



# Disorders of Consciousness Scale (DOCS): Administration and Clinical Application



# Cyber Seminar Speakers

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# Polling Question

- Who is in the audience?
  - OT
  - PT
  - Speech Pathologist
  - Nurse
  - Physiatrist
  - Neurologist
  - Researcher
  - Administrator
  - Other

# Polling Question

- Do you have experience evaluating patients in states of disordered consciousness?
  - Yes
  - No

# What setting do you work in?

- Acute Inpatient Rehabilitation
- Skilled Nursing Facility
- Long Term Acute Care Hospital
- Home Health
- Acute Care
- Outpatient Clinic
- Long Term Care Facility
- VA PRC
- VA PNS
- VA CBOC
- VA Other
- Non-VA Other

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- The authors including Dr. Theresa Pape nor their spouses have any financial or other relationship with any company who produces products or services related to the conduct of the DOCS research
- While specific equipment and material goods may be used in the conduct of the DOCS research, the authors do not endorse any specific commercial product or manufacturer

# Cyber Seminar Training Objectives

Audience members will become familiar with:

- The Disorders of Consciousness Scale (DOCS); An evaluation tool for persons with disordered consciousness
- How to use the DOCS to develop and refine treatment plans according to an individual patient's level of neurobehavioral functioning
- How to use the DOCS to inform prognoses for recovery of consciousness for individual patients
- Current research findings and how to apply that information to planning patient resources, caregiver education & adjustment

# Intended Clinical Audience

- Any allied health professionals interested in neurobehavioral evaluation of patients in states of disordered consciousness.
  - Nurses
  - Speech-Language Pathologists
  - Occupational Therapists
  - Physical Therapists
  - Neuropsychologists
  - Psychiatrists
  - Neurologists



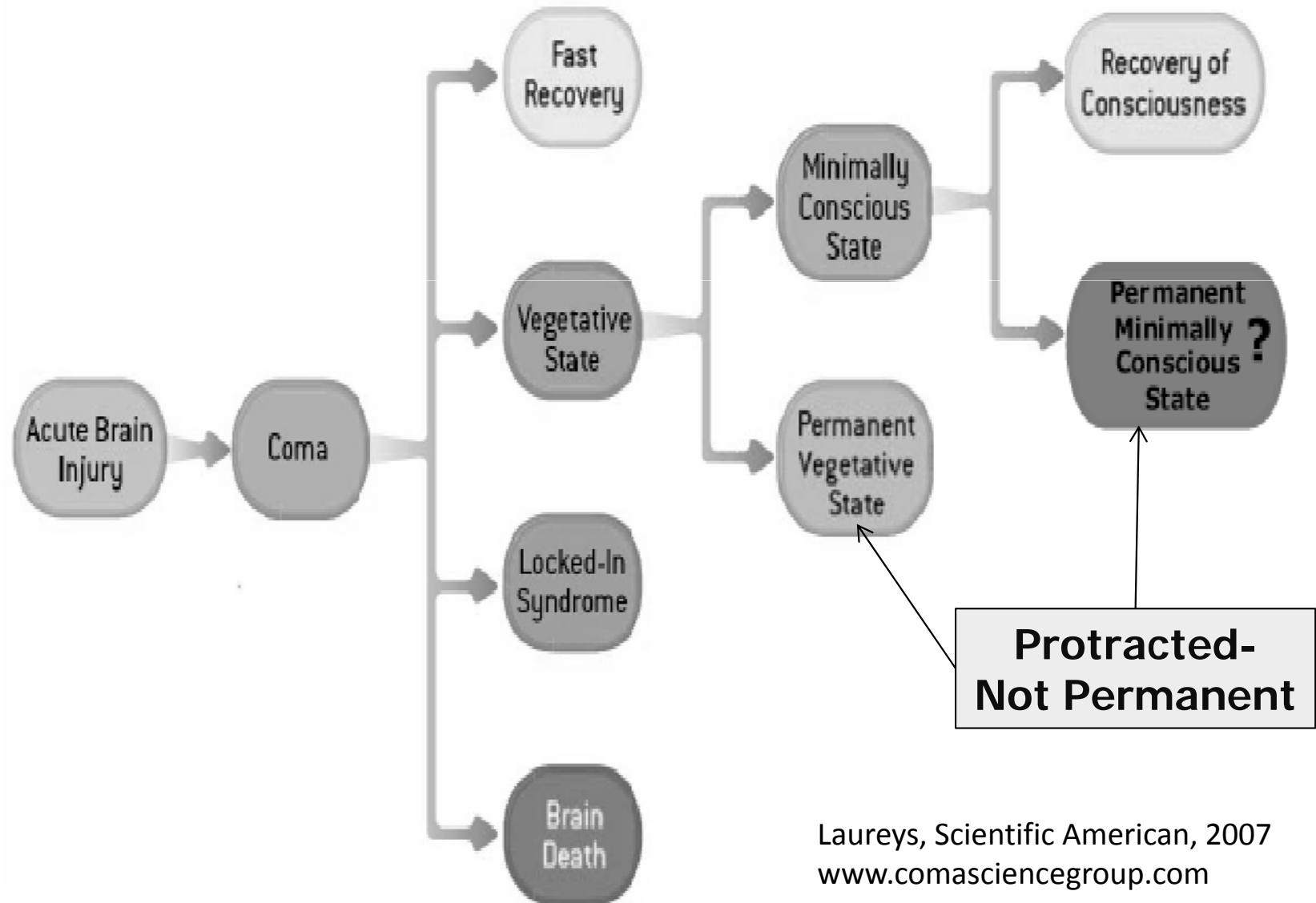
# Outline

- Characterize and describe severe traumatic brain injury according to impact, consequences and levels of disordered consciousness
- Provide an overview of an evaluation tool: The Disorders of Consciousness Scale (DOCS)
- Outline Goal Setting & Documentation of Progress
- Discuss the current State of the Science

# Severe Traumatic Brain Injury

- Incidence of Severe TBI is About 1% of all TBIs for civilian, military and Veteran population; Illustrative citations:
  - US civilian population  $\approx$  14 per 100,000 new TBIs (E-Medicine.com)
  - Joint Trauma Theater Registry (JTTR), 03 – 07, 604 new Isolated Severe TBIs (DuBose, 2011 *J of Trauma*)
- Average life span of a person living in a protracted state of disordered consciousness is  $\approx$  10 years. (Ansell, 1989)
  - JTTR: Mortality Outcomes are better in the military medical system relative to civilian data (DuBose, 2011 *J of Trauma*)
- Persons who suffer a severe TBI continue to make gradual improvements in function for at least 10 years post-injury. (Sbordone, 1995)
- Lifetime costs for medical care of persons living in protracted states of disordered states of consciousness range from \$600,000 to \$1.8 Million per person. (NIH Consensus Development Panel, 1999)

