



Determining brain injury severity

Several indicators are used to make predictions in determining brain injury severity.

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How predictions are made

Physicians look at several indicators to predict the level of a patient's recovery during the first few weeks and months after injury:

- Duration of coma
- Severity of coma in the first few hours after the injury (as measured by the Glasgow Coma Score)
- Duration of post-traumatic amnesia (PTA)
- Location and size of contusions and haemorrhages in the brain

Severity of injuries to other body systems sustained at the time of the TBI. Precise predictions are difficult with TBI, but some generalizations can be made:

- The more severe the injury, the longer the recovery period, and the more impairment a survivor will have once recovery has plateaued.
- Recovery from diffuse axonal injury takes longer than recovery from focal contusions.
- Recovery from TBI with hypoxic (lack of oxygen) injury (e.g. near drowning, strangulation or carbon monoxide poisoning) is less complete than without significant hypoxic injury.
- The need for surgery does not necessarily indicate a worse outcome. For example, a patient requiring the removal of a blood clot may recover as completely as one who never needs surgery. The Glasgow Coma Scale is used to determine the depth of coma.

The length of time a patient spends in a coma correlates to both post-traumatic amnesia (PTA) and recovery times:

- Coma lasting seconds to minutes results in PTA that lasts hours to days; recovery plateau occurs over days to weeks.
- Coma that lasts hours to days results in PTA lasting days to weeks; recovery plateau occurs over months.
- Coma lasting weeks results in PTA that lasts months; recovery plateau occurs over months to years. Post Traumatic Amnesia (PTA) is the gradual process of regaining consciousness after coma.

Individuals in PTA are partially or fully awake, but are confused about the day and time, where they are, what is happening, possibly who they are and they will have problems with memory.

Length of PTA is frequently used as a guide to the severity of brain injury. A commonly used interpretation of the scale involves the following:

General Guide

Severity Category	Mild	Moderate	Severe	Very Severe
Initial GCS	12-15	9-11	3-8	≤1
Duration of PTA	←24 hours	1-7 days	1-4 weeks	→4 weeks



A general finding is that if the PTA stage lasts for more than one week, ongoing cognitive problems can be expected. It is important for the person and the family to be optimistic but realistic about recovery and to develop a better understanding of what is or isn't possible. Some families with a loved one in hospital have likened this to hoping for the best while preparing for the worst.

The Rancho Los Amigos Levels of Cognitive Functioning

Level 1 - No Response: Person appears to be in a deep sleep.

Level 2 - Generalized Response: Person reacts inconsistently and not directly in response to stimuli.

Level 3 - Localized Response: Person reacts inconsistently and directly to stimuli.

Level 4 - Confused/Agitated: Person is extremely agitated and confused.

Level 5 - Confused-Inappropriate/Non-agitated: Person is confused and responses to commands are inaccurate.

Level 6 - Confused-Appropriate: Person is confused and responds accurately to commands.

Level 7 - Automatic-Appropriate: Person can go through daily routine with minimal to no confusion.

Level 8 - Purposeful-Appropriate: Person has functioning memory, and is aware of and responsive to their environment.

Level 9 - Purposeful-Appropriate: Person can go through daily routine while aware of need for stand by assistance.

Level 10 - Purposeful-Appropriate/Modified Independent: Person can go through daily routine but may require more time or compensatory strategies.

NIH Stroke Scale/Score (NIHSS)

The level of stroke severity as measured by the NIH stroke scale scoring system:

- 0 = no stroke
- 1-4 = minor stroke
- 5-15 = moderate stroke
- 15-20 = moderate/severe stroke
- 21-42 = severe stroke

Calculates the NIH Stroke Scale for quantifying stroke severity.

- Level of consciousness
- Ask month and age
- 'Blink eyes' & 'squeeze hands'
- Horizontal extraocular movements
- Visual fields
- Facial palsy
- Left arm motor drift
- Right arm motor drift
- Left leg motor drift
- Right leg motor drift
- Limb Ataxia
- Sensation
- Language/aphasia
- Dysarthria
- Extinction/inattention

You can read more about this system at <https://www.mdcalc.com/nih-stroke-scale-score-nihss>