Validation of the Stanford Proxy Test for Delirium (S-PTD)

A New Tool for the Screening of Delirium Based on DSM-5 & ICD-10 Criteria

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- With respect to the following presentation, there has been no relevant (direct or indirect) financial relationship between Dr. Maldonado (and/or spouse) and any for-profit company in the past 10 years which could be considered a conflict of interest.
- Member of the Board of Directors ADS
- President-Elect of the ADS
- President, Senate SoM
- Funding from:
  - NIMH
  - Chase Research Fund (unrestricted)
  - Agency for Healthcare Research and Quality (AHRQ)
  - LAM Foundation Clinical Research Network; U.S. Department of Defense
Delirium Core Diagnostic Characteristics

- Global DISTURBANCE OF COGNITION: Perceptual distortions, impairment of abstract thinking and comprehension, memory impairment, disorientation
- CIRCADIAN RHYTHM: Disturbance of Sleep-Wake Cycle
- EMOTIONAL DYSREGULATION: Irritability, anger, fear, anxiety, perplexity
- PSYCHOMOTOR DISTURBANCE: Delirium phenotype
- Impairment of CONSCIOUSNESS AND ATTENTION: Reduced ability to direct, focus, sustain, and shift attention
Delirium – why should we care?

1. Delirium is the most common psychiatric syndrome found in the general hospital setting. After controlling for age, and medical comorbidities, patients who develop delirium fare much worse than their non-delirious counterparts.

2. One of the six leading causes of preventable conditions in hospitalized elderly patients.
4. **Adverse Long Term Sequelae – Cognitive Impairment**

- After adjusting for age, education, preexisting cognitive function, severity of illness, severe sepsis, and exposure to sedative medications in the intensive care unit:
- Increasing *delirium duration* was an independent predictor of worse *cognitive performance* on neuropsychological testing at 3 and 12 months follow up (*p*=0.02 and *p*=0.03, respectively).
- An *increase* from 1 day of delirium to 5 days was independently associated with a 7 point *decline* in the cognitive battery mean score at 12 months f/u (*p*=0.03)
- Duration of *mechanical ventilation* was not associated with long-term cognitive impairment (*p*=0.20)

*Girard et al. Cric Care Med 2010*
Delirium – why should we care?

4. ↑ Adverse Long Term Sequelae – Cognitive Impairment

**Delirium accelerates cognitive decline in Alzheimer Disease**

- Among those with AD, cognitive deterioration following delirium proceeded at twice the rate in the year after hospitalization compared with patients who did not develop delirium.
- Patients who had developed delirium maintained a more rapid rate of cognitive deterioration throughout a 5-year period following hospitalization.

*Fong et al, Neurology 2009;72:1570–1575*

- Based on > 20 prospective studies of > 5,000 patients within the last 3 decades a **significant association** was found between delirium and long-term cognitive dysfunction.
  - **About 40% of patients with delirium** develop some form of cognitive impairment when followed up about 3 months to 5 years after an episode of delirium.

Delirium – why should we care?

5. ↑ Adverse Long Term Problems – Emotional Sequelae

Systematic review of studies in general ICU settings revealed that:

- up to 27% of ICU survivors suffer from PTSD
- Risk factors included:
  - use of benzodiazepines
  - duration of sedation
  - fear, stress and delirium in the ICU


Nature and content of post-intensive care memories:

- 70% of patients had hallucinatory/delusional intrusive memories, while 12% had factual but no hallucinatory/delusional memories; 18% were uncertain
- The content of intrusive memories commonly merged realistic events with delusions and frightening hallucinations.

Wade et al, Br J Health Psychol. 2014
Delirium – why should we care?

