

# Post-Traumatic Confusional State: Case Definition

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# Case Definition Project

- Confusion Taskforce
- Brain Injury Disorders of Consciousness Interdisciplinary Special Interest Group (BI-ISIG)
- American Congress of Rehabilitation Medicine
- Leadership Team: Mark Sherer, Doug Katz, Yelena Bodien
- Started work 2013

# BI-ISIG DOC Confusion Taskforce Members

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- Matt Doiron
- Brian Greenwald
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- Flora Hammond

# Goals

- Create a clear definition of post-traumatic confusional state (PTCS) that will be helpful for clinical and research applications
- Provide guidance for assessment of PTCS
- Relate the distinction of confused/not confused to differences in functional independence

# Guiding Principles for Mark

- Contribute to the development of a comprehensive understanding of delirium caused by trauma so that this can be compared to deliria caused by other conditions such as anoxia, intracerebral hemorrhage, intoxication, etc.
- Establish PTCS as a Disorder of Consciousness that is an aspect of recovery from TBI similar to Minimally Conscious State, Vegetative State, or Coma

# Possible Courses of Recovery after TBI

- Coma → Vegetative State → Minimally Conscious State → Post-Traumatic Confusional State → Continued Recovery
- Coma → Minimally Conscious State → Post-Traumatic Confusional State → Continued Recovery
- Coma → Post-Traumatic Confusional State → Continued Recovery
- Post-Traumatic Confusional State → Continued Recovery
- Altered consciousness

# Why is PTCS Important?

- Affects clinical management
  - Patient safety
  - Staff safety
  - Participation in care
  - Family distress
- Related to patient outcome
- Prominent aspect of the natural history of TBI recovery
- Conceptual issues in understanding partial consciousness/awareness

# ICD 10 Delirium Criteria

- Clouding of consciousness (awareness, attention)
- Disturbance of cognition (memory, disorientation)
- Psychomotor disturbance (shifts from hypo- to hyper-activity, increased reaction time, increased or decreased flow of speech, enhanced startle)

# ICD 10 Delirium Criteria cont.

- Disturbance of sleep or sleep-wake cycle (insomnia, nocturnal worsening of symptoms, disturbing dreams which may continue as hallucinations)
- Rapid onset and fluctuation of symptoms
- Objective evidence of cerebral or systemic disease

# Case Description

Russell, 1932

- Thus the patient may be drowsy or talkative, docile or aggressive, impudent or irritable. He is never reserved; he may tell you his secrets, may be boastful or affectionate, and may even attempt to bribe his attendants to let him out of bed.

# Case Description

Symond, 1937

- There is profound disorientation in space and time, with a tendency to interpret the surroundings in terms of past experience. There is a defect of perception and inability to synthesize perceptual data. Memory and judgment are grossly impaired. Thought is constantly impeded by perseveration. Disturbance of the speech function is conspicuous. The mood is often elated and there is sometimes a push of talk resembling that seen in hypomanic states.

# Post-traumatic Amnesia (PTA)

INS Dictionary, 1999

- A period of anterograde amnesia in which new memories cannot be consistently made and recalled that follows recovery of consciousness in head injury or other neurological trauma. The duration of PTA is often used as a predictor of the degree of recovery.

# Terms Used by Symonds and Russell to Describe PTA

- Clouded consciousness
- Stuporous
- Restless
- Irritable
- Inability to concentrate
- Defective memory
- Loss of emotional control
- Perseveration
- Impaired judgment
- Disturbed speech
- Mental fatigability
- Disorientation
- Bewilderment
- Fluctuation
- Confusion
- Excited
- Dazed
- Delirium
- Defect of perception
- Elated mood
- Hallucinations/delusions

# PTA vs. Confusion

- Conceptualizing early recovery from TBI as a subtype of delirium highlights the broad range of symptoms seen in early recovery – agitation, fluctuation, decreased level of arousal, etc. and provides an external criterion to compare to.
- Delirium caused by TBI can be compared to deliria caused by other injuries or diseases such as stroke, drug withdrawal, organ failure, etc.