# Consequences of Severe BI



# Comatose

- A state of unarousable neurobehavioral responsiveness
- No evidence of eye opening either spontaneous or in response to stimulation
- Do not follow commands, demonstrate volitional behavior, nor verbalize/mouth words
- Pathology: Bilateral hemispheric or Brain Stem (midbrain and pons) injury

Plum & Posner, 1980, Diagnosis of Stupor & Coma

# Vegetative State (VS)

- State of arousal without behavioral evidence of awareness of self or capacity to interact with the environment
- Wakefulness (spontaneous or stimulus induced) is preserved
- Pathology: Common feature is diffuse damage to white matter of the cerebral hemispheres and/or thalamus

Adams, 2000 *Brain* 123: 1327-38

Jennett, 1972 *Lancet* 1:734-37.



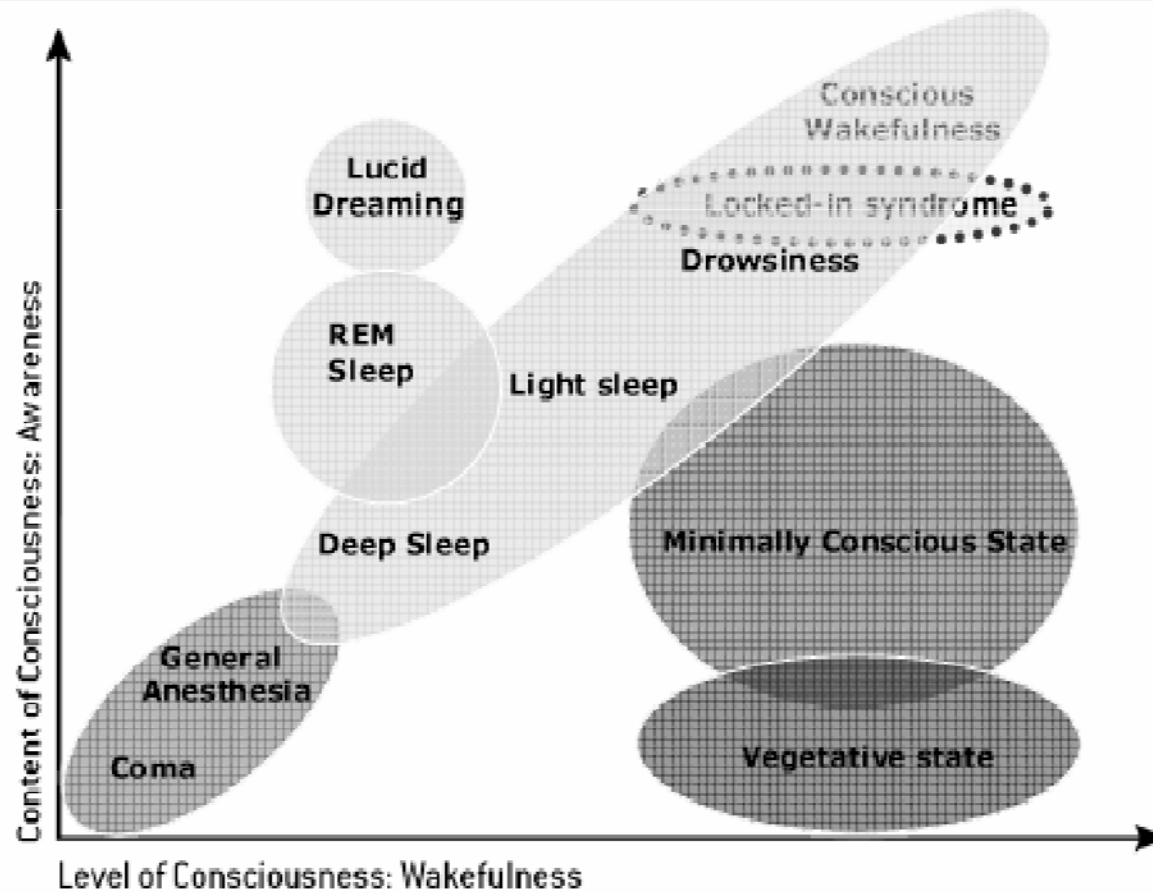
# Minimally Conscious State (MCS)

- A condition in which minimal but definite behavioral evidence of self or environmental awareness is demonstrated
- Inconsistent occurrence of :
  - Following simple commands
  - Gestural or verbal “yes/no” response
  - Intelligible verbalizations
  - Movement or affective behaviors that occur in relation to relevant environmental stimuli and not reflexive
- Pathology: Being investigated

- Giacino J. *Neurology*. 2002;58(3):349-353

Schiff, 2005, 64 (3) 514-523

# Consciousness



Laureys, *Trends in Cognitive Sciences*, 2005

[www.comascience.org](http://www.comascience.org)

# Recovery of Full Consciousness (Emerge from MCS)

- Pape Lab Research Definition:
  - Reliable and consistent demonstration of one of the following:
    - Functional interactive communication
    - Functional use of one or more objects
    - Behavioral manifestation of a sense of self in the environment
      - Examples
  - Higher level Cognitive Testing Indicated



# Polling Question

- Have you administered the Disorders of Consciousness Scale?
  - Yes
  - No

# Polling Question

- What other neurobehavioral scales for this population do you use?