6. ↑ Mortality
   - > 49% of all US hospital days are spent caring for patients with delirium.¹
   - Death: 1 vs. 8%²
   - 90 day mortality 3% vs. 11%³
   - 6-month mortality 15% vs. 34%⁴

![Delirium and Mortality](image)

2. Francis J et al. JAMA 1990;263:1097
3. Pompei et al. JAGS 1994; 42: 809
4. Ely et al 2004
5. Pisani, Am J Resp Crit Care 2009
**Delirium – why should we care?**

7. **↑ Health Care Costs**

- The overall cost is of about 2.5X higher than non-delirious counterparts. \(^1,2\)
- Estimated to occur in >2.3M inpatients/yr = 17.5M inpatients days. \(^3\)
  - Delirium results in increased nursing time per patient, higher per-day hospital costs, and an increased length of hospital stay. \(^4\)
  - A recent study estimated that delirium is responsible an additional cost of $60,000 - $64,000/patient/yr.
    - Thus, total direct 1-year health-care costs attributable to delirium is up to $164 B (USA) and $182 B (Europe). \(^5,6,7\)
- Costs accrue after hospital discharge due to greater need for long-term care or additional home health care, rehabilitation services, and informal caregiving.
  - Lengthened hospital stay: 7 vs. 12 days
  - ↑ nursing home placement: 3 vs. 16% \(^6,8\)
  - The functional decline persisted at 6 months after hospital discharge\(^10\)

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1. Milbrandt et al, CCM 2004
2. Leslie et al, Arch Int Med 2008
3. Rizzo et al, Medical care 2001
7. Ely et al. Int Care Med 2001; 1892-1900
Delirium’s Diagnostic Dilemma
Delirium Phenotypes & Clinical Outcomes

Delirium Precipitant Factors
("End Acute Brain Failure")

Baseline Cognitive & Physical Functioning

Subsyndromal Type

Hypoactive Type

Mixed Type

Hyperactive Type

“Catatonic” Type
(catatonic Retardation)

Restoration of Baseline Impaired Cognitive Functioning

Impaired Cognitive & or Physical Recovery

Persistent Delirium Type

“Excited” Type
(catatonic Excitement)

# Objective Measures for the Diagnosis of Delirium

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<tbody>
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<td>Confusion Assessment Method (CAM) (Inouye et al 1990) (Inouye, Balkin et al. 1990)</td>
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<tr>
<td>Delirium Assessment Scale (DAS) (O’Keeffe 1994) (O’keeffe 1994)</td>
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<td>Neelon and Champagne (NEECHAM) Confusion Scale (Neelon, Champagne et al. 1996)</td>
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<td>Memorial Delirium Assessment Scale (MDAS) (Breitbart et al 1997)</td>
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<td>Delirium Severity Scale (DSS) (Bettin et al 1997) (Bettin 1998)</td>
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<td>Delirium Index (DI) (McCusker et al 1998) (McCusker, Bellavance et al. 1998)</td>
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<td>Intensive Care Delirium Screening Checklist (ICDSC) (Bergeron et al. 2001)</td>
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<td>Delirium Detection Score (DDS) (Otter et al 2005) (Otter, von Heymann et al. 2005)</td>
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<td>Delirium Detection Tool-provisional (DDT-pro) (Kean, Trzepacz et al. 2010)</td>
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<td>bCAM (Han et al, 2013)</td>
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<td>4AT (McLullich, et al 2013)</td>
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<th>DSM-V (“Gold Standard”; APA 2014)</th>
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<tr>
<td>Stanford Proxy Test for Delirium (PTD) (Maldonado, Sher, et al 2014)</td>
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Patient Ability to Participate in cognitive tests or interviews

**Excited delirium**
- Not cognitively testable (too agitated)

**Normal function**
- Cognitively testable
- Range of level of increased arousal

**Hypactive**
- Cognitively testable

**Hypoactive**
- Cognitively testable

**Catatonia/Coma**
- Not cognitively testable (too drowsy/unresponsive)

Maldonado; Crit Care Clin, 2017:33(3)
Rationale

• This may partly be due to the reliance of these validated tools on the patient's report of symptoms and their (in)ability to engage in active participation on the delirium screening tool itself.