# Confusion Taskforce Work Plan

- Create draft definition of PTCS
- Develop clinical questions to be addressed by literature review
- Conduct systematic review of literature on confusion and PTA in persons with TBI
- Integrate evidence with expert opinion
- Create proposed components of Case Definition
- Vote/revise through Delphi Process
- Finalize Case Definition

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# Draft definition: PTCS

The Posttraumatic Confusional State (PTCS) is a condition of altered consciousness occurring after a traumatic brain injury in which all of the following clinical features are present:

1. Impaired attention (i.e. reduced ability to focus, sustain and shift attention)
2. Impaired episodic memory (i.e. impaired encoding and retrieval of recent experiences)
3. Impaired orientation to person, place, time, and/or situation
4. Fluctuation of the disturbance (i.e., waxing and waning of the specific features above and their severities, individually or collectively)

# Draft definition: PTCS (cont.)

Other features of PTCS commonly co-occur with the above features and may include any of the following:

1. Emotional and/or behavioral dysregulation (i.e., affective lability, irritability, restlessness, agitation, aggression, disinhibition, hypoactivity)
2. Sleep-wake cycle disturbances, including disturbances initiating and maintaining sleep and/or diminished daytime arousal
3. Confabulation
4. Delusions
5. Perceptual disturbances (i.e. illusions and/or hallucinations)

# Draft definition: PTCS (cont.)

The features above are not better explained by another preexisting, established, or evolving neurocognitive disorder, do not occur in the context of a severely reduced level of arousal or awareness (i.e., coma, vegetative state, minimally conscious state), and are not better explained as a direct physiological consequence of another, potentially co-morbid, medical or neurological condition, substance intoxication or withdrawal, or exposure to a toxin or medication.

# Clinical Questions

- What is the phenomenology of PTCS?
- What is the lower boundary of PTCS?
- What is the upper boundary of PTCS?
- Is PTCS “time limited?”
- Do signs of PTCS recover in a particular pattern?
- How does functional status of persons in PTCS differ from persons who are no longer in PTCS?
- What is the pathophysiology of PTCS?

## Literature Search

- Ovid MEDLINE® Database
- 1949- February, 2013
- key words included: confusion, minimally conscious, minimally responsive, delirium, dementia, amnestic, cognitive disorders, psychomotor agitation, posttraumatic...etc

**\*\*1757 abstracts extracted\*\***

# Methods

1. Conducted literature search with key words (e.g., confusion, minimally conscious, minimally responsive, delirium, dementia, amnestic, etc)
2. Reviewed abstracts in teams of 2 volunteers (retained 154 of 1757 abstracts)
3. Reviewed articles of retained abstracts
4. Abstracted data in teams of 2 volunteers from 53 retained articles
5. Created evidence tables
6. Use abstracted data and evidence tables to develop Delphi questions

