

Rancho Los Amigos Levels of Cognitive Function Scale	
LEVEL	DESCRIPTION
I	No response
II	Generalized response to stimulation
III	Localized response to stimuli
IV	Confused and agitated behavior
V	Confused with inappropriate behavior (nonagitated)
VI	Confused but appropriate behavior
VII	Automatic and appropriate behavior
VIII	Purposeful and appropriate behavior
IX	Purposeful and appropriate (standby assistance on request)
X	Purposeful and appropriate (modified independent)

- The **Rancho Los Amigos Scale**, also known as the Ranchos Scale describes the cognitive and behavioral patterns found in brain injury patients as they recover from injury. It was originally developed by the head injury team at the Rancho Los Amigos Hospital in Downey, California to assess patients emerging from a coma.
- The scale was developed based on assumption that observation of the type, nature, and quality of the patient's behavioral responses can be used to estimate the cognitive level at which the patient is functioning.

Rancho Los Amigos Levels of Cognitive Functioning			
Need Total Assistance	1	No <b>response</b>	<ul style="list-style-type: none"> <li><b>Level 1:</b> No response, person appears to be in deep sleep</li> <li><b>Level 2:</b> Generalized response, person reacts inconsistently, not directly in response to stimuli</li> <li><b>Level 3:</b> Localized response, reacts inconsistently, directly to stimuli</li> <li><b>Level 4:</b> Confused/Agitated, person is extremely confused, agitated</li> <li><b>Level 5:</b> Confused-Inappropriate/Non-Agitated, person is confused and responds inaccurately to commands</li> <li><b>Level 6:</b> Confused-Appropriate, Person is confused, responds accurately to commands</li> <li><b>Level 7:</b> Automatic-Appropriate, person goes through daily routine with minimal confusion</li> <li><b>Level 8:</b> Purposeful-Appropriate, person has functioning memory, responsive to environment, may display depression</li> <li><b>Level 9:</b> Purposeful-Appropriate, goes through daily routine aware of need for stand-by assistance, depression may continue</li> <li><b>Level 10:</b> Purposeful-Appropriate/Modified Independent, goes through daily routine but may require more time or compensatory strategies, periodic depression may occur.</li> </ul>
	2	Generalized <b>response</b> to stimuli	
	3	Localized <b>response</b> to stimuli	
Need Maximal Assistance	4	<b>Confused</b> and <b>agitated</b> behavior	
	5	<b>Confused</b> with inappropriate behavior ( <b>non-agitated</b> )	
Need Moderate Assistance	6	<b>Confused</b> but appropriate behavior	
Need Minimal Assistance	7	Automatic and appropriate behavior	
Needs Stand-By Assistance	8	<b>Purposeful and appropriate</b> behavior	
Needs Standby Assistance on request	9	<b>Purposeful and appropriate</b> (standby assistance on request)	
Modified Independent	10	<b>Purposeful and appropriate</b> (modified independent)	

What is the description of a Rancho Los Amigos level of IV?

- Localized response to stimuli
- Confused and agitated behavior
- Confused with inappropriate behavior
- Confused but appropriate behavior

- Level III: localized response to stimuli
- Level V: confused with inappropriate behavior
- Level VI: confused but appropriate behavior

Rancho IV	Rancho V	Rancho VI
<b>Confused + agitated</b>	<b>Confused + inappropriate</b>	<b>Confused + appropriate</b>

A traumatic brain injury (TBI) patient that is confused and inappropriate would be considered a Ranchos level:

- I
- IV
- V
- VI

- A Ranchos level IV patient would be confused and agitated.
- A level VI patient would be confused and appropriate.
- Ranchos level refers to the Ranchos Los Amigos scale, which is used in rating recovery from brain injury.

**RANCHO Los Amigos Scale:** This scale is commonly used by both medical and rehabilitation providers to measure and track cognitive recovery after traumatic brain injury. It is a 10-point scale, although many medical professionals only use the first 8 levels.

A 26-year-old is admitted to the inpatient rehabilitation unit following a traumatic brain injury. They are confused, inappropriate, agitated, and requires a padded floor bed. What is their Rancho Los Amigos level?