Open ended

# What should Clinicians get from a Neurobehavioral Evaluation for this population?

- Capacity to monitor recovery using repeated measures over an extended period of time:
  - Detects subtle changes in neurobehavioral functioning
  - Reliability, validity and precision over time
- Capacity to determine intervention effects:
  - Detect a short term effect using single subject designs in daily clinical practice
  - Clinical Trials
  - Reliability, validity and precision over time
- Evidence to:
  - Inform clinical decisions during and after acute rehabilitation
  - Share with families and caregivers
  - Inform short and long term prognoses of meaningful outcomes
    - Meaningful to who?
- Diagnosis if it will influence treatment plans and prognoses

# Polling Question

- What decisions are you making on behalf of persons living in states of disordered consciousness?
  - Open ended

# Polling Question

- What evidence/information would inform and guide these decisions?
  - Open ended

# Disorders of Consciousness Scale (DOCS)

- First Step: Develop the DOCS to detect subtle changes in observable indicators of neurobehavioral functioning to:
  - Measure Neurobehavioral Functioning with the capacity to know the precision/accuracy of the measure
  - Measure Changes in Neurobehavioral Functioning as a descriptor of recovery as well as in response to interventions
  - Predict short and long term outcomes

# DOCS Reliability & Validity: 2001 - 2004

Given a 2 hour training (Interactive lecture) & 1 Practice session:

- Inter-rater reliability between disciplines – high level of agreement
- Rating Scale: Functioning as theorized
- Rater reliability = .93 (*2011 final report*)
- No rater bias over time (weekly for 6 weeks)
- No item bias over time (weekly for 6 weeks)
- Rater severity & leniency by discipline does not bias DOCS measures

**Source:** Pape T, et al. *Journal of Rehabilitation Research and Development*. 2005;41:1-18

# DOCS Validity: 2004 - 2007

- Construct Validity: 23 of 34 test stimuli remain stable over time with no floor or ceiling effect
- Targeting of Items to Population
- Dimensionality
- Preliminary Predictive Validity (73% - 77% accuracy using baseline DOCS)

**Source:** Pape T, et al. *Journal of Rehabilitation Research and Development*. 2005;41:1-18

- Predictive Validity: DOCS measures obtained within 94 days of injury predicted recovery of full consciousness up to 1 year after injury with 75% to 91% accuracy (using DOCS change)

**Source:** Pape T et. al. *Physical Medicine & Rehabilitation*, 2009; 1:2, 152-161



# Recently completed Research: 2008 - 2011

- Confirmatory psychometric study
  - Update will be out in 2012
- Rater Severity & Leniency
  - 2012
- MCID
  - 2013
- Diagnostic Validity
- Predictive Validity
  - Consciousness (2012)
  - Function
    - Expression of Needs Under Review
    - Other functions: Pape et al 2006 *Brain Injury*

# DOCS

- Baseline Observation Protocol
- 23 Test Stimuli/Items
- 3 Point Rating Scale
  - 0 = No Response; Response does not differ from baseline behavior
  - 1 = General Response
  - 2 = Localized Response; Response IS contextually related to the test stimuli
- Elicit and Score Best Responses
  - Best response profile

# 23 Test Stimuli

- **Social Knowledge**

- Greet

- **Taste and Swallowing**

- Juice
- Massage

- **Olfactory**

- Odor

- **Proprioceptive/Vestibular**

- Joint

- **Tactile**

- Air
- Feather
- Hair
- Toe
- Hand (Arm Massage)
- Scrub
- Swab
- Cube



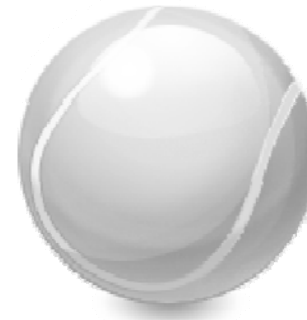
- **Auditory**

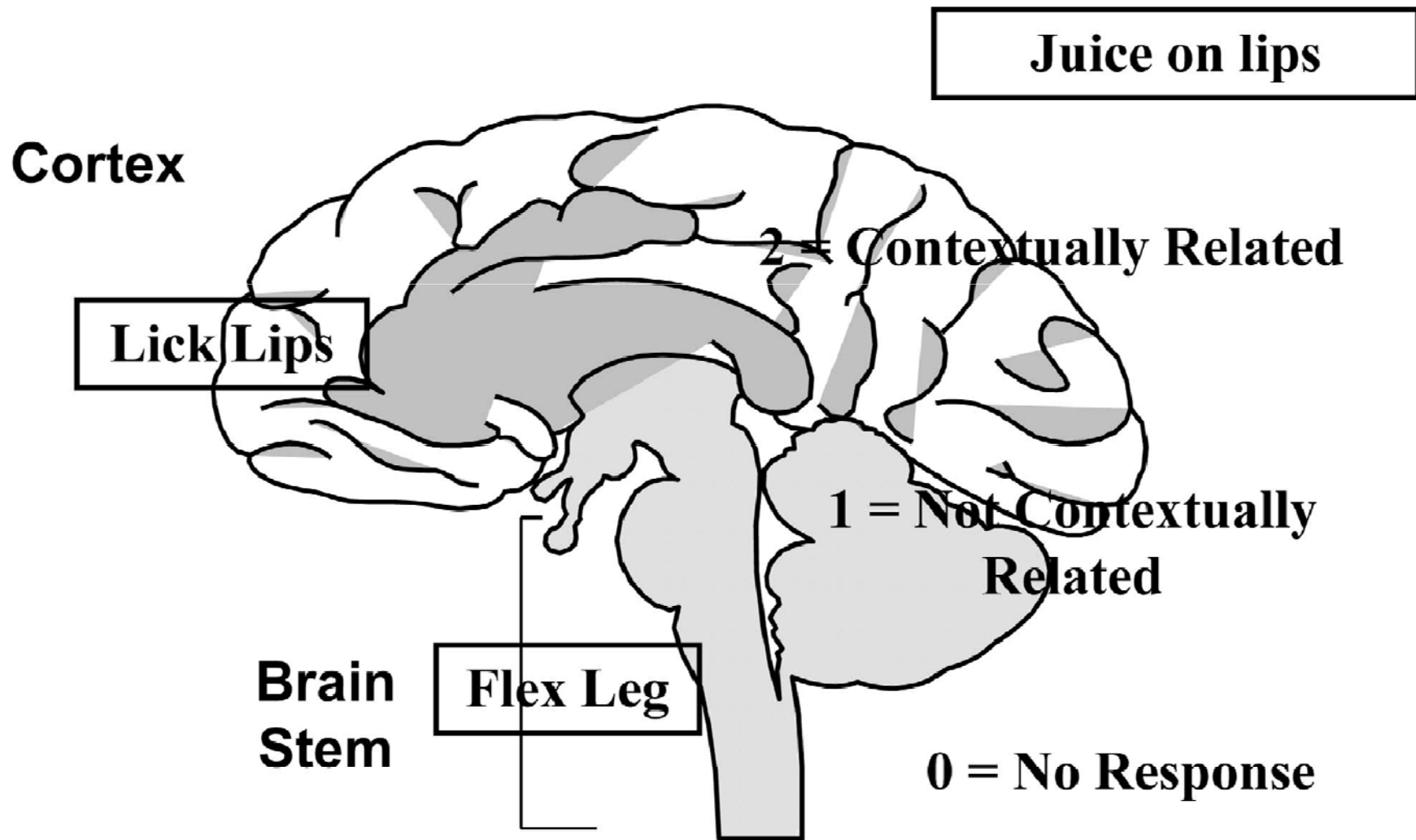
- Whistle
- Clap
- Name
- Bell
- Command