## Abstract reviews

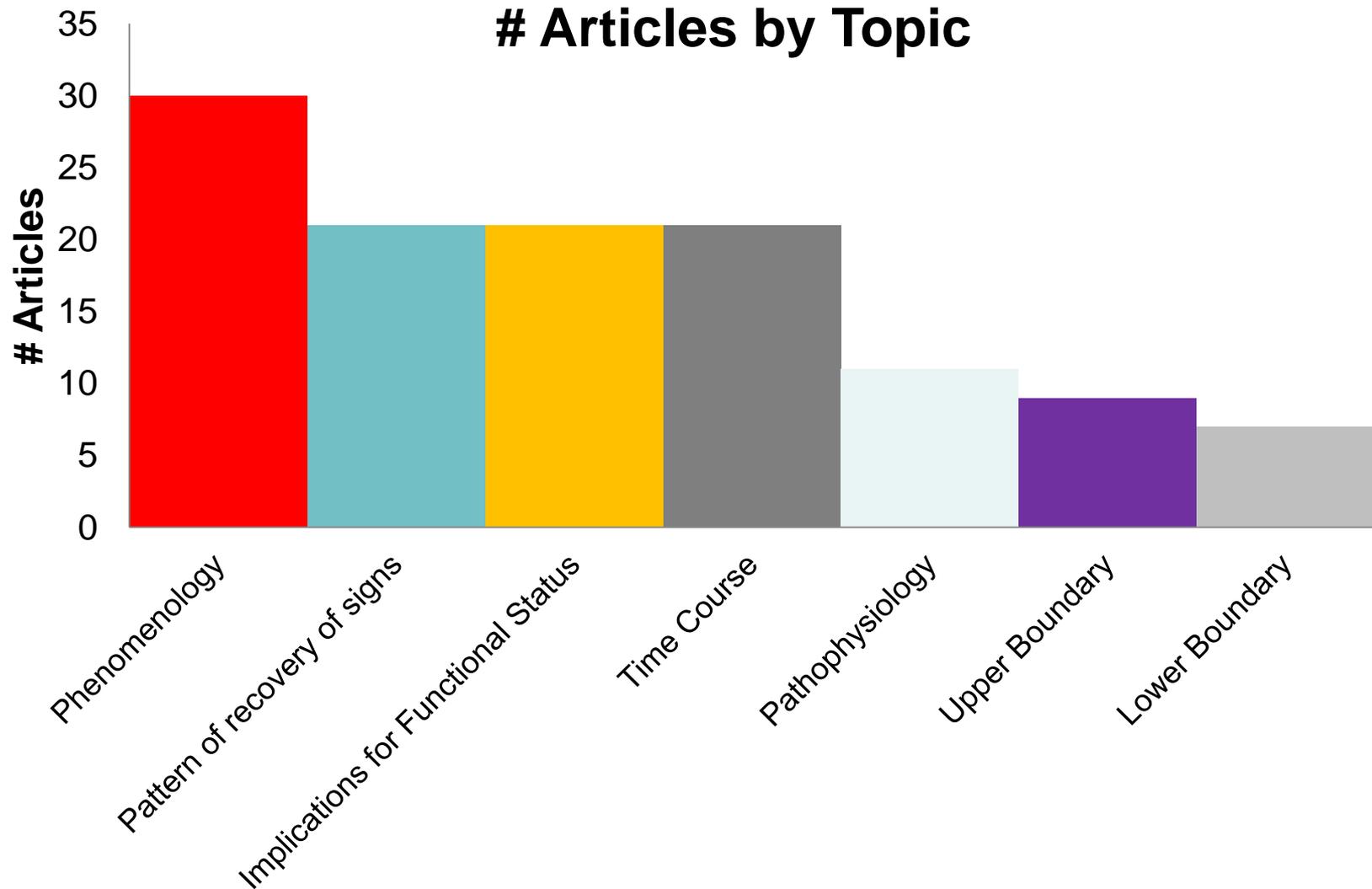
8 teams, 2 reviewers per team (~220 abstracts per team)

### **criteria for abstract to be retained**

The paper presents new empirical findings

- Study is not a case report or small case series ( $n \leq 10$ )
- Findings are relevant to confusion, delirium, or PTA
- Participants sustained TBI
- Pertinent to least one of: (a) phenomenology, (b) course, outcome, prognosis (c) distinction from other clinical states, (d) possible subtypes, (e) neurophysiologic or neuroanatomic causes

# Clinical Questions Addressed



# Sample Evidence: Attention

Reference	Key Finding
Nakase-Richardson, Yablon, Sherer, et al., 2007	91% of patients who met clinical delirium diagnostic criteria (DDC) had an attention impairment on the Delirium Rating Scale-Revised (attention= 0-3 scale from alert/attentive to severe difficulty focusing and/or sustaining attention); 47% who did not meet DDC had attention impairment
Sherer, Yablon, Nakase-Richardson, et al., 2009	In PTCS patients, Cognitive Impairment (per CAP, which mostly assesses attention) is seen in 87% of mild, 95% of moderate, and 100% severe patients at 1st administration in inpatient rehab. Mild= 3-4 symptoms of confusion on CAP, moderate = 5 symptoms, severe =6-7 symptoms
Sherer, Yablon, Nakase-Richardson, et al., 2008	95% of PTCS patients had Cognitive Impairment (per CAP, which mostly assesses attention); ~35% of non-PTCS pts had cog impairment.
Sherer, Nakase-Thompson, Yablon, et al., 2005	90% of patients in PTCS had Cognitive Impairment (per CAP, which mostly assesses attention); ~47% of non-PTCS also had Cognitive Impairment