- A. IV
- B. V
- C. VI
- D. VIII

- The Rancho Los Amigos level IV applies to persons who are confused and agitated. The need of a padded floor bed indicates that the patient is restless and agitated.
- This scale is a useful descriptive tool for clinicians and family members to follow a patient's cognitive and behavioral functioning on an eight-point scale.

- In idiopathic **normal pressure hydrocephalus**, the typical clinical triad includes cognitive impairment, gait disturbance, and urine frequency.
- Cause of NPH: The cause of excess fluid in the ventricles of the brain may be due to injury, bleeding, infection, brain tumor, or surgery on the brain. However, the cause is often not known. When excess fluid builds up in the ventricles, they enlarge and press against nearby brain tissue.
- Post-traumatic hydrocephalus (PTH) is one of the special types of hydrocephalus, which occurs after traumatic brain injury (TBI).

A clinical feature of normal pressure hydrocephalus (NPH) is:

- A. Ataxic gait
- B. Urinary incontinence
- C. Memory impairment
- D. All of the above

- Sometimes called the “3 Ws” wobbly, wet and wacky, NPH is characterized by ataxic gait, urinary incontinence, and dementia.

Wobbly (Walking)	Wide Gait	Wet (Water)	Urinary Incontinence	Wacky (Weird)	Dementia
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Failure to use a helmet when involved in a motorcycle accident increases the likelihood of head, neck, and facial trauma by:

- A. 2x
- B. 3x
- C. 4x
- D. 5x

- Compared with a rider wearing a helmet when involved in a motorcycle crash, a rider without a helmet is **twice** as likely to suffer head, neck, and facial injury.
- Furthermore, not wearing a helmet more than **triples** the likelihood of being killed in the crash.



Overall, the most common cause of severe traumatic brain injury (TBI) is:

- A. Alcohol (ETOH) intoxication
- B. Motor vehicle accidents (MVA)
- C. Falls
- D. Assault

- MVA accounts for approximately 50% of all TBI cases. Assault is the second most common cause.
- In the elderly population, gait and visual disturbances lead to falls, which cause most of the TBIs in the elderly.

Phenytoin (Dilantin) was started acutely in the emergency department for seizure prophylaxis in a patient with moderate traumatic brain injury. How long should it be continued?

- A. 1 week
- B. 1 month
- C. 3 months
- D. 6 months

- Studies support the use of phenytoin for early post-traumatic seizure prophylaxis, but only for the first week after injury.

- **Posttraumatic agitation** is common after TBI. Furthermore, aggression was consistently associated with depression.
- **Insomnia** is common in TBI patients. They may have nighttime awakenings and longer sleep-onset latency.
- **Posttraumatic headache** in 38%.
- **Posttraumatic depression** in 40% after TBI, it is further associated with cognitive decline, anxiety disorders, substance abuse, dysregulation of emotional expression, and aggressive outbursts.

## Post Traumatic Agitation

- A subtype of delirium during Post Traumatic Amnesia
- Typically involves Frontal and Temporal Lobes in TBI
  - Responsible for Inhibition and Perseveration
  - Excess of one or more behaviors
    - Aggression
    - Disinhibition
    - Lability
    - Low arousal/hyperarousal
    - Confusion
    - Restlessness
    - Irritability/Outbursts of anger
    - Sensory Hyper stimulation (light/sound)
    - Distractibility/Poor Sustained attention
    - Compulsive Behaviors
    - Egocentricity

How should a behaviorally agitated traumatic brain injury (TBI) patient be managed?

- Restrain them even if not a risk to self or others
- Administer lorazepam (Ativan) or haloperidol (Haldol) to calm them
- Call hospital security to restrain them
- Identify cause of agitation and reorient the patient

- Agitation from a TBI is caused by confusion and inability to retain memory (posttraumatic amnesia).
- First, the inciting factor should be identified. Then, one person should speak with the patient in a calm manner and redirect the patient as to where he or she is and why they are in the hospital.
- The environment should be altered to minimize distractions, provide a structured program of therapies, and be safe.
- Restraints and medications such lorazepam (Ativan) should only be used if there is a risk for the patient to injure himself or herself or others. Haloperidol (Haldol) should never be used because it has been shown to negatively impact recovery.