- **Visual**

- Blink
- Focus
- Tracking Objects
- Tracking Familiar Faces
- Focus Familiar Face





# No Response

- No active movement or vocalization following the presentation of the stimuli
- Response to stimuli does not differ from behavior observed during baseline observation

# Generalized Responses

- A general response is NOT predictable
- Is not contextually related to test stimuli, but is different from baseline behavior
- Form B contains several examples, but should NOT be considered:
  - An all inclusive list
  - A “recipe”
  - Always use your clinical judgment

# Examples of Generalized Responses (GR)

- If different from baseline, then the following could be examples of Generalized Responses:
  - Reflexes differing from reflexes observed at baseline
  - Changes in respiration
  - Changes in Tone (Increase/Decrease)
  - Muscle tensing or other movements unrelated to the area stimulated

# GR Examples (cont...)

- If different from baseline, then these could also be examples of GR:
  - Unrelated vocalizations
  - Blinking that deviates from baseline
  - Deviation in blood oxygen levels from baseline range
  - Deviation in heart rate from baseline range
  - Eye opening



# Localized Responses

- A response, not observed at baseline, that is contextually related to the test stimuli
- The response reflects an ability of the patient to regulate incoming sensory information, that is constantly changing, and to control their motoric responses to the sensory input

# Examples of Localized Responses

- If different from baseline, then the following could be examples of Localized Responses:
  - Orienting or localization movements toward the sound
  - Vocalization or response indicating subjects comprehension of a greeting

# Generalized versus Localized

- If the differentiation between a GR and a LR is unclear, then follow this guideline:
  - A localized, response is a response that is contextually related to the stimulus provided
  - The production of a localized response requires ongoing regulation of incoming stimulation and an ability to voluntarily control the response to the stimulation
  - Localized responses occur in relationship to the area stimulated and these responses are not attributable to reflexic activity

# Summary of Rating Scale

- No Response = 0
  - No active movement or vocalization in response to stimuli;  
OR no change in response from baseline
- Generalized Response = 1
  - Response is not contextually related to test stimuli but is different from baseline behavior
- Localized Response = 2
  - Response, not observed at baseline, that is contextually related to test stimuli

# Optimal Testing Environment = Environment that elicits best responses

- Post “Do Not Disturb” sign
- Close the door
- Eliminate unpredictable noises (e.g., TV, radio, intercom, phone)
- Diminish bright lights (e.g., close or partially close blinds if sunlight is exceptionally bright)
- Avoid inadvertent tactile & auditory stimulation
- Rule out visual impairments for Testing Readiness
- Re-position throughout the test as needed
  - See positioning procedures & guidelines in DOCS manual



# Baseline Observations

- A behavioral baseline against which subsequent change can be measured
- Determines the level of neurobehavioral functioning associated with each response to the test stimuli
- Critical to accurate measurement
- Double check the testing environment after completing the Baseline Observation



# Evaluation Session

- 23 Test Stimuli
  - 40-60 minutes
  - Two 20-30 minute sessions
    - 24 hours
    - Baseline observations are completed each time

# Administration and Scoring General Guidelines

- 23 Test Stimuli (other items are research items)
- Scoring Forms
  - B = Long Form
  - A = Short Form
- Apply each stimulus for 5 seconds
- Observe for 10-15 seconds after administering a test stimuli and wait 30-60 seconds prior to administering the next test stimulus



# Administration and Scoring Guidelines (cont...)

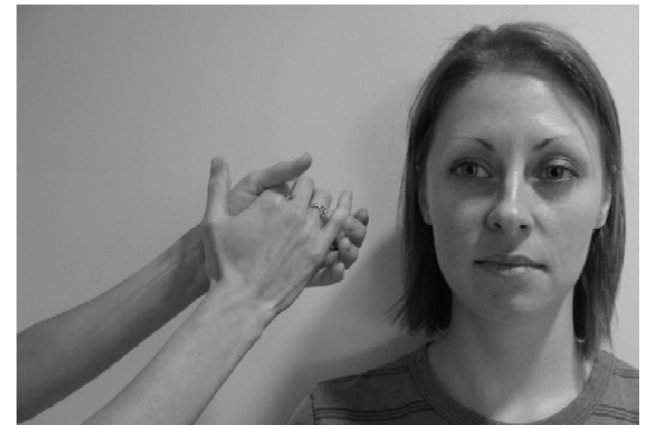
- The number of times each stimulus is administered/repeated is determined via clinical judgment
- Always score the best response. If a 2 is not scored, then repeat administrations on other side of body (bilaterally)
- Specific directions for test administration of each item is provided in the DOCS Training Manual and DVD

# Auditory Item Examples

Whistle: Blow whistle sharply and loudly one time behind ear



Clap: Clap hands sharply and loudly one time behind ear



Name: Call out patient's name (first name, last name, or nickname); if repeating this stimuli then be sure to vary the inflection and loudness with each repetition

# Visual Item Examples

Focus Object: Hold 3-dimensional object in a visual field approximately 18 inches from face

Track Object: Present object in the left visual field, slowly move object right, cross midline (horizontal); if score of 2 is not given, then repeat moving right to left

- If a score of 2 is still not given then test vertical tracking by presenting object in middle visual field, slowly move object upward
- You can start with vertical and end with horizontal



# Conversion of Raw Scores and Interpretation

- ▶ Converting Total Raw Scores to Total DOCS Measures
- ▶ Interpretation of DOCS Measures
- ▶ Converting DOCS Modality Raw Scores to Modality Measures.
- ▶ Interpretation of Modality Measures

**DOCS Scoring Table for the 23 Reliable and Valid Items Reported in Pape (2005)\***

**Instructions:** Transfer best scores from scoring form to this form and add total DOCS score. Use the appropriate conversion chart to convert Total DOCS Raw Score to DOCS Measure. If items were skipped write skipped in the cell and do not add it in the total. The scores can be converted to a measure if items are skipped and therefore not included in the total score.