# Sample Evidence: Attention (con't)

Reference	Key Finding
Weir, Doig, Fleming, et al., 2006	52% of PTA patients were unable to attend to a task for 30mins on initial assessment, 8% had distractibility on initial assessment. (PTA=Westmead; attention/distractability=Behavioral Rating Scale, a subjective, ill-defined behavior scale)
Stuss, Binns, Carruth, et al., 1999	All subjects were initially in PTA and all had attentional impairment on easier attention tasks (PTA=GOAT; attention= counting forward, months forward). In mild TBI, more attention tasks recovered concurrently with recovery of PTA. For moderate/severe TBI, months forward, counting backwards, and continuous performance recovered before or concurrently with orientation and counting by 3's and months backward recovered simultaneously or after orientation. In all cases, easier attention tasks recovered before/with orientation and harder tasks with/after orientation.

# Sample Evidence: Memory

Reference	Key Finding
Kennedy, Nakase-Thompson, et al., Nick, 2003	Patients with delirium perform at the floor on memory subscale of Cognitive Test for Delirium; but memory did not stand out by itself as a unique contributor to predicting delirium; even patients who were not in delirium had memory impairment (visual memory for 5 objects with recognition in field of 10; immediate recall of number of pictures shown on initial exposure)
Schwartz, Carruth, Binns, et al., 1998	Patients with resolved PTA still had word recall impairments; memory for words seems to resolve as PTA resolves

# Sample Evidence: Memory (con't)

Reference	Key Finding
Stuss, Binns, Carruth, et al., 1999	Word recognition (3 words after 24 hours) recovers at about the same time as PTA (per GOAT) but word recall recovers after PTA. Picture recognition recovers at about the same time as PTA in mild/moderate TBI and precedes PTA recovery in severe PTA. Picture recognition/recall recovers before word recall.
McCrea, Kelly, Randolph, et al., 2002	On Standardized Assessment of Concussion, concussed football players scored lower on tests of memory (immediate and delayed) 15 minutes post injury, but not 48 hours (not clear how many were in PTA at 15 minute assessment even in those with PTA and LOC after injury) only N=15 had PTA; very mild patients

# Sample Evidence: Orientation

Reference	Key Finding
Nakase-Richardson, Yablon, Sherer, et al., 2009	Patients who met a clinical diagnosis of delirium were more likely to incorrectly answer simple orientation questions (name, state of residence) than those who were not in delirium
Nakase-Thompson, Sherer, Yablon, et al., 2004	Multivariable linear regression models indicated that lower GOAT scores were associated with a greater likelihood of a clinical diagnosis of delirium
Sherer, Nakase-Thompson, Yablon, et al., 2005	58 of 65 patients classified as confused by the Confusion Assessment Protocol were also disoriented as indicated by GOAT (scores less than 75). Two patients classified as not confused were also disoriented.
Sherer, Nakase-Richardson, Yablon, Nick, 2008	Approximately 95% of 83 patient classified as confused by CAP were disoriented while 0% of 85 patients classified as not confused were disoriented

# Sample Evidence: Orientation (con't)

Reference	Key Finding
Stuss, Bins, Carruth, et al., 1999	When resolution of the post-traumatic confusional state was defined as recovery of the ability to recall 3 of 3 words after a 24 hour delay, 100% of 108 patients with TBI showed recovery of orientation before recovery of 3 word recall
Wilson, Evans, Emslie, et al., 1999	Eight patients with severe TBI judged to be in PTA based on neurosurgeon assessment, obtained poorer orientation scores on 11 items from the Wechsler Memory Scale – Revised than 10 patients with severe TBI judged not to be in PTA by their therapists. Patients in PTA were less than 3 months post-injury while those out of PTA were 6 or more months post-injury

# Sample Evidence: Consistency/Fluctuation

Reference	Key Finding
Nakase-Richardson, Yablon, Sherer, 2007	91% of 78 patients making a clinical diagnosis of delirium showed fluctuation on the Delirium Rating Scale – Revised as compared to only 21% of 93 patients not in delirium
Sherer, Yablon, Nakase-Richardson, 2009	Fluctuation was present for 41 of 41 patients with severe confusion as assessed by the CAP, 28 of 28 patients with moderate confusion, and 37 of 38 patients with mild confusion on initial assessments after admission to rehabilitation
Ewert, Levin, Watson, Kalisky, 1989	11 of 16 patients in PTA by GOAT criteria showed fluctuation in GOAT scores across 4 assessments where fluctuation was indicated by any decrease in GOAT score on a subsequent assessment