A first-line intervention for post-traumatic agitation would be:

- Restraining the patient
- Placing patient in a quiet room and limiting the number of visitors
- Medicating the patient
- Getting a psychiatric evaluation

- The first step would be to create a low-stimulus environment for the patient.

What should be initially prescribed to a patient with a traumatic brain injury (TBI) who suffers from insomnia, poor attention, poor memory, depressed mood, and headaches?

- A stimulant to help with the attention
- A headache medication
- A sleeping medication and sleep hygiene
- An antidepressant

- For a patient with a TBI, sleep is one of the most important aspects of medication management. If it is not addressed, lack of sleep may cause difficulty with attention, memory, headaches, poor mood, and overall poor general health.

**TECH**  
Avoid screen time 1-2 hours before you go to bed

**SMELL**  
Spray lavender oil over your pillow before bedtime

**LIGHT**  
Cover your windows with dark curtains

**READ**  
Enjoy a good book to calm the mind

**CAFFEINE**  
Stay away from coffee / tea 6-8 hours before bedtime

**RELAX**  
Practice yoga, breathing exercises, meditation

**Reduce**  
smartphone usage

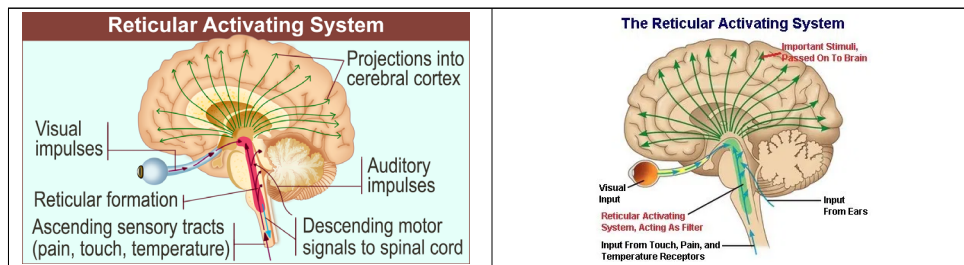
**Create a**  
nightly ritual

**Avoid caffeine**  
4-6 hours before sleeping

**Don't eat or drink too much**  
at bedtime

**Sleep at the same time**  
every night

- Sleep hygiene is a variety of different practices and habits that are necessary to have good nighttime sleep quality and full daytime alertness.
- Obtaining healthy sleep is important for both physical and mental health. It can also improve productivity and overall quality of life. Everyone, from children to older adults, can benefit from practicing good sleep habits.



- **Consciousness** is a function of the ascending reticular activating system (RAS) and the cerebral cortex.
- The **RAS** is composed of cell bodies in the central reticular core of the upper brainstem (mainly midbrain) and their projections to widespread areas of the cerebral cortex via both the thalamic and extrathalamic pathways.
- Lesions that interrupt the metabolic or structural integrity of the RAS or enough of the cortical neurons receiving RAS input can cause disorders of consciousness.

#### DISORDERS OF CONSCIOUSNESS

	COMA	VEGETATIVE STATE (VS)	MINIMALLY CONSCIOUS STATE (MCS)
Awake?	No	Yes	Yes
Aware?	No	No	Yes

Of the following disorders of consciousness, which would have the best prognosis?

- Coma
- Vegetative state
- Minimally conscious state

- In a **minimally conscious state (MCS)**, the patient will be able to show some evidence of self or environmental awareness and will show evidence of purposeful behaviors.

COMA	<ul style="list-style-type: none"> <li>• Lack of wakefulness as evidenced by the <b>lack of sleep wake cycles</b> on EEG</li> <li>• Patient's eyes remain closed.</li> </ul>
VEGETATIVE STATE (VS)	<ul style="list-style-type: none"> <li>• Characterized by the <b>resumption</b> of the <u>sleep-wake cycle</u> on EEG</li> <li>• Patient opens eyes (either spontaneously or with noxious stimuli).</li> </ul>

Which best describes someone who is in a vegetative state?

