounds  
                                             | 3. Inappropriate words  
                                             | 4. Confused  
                                             | 5. Orientated       |
| Best Motor Response (earn a score from 1 to 6) | 1. No motor response  
                                              | 2. Extension to pain  
                                              | 3. Flexion to pain  
                                              | 4. Withdrawal from pain  
                                              | 5. Localizing pain  
                                              | 6. Obey’s commands       |
| Total                       |                                                       |               |
D. **Level Diagnosis:** To determine the level of brain injury, follow the calculations explained in the chart below. Notice that doctors consider both the patient’s Glasgow Coma Score (GCS) and loss of consciousness data (LOC). Using the chart below and your patient’s GCS score and LOC time, determine the level of your patient’s injury.

### GCS and LOC Prediction of Severity

<table>
<thead>
<tr>
<th></th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCS</td>
<td>13 or higher</td>
<td>9 to 12</td>
<td>8 or less</td>
</tr>
<tr>
<td>LOC</td>
<td>15 minutes or less</td>
<td>Over 15 minutes to a few hours</td>
<td>6 hours or more</td>
</tr>
</tbody>
</table>

Level of Traumatic Brain Injury = ________________________________

### Task 6. Describing the Injury

A. Record the patient’s level of injury in the space below.

<table>
<thead>
<tr>
<th>Spinal Column Section</th>
<th>Vertebra(e)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

B. Review the description of the injury. Does the description of the injury indicate that the damage to the spinal cord is

- Complete
- Incomplete

(circle one)

C. Based upon the patient’s level of injury, is this patient’s condition classified as

- Paraplegia
- Tetraplegia/Quadrplegia

(circle one)

D. Record the patient’s ASIA Scale Score? __________________. Explain what this score means:

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________