# Sample Evidence: Consistency (con't)

Reference	Key Finding
Sherer, Nakase-Thompson, Yablon, et al., 2005	100% of 65 confused patients showed fluctuation as assessed by the CAP as compared to 58% of 28 non-confused patients
Sherer, Nakase-Richardson, Yablon, Nick, 2008	100% of 83 confused patients showed fluctuation as assessed by the CAP as compared to 45% of 85 non-confused patients
Nakase-Thompson, Sherer, Yablon, et al., 2004	59 of 59 patients meeting a clinical diagnosis of delirium met the diagnostic criterion for fluctuating course while 4 of 26 patients not in delirium showed fluctuating course. On the Delirium Rating Scale, 51 of 59 delirious patients were rated as showing fluctuation as compared to 8 of 26 patients not in delirium.

# Integrate Evidence with Expert Opinion

- Evidence informed case definition: does the literature review support or refute aspects of the proposed definition and inform the questions about boundaries, recovery, function and pathophysiology?
- Where evidence is lacking, ambiguous or conflicting, an expert consensus process will be used to finalize the case definition.

# Definition and diagnostic criteria:

The Post-traumatic Confusional State (PTCS) is a condition of disordered consciousness after traumatic brain injury that is characterized by moderate to severe reduction in neurocognitive functioning because of impairments affecting all of the following areas:

**Attention** – Persons in PTCS have reduced ability to focus, sustain, and shift attention.

**Memory** – Persons in PTCS have impaired ability to encode and later recall new memories.

**Orientation** – Persons in PTCS are not fully oriented to place, time, and current circumstances.

**Consistency** of cognition and behavior – Persons in PTCS show fluctuation in performance on a wide range of tasks so that level of cognitive and behavioral capacity varies through the day.

- These four core clinical impairments may vary in severity and improve at different rates as the condition evolves. The apparent presence and severity of these impairments will depend on the methods used to assess them.

In addition to these four key clinical impairments, PTCS can include any of the following:

**Emotional and/or behavioral dysregulation** (e.g., agitation/restlessness, affective lability, irritability, impulsivity, disinhibition, aggression, decreased responsiveness, hypoactivity or reduced range of affect)

**Sleep-wake cycle disturbance** (e.g., excessive sleep, insufficient sleep, alteration of normal sleep pattern, or decreased level of arousal)

**Confabulation**

**Delusions**

**Perceptual disturbances** (e.g., illusions, hallucinations)

Impairments in the core and associated areas are of sufficient severity to limit functional independence and interfere with the individual's ability to cooperate with needed medical care, maintain personal safety, and/or interact effectively with others and the environment.

The core and associated features are not better explained by another preexisting, established, or evolving neurocognitive disorder, medical condition, substance intoxication or withdrawal, or exposure to a toxin or medication.

Suggested criteria for Lower boundary emergence from unconsciousness (coma or VS/UWS) or minimally conscious state (MCS):

The published proposed criteria for emergence from MCS as defined by reliable, basic interactive communication (i.e., ability to consistently and accurately answer 6 basic yes/no questions or appropriately use 2 objects), presently serves as a clinical boundary between unconsciousness (VS/UWS) or minimal consciousness (MCS) and the PTCS.