Item #**	DOCS Test Item	Best Raw Score 1 <sup>st</sup> Evaluation	Best Raw Score 2 <sup>nd</sup> Evaluation	Best Raw Score Evaluation	Best Raw Score Evaluation
C1	1. GREET				
S1	2. JUICE				
S2	3. MASSAGE (Masseter)				
O1	4. ODOR				
PV1	5. JOINT				
T1	6. AIR				
T2	7. FEATHER				
T3	8. HAIR				
T4	9. TOE (Vibration)				
T5	10. HAND (Massage)				
T6	11. SCRUB				
T7	12. SWAB				
T8	13. CUBE				
A1	14. WHISTLE				
A2	15. CLAP				
A3	16. NAME				
A5	17. BELL				
A6	18. COMMAND				
V3	19. BLINK				
V4	20. FOCUS (On Objects)				
V5	21. TRACKING (Objects)				
V7	22. TRACKING (Familiar Face)				
V8	23. FOCUSFAC (Familiar Face)				
<b>TOTAL DOCS RAW SCORE</b>					
<b>DOCS Measure (Obtained from Appropriate Conversion Chart)</b>					

\* Pape, T. L.-B., Heinemann, A., Kelly, J.P., Hurder, A. G, Lundgren, S. (2005). A Measure of Neurobehavioral Functioning after Coma-Part I: Theory Reliability and Validity of the Disorders of Consciousness Scale. *Journal of Rehabilitation Research and Development*, Jan/Feb, 42 (1) 1-18.

\*\* Item numbers correspond with numbers in Table 3, page 10 of Pape (2005)

# Conversion of Total DOCS Raw Score to Total DOCS Measure

- ▶ Refer to Conversion Tables in Training Manual
- ▶ Calculation of Raw Score
  - Add scores of 23 items
  - What if items are skipped?
- ▶ Conversion of Raw Score to DOCunit
  - Closed Head Injury vs. Other Brain Injury
- ▶ What does this mean?

Conversion Table for Closed Head Injuries			
DOCS Raw Score	DOCunit	Standard Error	Percentile
0	5.0	18.2	1
1	16.8	9.9	1
2	23.5	6.9	3
3	27.4	5.7	4
4	30.2	4.9	6
5	32.4	4.4	7
6	34.1	4.1	9
7	35.7	3.8	12
8	37.0	3.6	13
9	38.3	3.4	15
10	39.4	3.3	16
11	40.4	3.2	19
12	41.4	3.1	21
13	42.3	3.0	22
14	43.2	2.9	25
15	44.0	2.9	28
16	44.8	2.8	30
17	45.6	2.8	33
18	46.3	2.7	37
19	47.1	2.7	41
20	47.8	2.7	43



21	48.6	2.7	44
22	49.3	2.7	47
23	50.0	2.7	49
24	50.7	2.7	51
25	51.4	2.7	54
26	52.2	2.7	56
27	52.9	2.7	59
28	53.7	2.7	62
29	54.4	2.8	66
30	55.2	2.8	70
31	56.0	2.9	72
32	56.8	2.9	73
33	57.7	3.0	76
34	58.6	3.1	79
35	59.6	3.2	81
36	60.6	3.3	83
37	61.8	3.4	84
38	63.0	3.6	85
39	64.3	3.8	87
40	65.9	4.1	90
41	67.6	4.4	92
42	69.8	4.9	93
43	72.6	5.7	95
44	76.5	6.9	97
45	83.1	9.9	98
46	95.0	18.2	99

# Clinical Application of DOCS Results

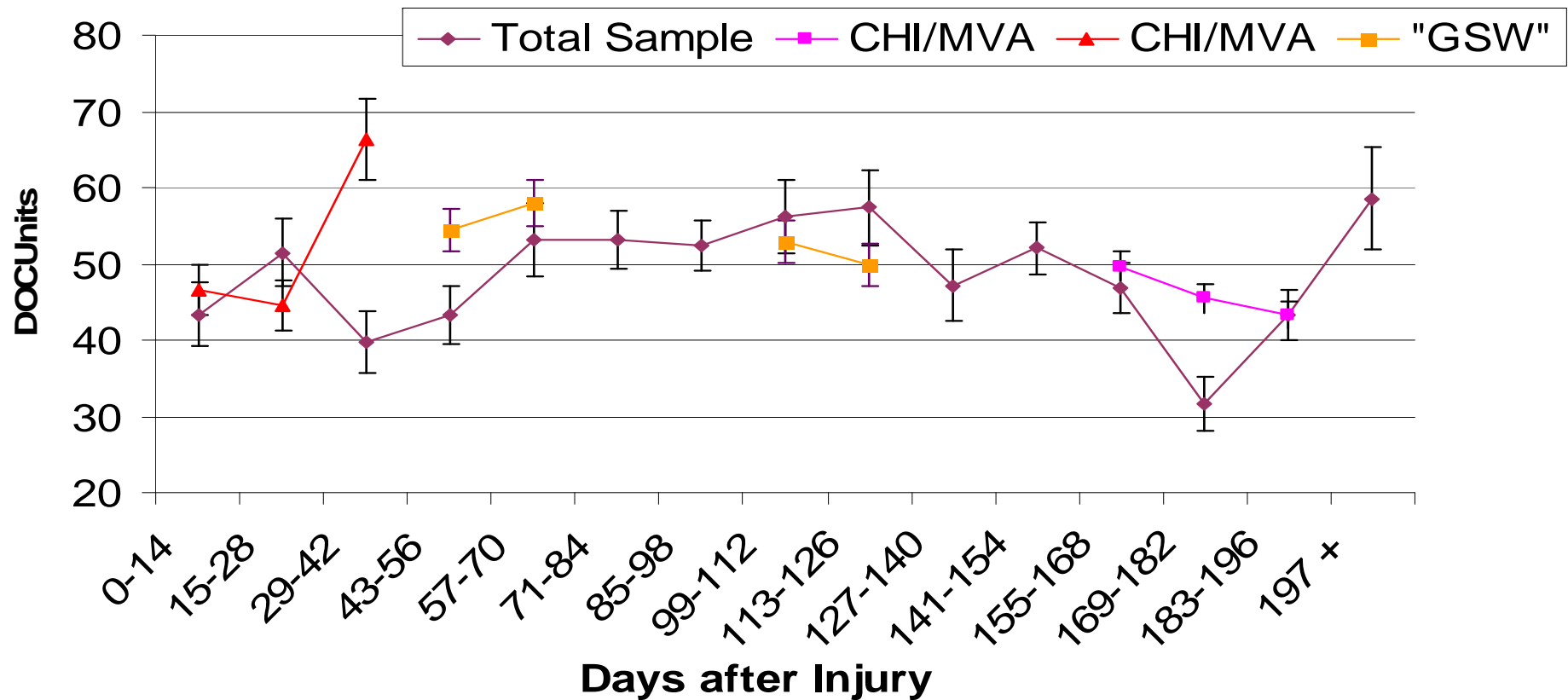
- ▶ Monitoring Recovery Over Time
- ▶ Modality Measure Conversion
- ▶ Interpretation and Application of Modality Measure Information