- Eyes are open, eyes are not tracking, he or she has sleep-wake cycles
- Eyes are open, eyes are tracking, he or she has sleep-wake cycles
- Eyes are closed, eyes are not tracking, he or she has no sleep-wake cycles
- Eyes are closed, eyes are not tracking, he or she has sleep-wake cycles

- A **comatose** patient has eyes closed and no sleep-wake cycles.
- A patient in a **minimally conscious state (MCS)** has eyes open, tracking, and inconsistent but reproducible behavior. Emergence from **MCS** occurs when there is consistent command following.

VEGETATIVE STATE (VS)	<ul style="list-style-type: none"> <li>• No perceivable evidence of purposeful behavior</li> <li>• No awareness of self or environment</li> </ul>
MINIMALLY CONSCIOUS STATE (MCS)	<ul style="list-style-type: none"> <li>• Patient shows evidence of inconsistent but reproducible (or sustained) purposeful behaviors.</li> <li>• Patient shows minimal but definite evidence of self or exhibits environmental awareness.</li> </ul>

Which of the following signify progressing from a vegetative state to a minimally conscious state?

- Spontaneous eye opening
- Sleep wake cycle
- Spontaneous breathing
- Visual tracking

- Spontaneous eye opening and presence of sleep wake cycle signifies the **vegetative state (VS)**.
- The diagnosis of **Minimally Conscious State (MCS)** is based on clearly discernible and reproducible evidence of purposeful movements.

COMA			VS			Locked-in syndrome		
	Awakeness Awareness		Yes	Awakeness Awareness		Yes	Awakeness Awareness	Yes
No		No			No			

- Locked-in syndrome (LIS), also known as pseudocoma, is a condition in which a patient is aware but cannot move or communicate verbally due to complete paralysis of nearly all voluntary muscles in the body except for vertical eye movements and blinking.
- Unlike persistent vegetative state, in which the upper portions of the brain are damaged and the lower portions are spared, locked-in syndrome is caused by damage to specific portions of the lower brain and brainstem, with no damage to the upper brain.
- Causes: poisoning, brainstem stroke, disease of the circulatory system, medication overdose, central pontine myelinolysis secondary to excessively rapid correction of hyponatremia, TBI, etc.

**Minimally conscious state is defined by the presence of:**

- A. Sleep-wake cycle
- B. Cranial nerve reflexes
- C. Environmental awareness
- D. Reflexive behaviors

- **Minimally conscious state** refers to the return of self- or environmental awareness.
- **Vegetative state** is characterized by the presence of sleep-wake cycles.
- Cranial nerve reflexes may be preserved in the vegetative state. One must be careful that reflexive behaviors such as yawning or auditory startle not be considered true awareness.

## Coma

- Lack of wakefulness as evidenced by the lack of sleep wake cycles on EEG
- Patient's eyes remain closed.
- There is *no* spontaneous purposeful movement or ability to discretely localize noxious stimuli.
- No evidence of language comprehension or expression
- It results from the damage to the RAS in the brainstem or its connections to the thalami or hemispheres.
- It can last 2 to 4 weeks for people who do not emerge.

## Vegetative State

- Characterized by the resumption of the sleep-wake cycle on EEG
  - No awareness of self or environment
  - No perceivable evidence of purposeful behavior
  - Presence of a verbal or auditory startle but no localization or tracking
  - Patient opens eyes (either spontaneously or with noxious stimuli).
- Neuropathology of vegetative state (VS)
  - Related to diffuse cortical injury
  - Bilateral thalamic lesions are prominent findings in VS.
- The term *persistent vegetative state* (redefined by the Multi-Society Task Force on PVS, 1994) is still currently used in the United States for VS that is present  $\geq 1$  month after a traumatic or nontraumatic brain injury.
- The Task Force also introduced the term *permanent* to denote irreversibility after 3 months following nontraumatic brain injury and 12 months following TBI (Howsepian, 1996).