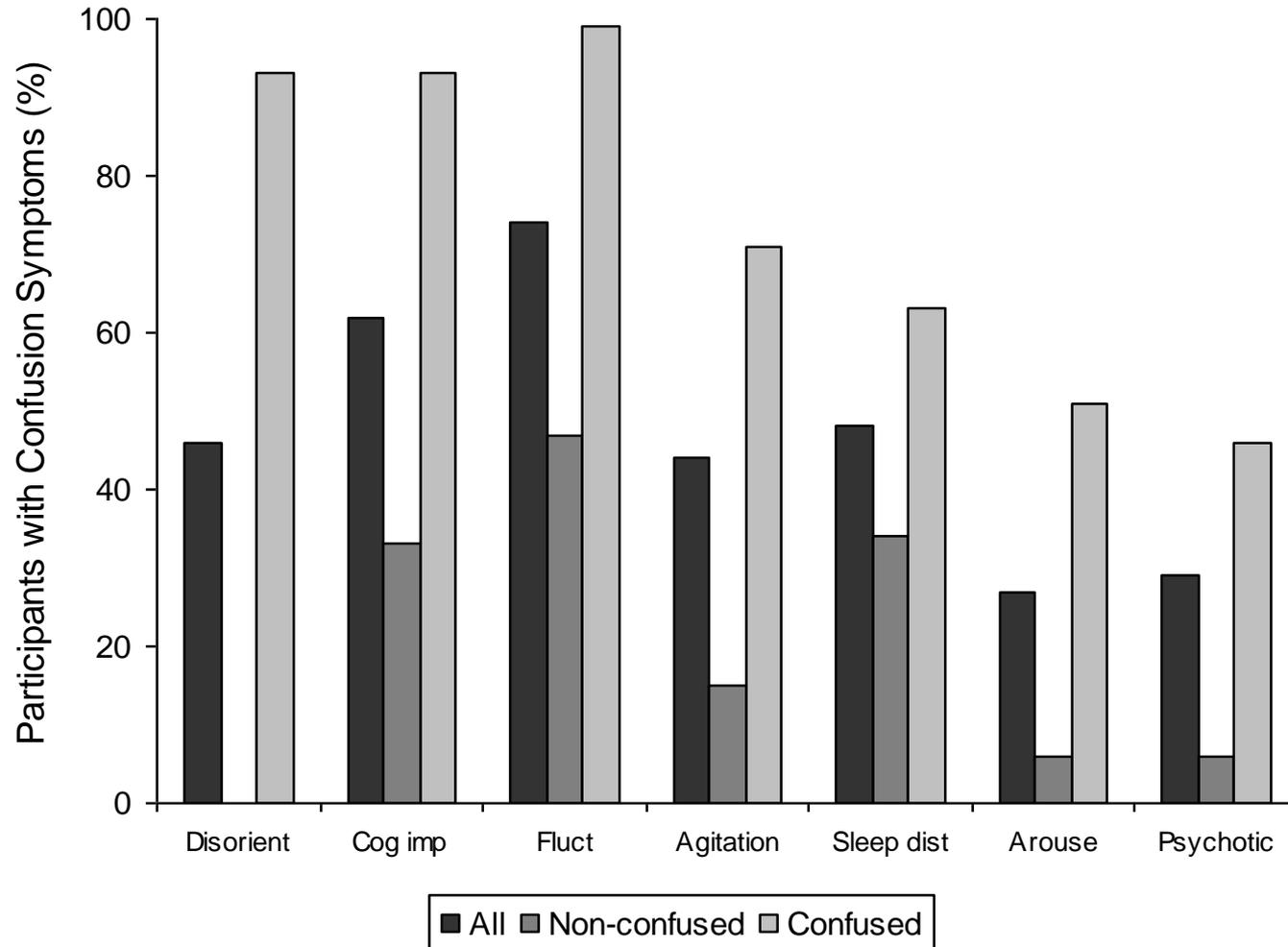
Suggested criteria for Upper boundary –  
emergence from PTCS:

Emergence from PTCS is defined by substantial improvement in the 4 core clinical impairments to the extent that the individual is: oriented in all spheres; able to initiate, sustain and shift attention while engaging in familiar tasks and social interactions; able to retain new information and recall recent experiences; and not displaying excessive variations in cognitive performance and emotional responses.

When PTCS resolves the individual demonstrates adequate awareness to facilitate differential responses consistent with their current situation, setting, personal needs, internal drives, social demands and physical capacity. As a result, the individual will require less intense supervision and cueing to maintain safety and engage in everyday activities.

# Persistent Signs of Confusion

Sherer et al., 2008



# Consensus process

- Delphi Technique:
  - Iterative feedback process
  - Participants receive feedback of the position of the whole group, summation of comments, range of opinions, reasons underlying and the participant's own position.
  - Group tends to converge towards a consensus with each iteration.
  - Consensus achieved when reach a target threshold of agreement (e.g., 80%)