• Instead, a screening tool relying on the observations of nursing staff could potentially provide a more accurate assessment of patient symptoms.

• “the low sensitivity of the CAM-ICU in routine, daily practice may limit its use as a screening test” (Neto et al., 2012).
**Delirium Diagnostic Criteria**

**DSM V**

A. Disturbance in attention (i.e., reduced ability to direct, focus, sustain, and shift attention) and awareness (reduced orientation to the environment).

B. The disturbance develops over a short period of time (usually hours to a few days), represents a change from baseline attention and awareness, and tends to fluctuate in severity during the course of a day.

C. An additional disturbance in cognition (e.g., memory deficit, disorientation), language, visuospatial ability, or perception that is not better explained by a preexisting, established, or other evolving neurocognitive disorder.

D. The disturbances in Criteria A and C are not better explained by another preexisting, established, or evolving neurocognitive disorder and do not occur in the context of a severely reduced level of arousal, such as coma.

E. There is evidence from the history, physical examination, or laboratory findings that the disturbance is caused by the physiological consequence of another medical condition, substance intoxication or withdrawal (i.e., due to a drug of abuse or to a medication), or a toxin exposure, or is due to multiple etiologies.

**ICD–10**

Symptoms, mild or severe, should be present in each one of the following areas:

A. Impairment of consciousness and attention, on a continuum from clouding to coma (e.g., reduced ability to direct, focus, sustain, and shift attention);

B. Global disturbance of cognition (e.g., perceptual distortions, illusions and hallucinations - most often visual; impairment of abstract thinking and comprehension, with or without transient delusions, but typically with some degree of incoherence; impairment of immediate recall and of recent memory but with relatively intact remote memory; disorientation for time as well as, in more severe cases, for place and person);

C. Psychomotor disturbances (e.g., hypo- or hyperactivity and unpredictable shifts from one to the other; increased reaction time; increased or decreased flow of speech; enhanced startle reaction);

D. Disturbance of the sleep-wake cycle (e.g., insomnia or, in severe cases, total sleep loss or reversal of the sleep-wake cycle; daytime drowsiness; nocturnal worsening of symptoms; disturbing dreams or nightmares, which may continue as hallucinations after awakening);

E. Emotional disturbance (e.g. depression, anxiety or fear, irritability, euphoria, apathy, or wondering perplexity).

The onset is usually rapid, the course diurnally fluctuating, and the total duration of the condition less than 6 months.
**Stanford Proxy Test for Delirium (S-PTD)**

**Development**

- Our team combined DSM-V & ICD-10 criteria and developed highly technical choice items to address every aspect of the diagnostic criteria.

- Conducted focused groups and cognitive testing sessions to obtain nurses’ feedback, allowing the nurses to re-write the descriptive items using language that is more akin to how nurses would describe a given patient’s behavior.

- Thus, the final version of S-PTD was written by nurses, for nurses.

## Proxy Test for Delirium (PTD)

Maldonado, et al. 2013 Psychosomatic Medicine Service, Stanford University School of Medicine