## Minimally Conscious State

- Patient shows minimal but definite evidence of self or exhibits environmental awareness.
- Patient shows evidence of inconsistent but reproducible (or sustained) purposeful behaviors.
  - Simple command following
  - Object manipulation
  - Intelligible verbalization
  - Gestural or verbal yes/no responses

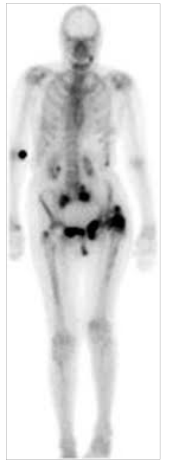
- **Heterotopic Ossification (HO)** is the abnormal growth of bone in the non-skeletal tissues including muscle, tendons or other soft tissue. When HO develops, new bone grows at three times the normal rate, resulting in jagged, painful joints.
- Neurogenic heterotopic ossification is characterised by the formation of bone in soft tissues, especially around large joints, following traumatic injury to the central nervous system. The hip is the most commonly involved joint in both spinal cord injury and traumatic brain injury

What is the most common location of heterotopic ossification (HO) after traumatic brain injury (TBI)?

- A. Shoulder  
B. Knee  
C. Hip  
D. Elbow

- HO occurs most frequently in the hips, followed by elbows, shoulders, and knees.

- A bone scan is a nuclear imaging test that helps diagnose and track several types of bone disease.
- A bone scan can also be an important tool for detecting cancer that has spread (metastasized) to the bone from the tumor's original location, such as the breast or prostate.
- Although a bone scan is very sensitive to abnormalities in bone metabolism, it's less helpful in determining the exact cause of the abnormality. If you have a bone scan that shows hot spots (darker spots vs. lighter cold spots), more testing may be needed to determine the cause.



Which is the most sensitive test used to identify early heterotopic ossification (HO)?

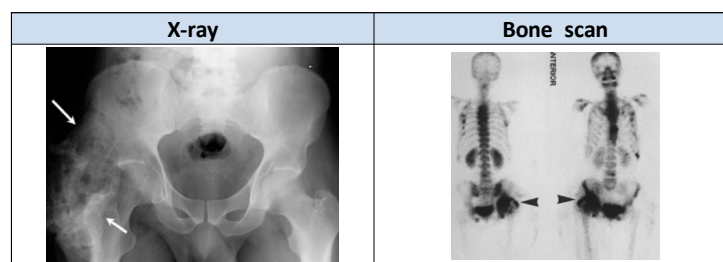
- A. X-ray  
B. Serum alkaline phosphatase  
C. Computed tomography (CT) scan  
D. Bone scan

- Phase 1 and 2 of a bone scan can help detect HO within 2 to 4 weeks.
- To detect HO on x-ray requires bone maturation, which can take as long as 4 weeks.
- CT scan is not indicated for HO identification, and serum alkaline phosphatase is a nonspecific/nonsensitive test.

What is considered the most effective method for the prevention of heterotopic ossification (HO)?

- A. Range of motion  
B. Radiation of bone tissue  
C. Nonsteroidal anti-inflammatory drugs (NSAIDs)  
D. Diphosphonates

- Range of motion is the best prophylaxis and treatment of HO.
- Radiation would have to be given to the whole body because HO development cannot be predicted.
- NSAIDs and diphosphonates have a role in treatment, but not significantly in prevention.



What is the most likely cause of acutely painful and restricted range of motion in the elbow of a TBI patient who has no x-ray abnormalities and no skin, nail or temperature changes in his arm?

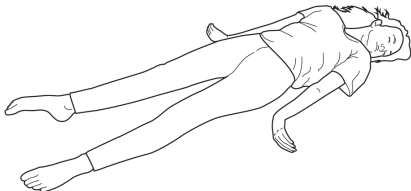
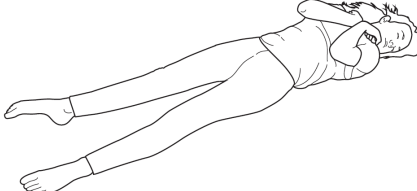
- A. Complex regional pain syndrome  
B. Cellulitis  
C. Fracture  
D. Heterotopic ossification

- **Heterotopic ossification** is the formation of lamellar bone inside soft-tissue structures and is presented as limited joint range and pain upon passive ROM.
- Complex regional pain syndrome presents as localized autonomic dysregulation in the affected area with vasomotor and/or sudomotor changes, temperature changes, edema, color difference, sweating, and/or atrophy.
- Cellulitis usually accompany with local skin changes (redness, swelling, and heat) and systemic findings (fever and lab abnormality).
- Because the x-ray is unremarkable, it is unlikely that there is a fracture.