# Monitoring Recovery Over Time

## Average DOCS Measures Every 2 Weeks

(N = 91 Persons & 141 DOCS)



# Modality Specific Conversion

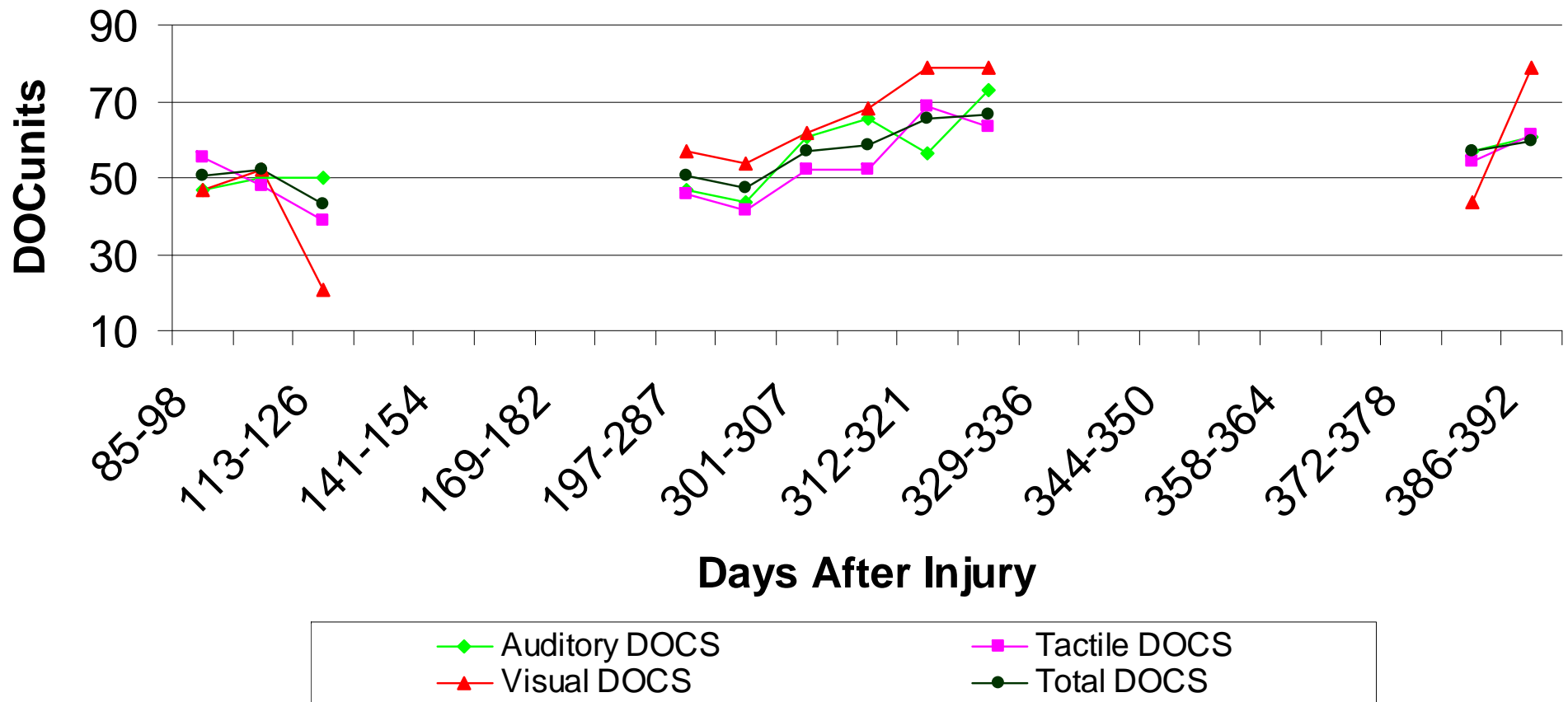
- ▶ DOCS Modality Scoring Tables
- ▶ Modality Specific Conversion Chart

<b>Tactile Item #</b>	<b>DOCS Tactile Test Item</b>	<b>Best Raw Score 1<sup>st</sup> Evaluation</b>	<b>Best Raw Score 2<sup>nd</sup> Evaluation</b>
T1	1. AIR	2	
T2	2. FEATHER	1	
T3	3. HAIR	0	
T4	4. TOE (Vibration)	2	
T5	5. HAND (Massage)	0	
T6	6. SCRUB	1	
T7	7. SWAB	1	
T8	8. CUBE	2	
PV1	9. JOINT	1	
<b>TOTAL RAW TACTILE SCORE</b>		<b>10</b>	
<b>DOCS Tactile Score</b> (Obtained from modality conversion chart)		<b>52.0</b>	

<b>Conversion Table for Tactile Modality Scores</b>			
<b>Tactile Modality Raw Score</b>	<b>DOCunit Score for Tactile Items</b>	<b>Standard Error</b>	<b>Percentile</b>
0	12.2	18.2	2
1	24.2	10.0	5
2	31.2	7.2	8
3	35.5	6.0	11
4	38.7	5.4	16
5	41.4	5.0	21
6	43.7	4.7	27
7	45.9	4.6	34
8	48.0	4.5	43
9	50.0	4.5	50
<b>10</b>	<b>52.0</b>	<b>4.5</b>	<b>58</b>
11	54.1	4.6	65
12	56.3	4.8	71
13	58.6	5.0	77
14	61.3	5.4	82
15	64.6	6.0	87
16	68.9	7.2	93
17	75.9	10.0	97
18	87.8	18.2	99