<table>
<thead>
<tr>
<th>Instructions – Using the provided scoring card, please grade as “0” = “not at all”, “1”=sometimes, “2”=most of the time, based on observations made during the preceding nursing shift and information provided by previous nursing staff &amp; family DURING THE PRECEDING 24 HRS.</th>
<th>Not at ALL</th>
<th>SOME TIMES</th>
<th>MOST of the time</th>
</tr>
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</table>
| **1. During your shift, has your patient experienced difficulties with attention:**  
For example:  
\(\text{a. Trouble maintaining focus when you ask questions or provide directions?}\\  
\text{b. Easily distracted during conversations?}\\  
\text{c. Easily distracted from tasks requiring attention (e.g., filling out the menu)}\) | 0 | 1 | 2 |
| **3. During your shift, has your patient experienced difficulties with memory:**  
For example:  
\(\text{a. Forgetting why he/she was admitted to the hospital?}\\  
\text{b. Forgetting daily events such as visitors, meals, procedures, etc.?}\\  
\text{c. Forgetting the identities/roles of primary team and staff members?}\) | 0 | 1 | 2 |
| **8. During your shift, has your patient experienced difficulties with perceptions:**  
For example:  
\(\text{a. ILLUSIONS, (e.g. believing that objects in the room are something else, or misinterpreting sounds/spoken language that he/she hears?)}\\  
\text{b. Auditory and/or visual HALLUCINATIONS (e.g., picking at "stuff" in his skin or sheets, grabbing/pointing at imaginary objects, having conversations with people not present in the room?)}\) | 0 | 1 | 2 |
| **11. During your shift, has your patient had changes in sleep pattern?**  
For example:  
\(\text{a. Experienced insomnia?}\\  
\text{b. Demonstrated excessive daytime somnolence which is clinically significant and impairing daily function?}\\  
\text{c. Has your patient experienced extremely vivid and disturbing dreams during the daytime?}\\  
\text{d. Talking about events from sleep/dreams as if they had actually occurred?}\) | 0 | 1 | 2 |
Stanford Proxy Test for Delirium (S-PTD)

- The S-PTD incorporates DSM-5 and ICD-10 diagnostic criteria.
- The instrument was developed in collaboration with members of the nursing staff who assisted in the development of test items prompts.
- The S-PTD eliminates the need of direct patient participation in the assessment.
  - instead, nurses complete the tool at the end of their shift; thus using the full shift patient interaction to gather the information needed to accurately diagnose delirium.
Stanford Proxy Test for Delirium (S-PTD)

• Methods:
  – Conducted at SHC on units housing Neurology, Neurosurgery & General Medicine patients over 3-mo.
  – Enrolled patients were separately & blindly screened for symptoms of delirium utilizing the:
    • PTD (primary nurse) at the end of their shift (end 10-12 hrs shift)
    • Confusion Assessment Method (CAM) (research assistant)
    • A clinical neuropsychiatric evaluation based on DSM-5/ICD-10 criteria (performed by Psychosomatic Medicine specialist - gold standard)
      – All exams administered within 60 min from each other.
  – The study was approved by the Stanford’s IRB Committee

Stanford Proxy Test for Delirium (S-PTD)

• Results:

- Average age: 59.9 years (standard deviation 19.5)
- Range of 18 – 98 yrs of age
- 54.5% were male.
- Indications for admission included brain surgery, spinal surgery, cerebral vascular accidents, cardiovascular diseases, seizures, gastrointestinal dysfunction, fever, infection, and pulmonary diseases.
- A total of 37 patients (17.3% of the sample) developed delirium, as captured by the gold standard, a neuropsych assessment based on DSM-5/ICD-10 criteria.
Stanford Proxy Test for Delirium (S-PTD)

• Results:

• using a cut-off score of ≥4

Psychometric Qualities:

- Sensitivity: 79.0%
- Specificity: 90.8%
- Positive predictive value: 70.0%
- Negative predictive value: 94.1%.

Stanford Proxy Test for Delirium (S-PTD)

Results:

- PTD performed just as well as CAM in identifying delirium, with a McNemar's Test P-Value of 0.739.
- However, PTD took less time to administer:
  - After an initial training period of 2 weeks, it took the average nurse < 1 min to complete the questionnaire (vs 5 min for CAM or 3–5 min for 3D-CAM).
  - Nurses reported that PTD was “easier to use” than CAM, "liking" the PTD better than CAM, and being “more willing to complete” the PTD than CAM.
Stanford’s Algorithm For Predicting Delirium (SAPD)

Maldonado, et al 2017, study underway
Validation of the Stanford Proxy Test for Delirium (S-PTD)

A New Tool for the Screening of Delirium Based on DSM-5 & ICD-10 Criteria

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American Delirium Society
8th Annual Meeting
Westin St. Francis Hotel
San Francisco, California
June 10-12, 2018