## POSTURING SECONDARY TO HEAD INJURY

<b>DECEREBRATE POSTURING</b>	<ul style="list-style-type: none"> <li>There is <b>extension</b> of the <u>upper</u> and <u>lower</u> limbs (hallmark: Elbows extended).</li> <li>Seen with midbrain lesions/compression; also with cerebellar and posterior fossa lesions</li> <li>In its fully developed form, it consists of opisthotonus, clenched jaws, and stiff, extended limbs with internal rotation of arms and ankle plantar flexion (Feldman, 1971).</li> </ul>
<b>DECORTICATE POSTURING</b>	<ul style="list-style-type: none"> <li>Posturing due to lesions at a higher level (than in decerebrate posture)</li> <li>Seen in cerebral hemisphere/white matter, internal capsule, and thalamic lesions</li> <li><b>Flexion</b> of the <u>upper</u> limbs (elbows bent) and <b>extension</b> of the <u>lower</u> limbs. Arms are in flexion and adduction and leg(s) are extended.</li> </ul>

Decerebrate posture	Decorticate posture
<b>extension</b> of the upper limb + <b>extension</b> of lower limb	<b>flexion</b> of the upper limb + <b>extension</b> of the lower limb
	
Remember, de <b>COR</b> ticate → “ <b>COR</b> ” = heart ⇔ Patient brings hands close to the <b>heart</b> by flexing the elbows	

In decerebrate posturing, there is:

- Extension of the upper and lower extremities
- Flexion of the upper and lower extremities
- Extension of the upper and flexion of the lower extremities
- Flexion of the upper and extension of the lower extremities

- In **decerebrate posturing**, the limbs will be stiff and extended with internal rotation of arms and ankles in plantar flexion.
- In patients with **decorticate posturing**, the legs are extended and the arms are flexed and adducted.

	Severe TBI (coma)	Moderate TBI	Mild TBI
Glasgow Coma Scale	3 - 8	9 - 12	13 - 15

Eye opening	Best verbal response	Best motor response
4 = spontaneous	5 = normal conversation	6 = follows commands
3 = to voice	4 = disoriented conversation	5 = localizes to pain
2 = to pain	3 = words, but no coherent	4 = withdraws to pain
1 = none	2 = no words, only sounds	3 = decorticate posture
	1 = none	2 = decerebrate posture
		1 = none

A 75-year-old female is brought to the emergency department following a fall. On examination, she presents with eye opening to verbal stimuli, confused conversation, and withdraws in response to pain. What is the severity of the TBI?

- mild TBI
- moderate TBI
- severe TBI

Eye opening	Best verbal response	Best motor response	=	GCS ____	⇔	_____ TBI

Eye opening	Best verbal response	Best motor response
4 = spontaneous open, blinking at baseline	5 = oriented conversation	6 = obeys commands for movement
3 = to verbal stimuli, command, speech	4 = confused conversation	5 = movement to painful stimuli
2 = to pain only	3 = inappropriate words (words)	4 = withdraws in response to pain
1 = no response	2 = incomprehensible speech (sounds)	3 = decorticate posturing
	1 = no response	2 = decerebrate posturing
		1 = no response

A 27-year-old male is brought to the emergency department following a motor vehicle accident. On examination, he presents with eye opening to pain only, incomprehensible speech without words, and decorticate posturing. What is his Glasgow Coma Score (GCS)? What is the severity of the TBI?

- A. 9, moderate TBI  
 B. 9, severe TBI  
 C. 7, moderate TBI  
 D. 7, severe TBI

Eye opening	Best verbal response	Best motor response	=	GCS ____	⇒	_____ TBI

Which clinical factor correlates most powerfully with outcome after a traumatic brain injury?