# Interpretation of DOCS Modality Measures

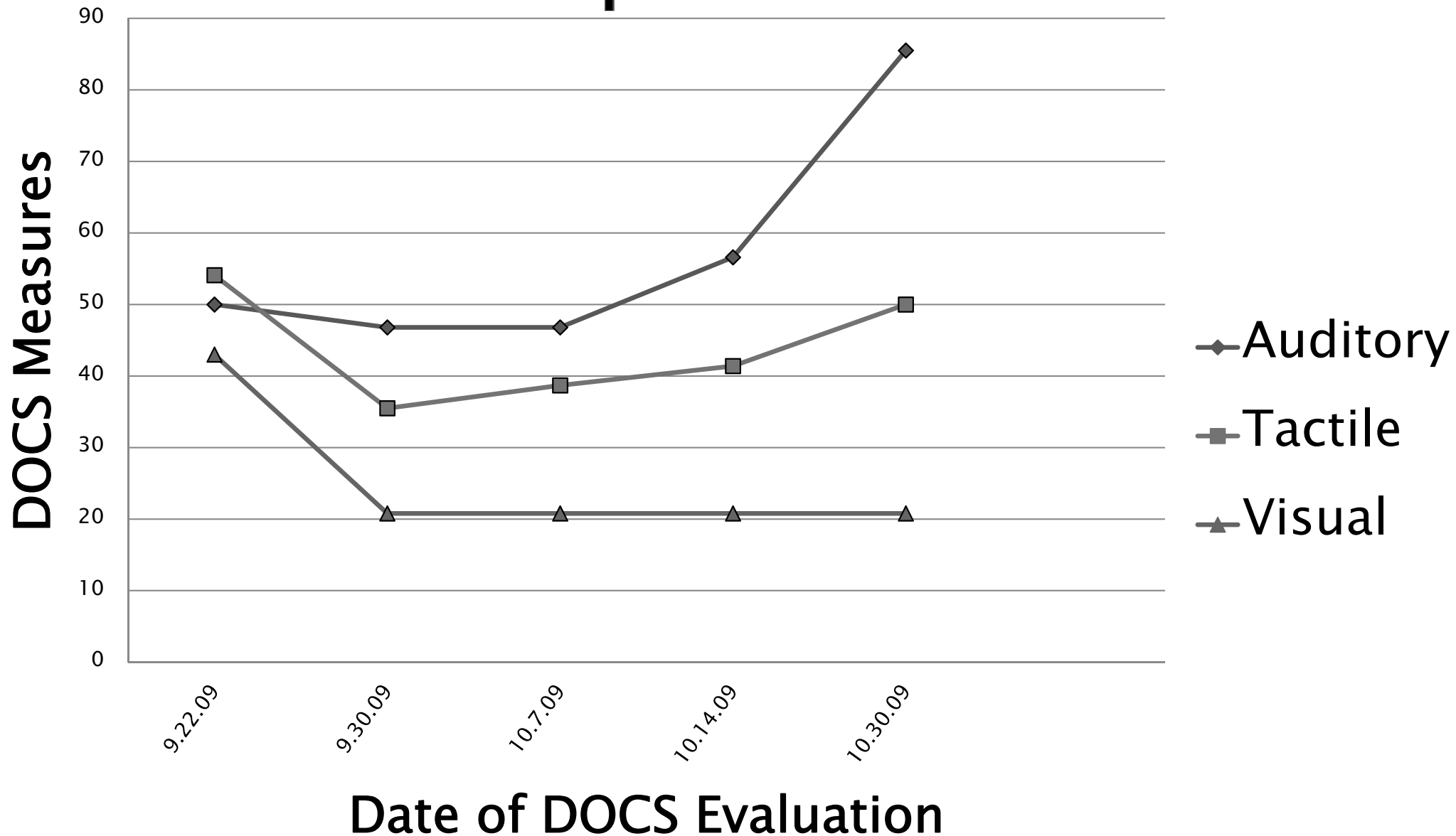
## DOCS Results For One Subject By Modality



# Clinical Application of Modality Plotting

- ▶ Objectively document progress by modality
- ▶ Develop interdisciplinary and uniform communication system
- ▶ Identify strengths and weaknesses by modality
- ▶ Diagnosis of sensory deficits (i.e. blind or deaf)

# Example: Detecting Visual Impairment



# Predicting Time to Consciousness

- **Goal:** Predict Recovery and Lack of Recovery of Consciousness at multiple time points within the first year of injury with
  - Equal accuracy (Balanced Predictions)
- **Sensitivity (Se)** = Predict recovery of consciousness when consciousness really does occur
- **Specificity (Sp)** = Predict lack of recovery of consciousness when it really does not occur

# Time to Consciousness Most Balanced Predictions

DOCS Baseline and DOCS Change: TBI (n = 83)									
	4 Months			8 Months			12 Months		
	AUC	Se	Sp	AUC	Se	Sp	AUC	Se	Sp
Baseline DOCS < or ≥ 48	.82	.78	.76	.83	.80	.80	.73	.67	.66
DOCS Change 1 <sup>st</sup> - 5 <sup>th</sup>	.87	.86	.83	.81	.75	.75	.88	.88	.92
DOCS Change 1 <sup>st</sup> - 2 <sup>nd</sup>	.91	.84	.87	.88	.83	.83	.80	.69	.70

**Source:** Pape TL-B, Tang C, Guernon A et al. Predictive Value of the Disorders of Consciousness Scale (DOCS). *Physical Medicine and Rehabilitation*. 2009.



# Interpreting sensitivity and specificity: Example

- Example: DOCS Change measured from 1<sup>st</sup> and 5<sup>th</sup> DOCS when predicting recovery of consciousness 4 months after injury
  - This measure of change predicted recovery when it actually occurred 86% (Sensitivity) of the time and when it actually did not occur 83% (Specificity) of the time
  - Yielding a False Negative rate of 14% and a False Positive rate of 17%.
  - Each prediction will be accurate 88% of the time

# Time to Consciousness: Influence of Magnitude of Change

**Table 4. Predicted Probabilities for Recovering Consciousness in One-Year Given Increments of 7, 8 or 9 Units of Change**

If Baseline DOCS score is...	Change in DOCS (in DOCS units)																		
	Decline									Plateau	Improve								
	-27	-24	-21	-18	-16	-14	-9	-8	-7	0	7	8	9	14	16	18	21	24	27
Absolute Probability of Regaining Consciousness in Year 1 of Injury																			
34.4	.016	.021	.029	.039	.047	.057	.091	.100	.110	.202	.340	.364	.388	.514	.564	.614	.683	.746	.799
41.3	.050	.067	.088	.116	.139	.166	.249	.268	.289	.453	.629	.653	.675	.776	.810	.839	.876	.906	.929
48.3	.092	.122	.158	.204	.239	.278	.391	.415	.440	.617	.767	.785	.801	.871	.892	.910	.932	.949	.962
53.0	.161	.207	.262	.325	.372	.421	.547	.573	.597	.752	.861	.873	.884	.927	.940	.950	.963	.972	.980
59.2	.306	.374	.448	.525	.575	.624	.735	.754	.773	.874	.934	.940	.946	.967	.973	.978	.983	.988	.991

# Timeframe for 7 to 9 units of DOCS Change

- Baseline acquired within 94 days of injury
- Average # of days during which 7, 8 and 9 units of DOCS change occurred
  - Ranges from 18 to 22 days
  - Evidence indicates that DOCS evaluations can be conducted every other week
  - While evidence suggest that repeat DOCS evaluations do not have to be conducted every 7 days to sufficiently capture/detect this amount of change, we suggest a conservative repeat testing schedule of every 7 to 10 days.

# Predicting Recovery of Functional Skills 1-Year after Injury

Outcomes	Significant predictors ( $p < 0.05$ )	p-value	Non-significant predictors in the model	c-index	H and L test	95% CI	Odds ratio	1-year after injury interpretation
Bedout <sup>3</sup>	CHI	0.0067	none	0.829	0.8168	(2.26, 158.9)	18.94	A person with a CHI was at least 18 times more likely to be out of bed for more than 8 hours on a typical day compared to persons with Other BL.
	UTI	0.0018				(2.65, 72.09)	13.83	A person who did not have a UTI during inpatient rehabilitation was at least 13 times more likely to be out of bed for more than 8 hrs in a typical day.
Cogashom <sup>3</sup>	Vet	0.0319	none	0.869	0.8665	(1.17, 32.16)	6.13	Compared to persons who are not eligible for veterans benefits, eligible persons were 6.13 times more likely to be considered safe to be left alone for portions of the day, rather than requiring 24-hour care for cognitive assistance.
	Dysinjrx	0.0182				(1.06, 1.84)	1.39	Every 5 day decrement in time between injury and receiving IP rehabilitation indicated that the person was 1.39 times more likely to be left alone for portions of a day rather than requiring 24-hour care due to cognitive issues.
Memhelp <sup>3</sup>	Marital	0.0354	Seiz ( $p = 0.3389$ )	0.720	0.8152	(1.12, 22.79)	5.05	Persons who were married at time of injury were at least 5 times more likely to sometimes need help with memory rather than always needing help with memory.
Physassi <sup>1</sup>	Dysinjrx	0.0340	Seiz ( $p = 0.0572$ )*	0.873	0.8546	(1.01, 1.19)	1.10	Every 1 day decrement between injury and receiving IP rehabilitation indicated that a person was 1.1 times

Establishing a Prognosis

**Source:** Pape T, Lundgren S, Heinemann A et al. Establishing a Prognosis for Functional Outcome during Coma Recovery, *Brain Injury*. 2006;20:743-75

# Prognostic Information Based on Modality Specific Information

- Recovery of Functional Skills 1-Year after Injury
- Additional Independent Variables
  - DOCS Auditory Measure
  - DOCS Tactile Measure
  - DOCS Visual Measure

<b>Models</b>	<b>Dependent Variables</b>	<b>Significant Predictor Variables</b>	<b>P Values</b>
<b>Tactile Average + pneum + HTN+ seiz + UTI</b>	<b>Time out of Bed</b>	<b>UTI</b>	<b>.058*</b>
<b>Visual Average + pneum + seiz + UTI</b>	<b>Cognitive Assistance</b>	<b>Seizure</b>	<b>.021*</b>
<b>Visual Average + pneum + seiz + UTI</b>	<b>Recovery of Consciousness</b>	<b>Visual Average</b>	<b>.076</b>
<b>Auditory Average + pneum + seiz + UTI + HTN</b>	<b>Recovery of Consciousness</b>	<b>Auditory Average</b>	<b>.082</b>
<b>Auditory Average + pneum + seiz + UTI + HTN</b>	<b>Communication Assistance</b>	<b>Auditory Average</b>	<b>.023*</b>
<b>Auditory Average + pneum + seiz + UTI + HTN</b>	<b>Cognitive Assistance</b>	<b>Auditory Average</b>	<b>.020*</b>
<b>Auditory Average + pneum + seiz + UTI + HTN</b>	<b>Social Contact</b>	<b>Auditory Average</b>	<b>.066</b>

# Polling Question

- When you see patients in disordered states of consciousness what is the most common etiology?
  - Blunt Trauma
  - Blast Trauma
  - Other Trauma
  - Anoxia
  - Stroke
  - Other

# Future Research

- AS we learn more about this population, there will always be updates and some things to watch for are:
  - Short Form
  - Diagnostic-MCID
  - Prognostication
  - Rater severity/leniency calibration system
  - Relationship of DOCS auditory scores with BAER findings
  - Clinical states of disordered consciousness
  - Empirically derived states of altered consciousness
  - Reconcile clinical and empirical evidence
    - Diagnostic algorithm



# Summary: Clinical Implementation of findings

- Monitoring: Currently being implemented
  - Bi-weekly is recommended if using DOCS to detect change
- Current Applications of DOCS Test Results
  - Rehabilitation Goal Setting,
  - Determining Short Term Treatment/Intervention Effects
- Evidence Based Prognoses after Severe TBI for Individual Patients is Possible:
  - Recovery of Consciousness: Ready for Clinical Implementation
    - Accuracy (Error) associated with each prediction/probability
    - Definition of consciousness
  - Functional skill recovery: Not ready for clinical implementation

# Summary: Research Implementation

Currently in use for:

- Clinical trials as primary treatment and/or rehabilitation effect/outcome
- Observational research
- Investigations of mechanisms of neurobehavioral recovery

# Polling Question

- What other clinical topics related to disorders of consciousness would you be interested in?
- Open ended

# Polling Question

- What other research topics regarding states of disordered consciousness would you be interested in?
  - Open ended

# Interested in Administering the DOCS at your facility?

Order DOCS Training DVD & Manual

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# Acknowledgements

- US Department of Veterans Affairs, Office of Research & Development
  - Health Services Research & Development (CCN07-133-1)
  - Rehabilitation Research & Development (B2632-V, B3302K & B4949N)
- Therapists and Clinicians at Participating Hospitals:
  - Minneapolis VAMC
  - Northwestern Memorial Hospital
  - The Rehabilitation Institute of Chicago
  - RML Specialty Hospital
  - Marianjoy Rehabilitation Hospital
  - Tampa VAMC
  - On With Life, Brain Injury Rehabilitation
  - Northwestern University's Feinberg School of Medicine
  - Edward Hines Jr. VA Hospital
- Nick Kot Charity ([www.nkc4tbi.com](http://www.nkc4tbi.com))
- The patients and their families/loved ones

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