- A. Age at injury  
 B. Duration of posttraumatic amnesia  
 C. Nature of the brain injury  
 D. Neuroimaging findings at injury

- Age, length of coma, and duration of posttraumatic amnesia (PTA) all provide valuable information that the clinician can use to mark milestones, but the most powerful of these is the **duration of PTA**. The longer the duration of the PTA, the worse the outcome. It is unlikely for a person with PTA lasting less than 2 months to have a serious disability; however, the likelihood of a good recovery is poor if the duration of PTA extends beyond 3 months.
- The use of neuroimaging to date has not been clinically helpful. MRI identifies lesions more frequently than computed tomography. Conventional MRI findings that strongly predict outcome include diffuse axonal injury (DAI), total lesion burden and DAI in the brainstem. However, the absence of lesions on MRI does not rule out TBI, the cost and difficulty of the exam in agitated or medically sick patients, and the lack of good research data preclude the routine clinical use of MRI for prognostic purposes.

	Severe disability is unlikely	good recovery is unlikely
Length of coma	< 2 weeks	> 4 weeks
Post-Traumatic Amnesia (PTA)	< 2 months	> 3 months

In the severe TBI population, the possibility of good recovery is unlikely when post-traumatic amnesia (PTA) is longer than:

- A. 1 month  
 B. 2 months  
 C. 3 months  
 D. 6 months

- Lower GCS scores are associated with worse outcome. **Good recovery is unlikely** when patient is >65 years old. **Good recovery is unlikely** when bilateral brainstem lesions are present on early MRI.

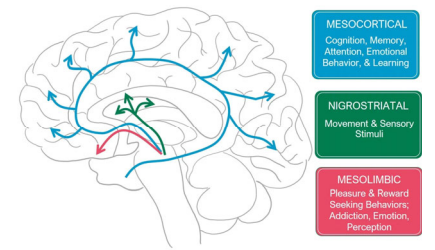
Which score range on the Galveston Orientation and Amnesia Test (GOAT) indicates the end of post-traumatic amnesia (PTA)?

- A. 75-85  
 B. 55-65  
 C. 35-45  
 D. 15-30

- A standard technique for assessing post-traumatic amnesia (PTA) in adults is the Galveston Orientation and Amnesia Test (GOAT), a brief structured interview that quantifies orientation and recall of recent events.
- The GOAT score can range from 0 to 100, with a score at or above 75 defined as normal. The end of PTA is defined as when the GOAT score is at or above 75 for 2 consecutive days.



- Inside the brain, **dopamine** plays important roles in executive functions, motor control, motivation, arousal, reinforcement, and reward, as well as lower-level functions including lactation, sexual gratification, and nausea. The dopaminergic cell groups and pathways make up the dopamine system which is neuromodulatory.
- **Dopamine** is known as the feel-good neurotransmitter – a chemical that ferries information between neurons. The brain releases it when we eat food that we crave or while we have sex, contributing to feelings of pleasure and satisfaction as part of the reward system. This important neurochemical boosts mood, motivation, and attention, and helps regulate movement, learning, and emotional responses.



What neurotransmitter should be enhanced to improve cognitive recovery in patients with a traumatic brain injury (TBI)?

- A. Norepinephrine  
B. Dopamine  
C. Histamine  
D. Acetylcholine

- Medications such as amantadine, bromocriptine, and methylphenidate are dopaminergic, which assist in improving attention and cognitive function.
- Histamine has no role in cognitive recovery, except that histamine-2 blockers should be avoided because they cause sedation.
- Norepinephrine also has a limited role in the treatment of cognition in TBI.

Which of the following medications has the best evidence to accelerate the pace of functional recovery in patients with disorders of consciousness after severe TBI?

- A. Methylphenidate  
B. Modafinil  
C. Zolpidem  
D. Amantadine

- Amantadine has the best evidence to accelerate the pace of functional recovery in patients with disorders of consciousness after severe TBI.
- Amantadine can block the multiplying of influenza A virus in the body. In patients with Parkinson's disease and drug-induced movement disorders, amantadine increases the effect of a chemical in your brain called **dopamine**. This helps your body better control your movements.

Criteria	Mild	Moderate	Severe
Structural imaging	Normal	Normal or abnormal	Normal or abnormal
Loss of consciousness	0-30 min	>30 min and <24 h	>24 h
Alteration of consciousness or mental state*	Momentary to 24 h	>24 h	>24 h
Post-traumatic amnesia	0-1 d	>1 and <7 d	>7 d
Glasgow Coma Scale score	13-15	9-12	<9

SYMPTOMS OF TBI	
MODERATE TO SEVERE TBI	MILD TBI
Accounts for 10% of all cases	Accounts for 90% of all cases (based on WHO information)
<b>SYMPTOMS:</b>	<b>SYMPTOMS:</b>
<ul style="list-style-type: none"> <li>• slurred speech</li> <li>• profound confusion</li> <li>• seizures</li> <li>• persistent headaches</li> <li>• coma</li> </ul>	<ul style="list-style-type: none"> <li>• headaches</li> <li>• dizziness &amp; fatigue</li> <li>• sleeping difficulties</li> <li>• memory &amp; concentration problems</li> <li>• blurred vision</li> </ul>

TBI accounts for 80-90% of all TBI cases; TBI accounts for 10-20% of all TBI cases.

- A. Mild / Moderate to Severe  
B. Moderate to Severe / Mild

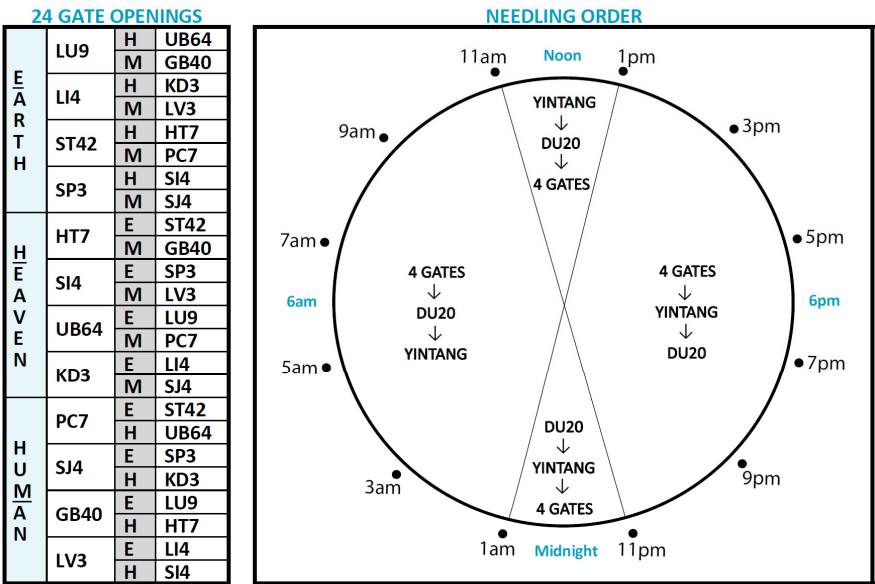
According to the CDC, what is a characteristic of mild traumatic brain injury?

- A. Loss of consciousness <60 minutes  
B. Post-traumatic amnesia <48 hours  
C. GCS 13-15  
D. Caused by blunt injury

- Mild traumatic brain injury is defined by any period of transient confusion, disorientation or impaired consciousness, amnesia around the time of the injury, loss of consciousness lasting <30 minutes, post-traumatic amnesia lasting up to 24 hours, GCS scores of 13-15.
- The nature of the brain injury is not a characteristic used to diagnose mild traumatic brain injury.

**GATE OPENING**

Tong Gi Chim



**4. Great Gate Opening:** A treatment called Great Gate Opening is used in addition to Gate Opening for more severe conditions. Two more needles are added: PC9 on one side, and SJ1 on the other. Note that both the PC and SJ both exist only as functions, not as true physical organs.

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EARTH CIRCUIT								HEAVEN CIRCUIT								HUMAN CIRCUIT							
LU		LI		ST		SP		HT		SI		UB		KD		PC		SJ		GB		LV	

