Natural history of recovery and outcome after severe TBI: Separating fact from fiction

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”The greater the ignorance, the greater the dogmatism.”

(Sir William Osler)

“…and the greater the dogmatism, the greater the likelihood of error.”

(J. Giacino)

Myth 1

It is possible to predict which patients will fail to recover after severe brain injury with sufficient confidence within 72 of injury.

Frequency and timing of Withdrawal of Life-Sustaining Treatment (WLST)

Table 4: Deaths and percentage of deaths following withdrawal of life-sustaining therapy within the first three days of care

Centre	No. of admissions	Deaths within first 3 d of care, no.	Among all deaths within the first 3 d of care, deaths following withdrawal of life-sustaining therapy		Among deaths following withdrawal of life-sustaining therapy, deaths occurring within the first 3 d of care	
			No.	% (95% CI)	No.	% (95% CI)
A	120	15	11/15	73.3 (48.1–89.1)	11/26	42.3 (25.5–61.1)
B	120	28	26/28	92.9 (77.4–98.0)	26/46	56.5 (42.3–69.8)
C	120	4	2/4	50.0 (15.0–85.0)	2/9	22.2 (6.3–54.7)
D	120	22	14/22	63.6 (43.0–80.3)	14/39	35.9 (22.7–51.6)
E	120	23	7/23	30.4 (15.6–50.9)	7/18	38.9 (20.3–61.4)
F	120	22	13/22	[illegible]	13/22	59.1 (38.7–76.7)
Total	720	114	73/114	64.0 (54.9–72.3)	73/160	45.6 (38.1–53.4)

Note: CI = confidence interval.

Turgeon, et al., CMAJ, 2011
(6 Canadian Level I Trauma Centers; N= 720)

Table 3. Length of Stay and Disposition by Withdrawal of Life-Supporting Treatment

Characteristic	No withdrawal of LST	Withdrawal of LST	Total
No. of persons included	30 080	7869	37 949
Total LOS			
No. with data	30 040	7868	37 908
Mean (SD), d	15.4 (17.4)	[illegible]	13.3 (16.4)
Median (Q1-Q3), d	10.0 (3.5-21.0)	3.0 (1.0-7.0)	8.0 (2.0-19.0)
(Range), d	(1.0-357.0)	(1.0-179.0)	(1.0-357.0)
Total ICU LOS			
No. with data	27 542	7909	34 751
Mean (SD), d	9.7 (10.0)	5.2 (6.3)	8.8 (9.5)
Median (Q1-Q3), d	6.0 (3.0-14.0)	3.0 (1.0-7.0)	5.0 (2.0-13.0)
(Range), d	(1.0-178.0)	(1.0-180.0)	(1.0-180.0)
Total ventilator days			
No. with data	25 960	7327	33 987
Mean (SD), d	7.5 (9.0)	4.8 (6.0)	6.9 (8.5)
Median (Q1-Q3), d	4.0 (2.0-11.0)	2.0 (1.0-6.0)	3.0 (2.0-10.0)
Range, d	1.0-207.0	1.0-180.0	1.0-207.0
Discharge disposition, No. (%)			
Deceased/expired	5961 (18.3)	7026 (93.7)	12 987 (33.9)
Discharged/transferred to home	8572 (29.8)	28 (0.4)	8600 (23.7)
Discharged/transferred to hospital	13 562 (47.1)	74 (1.0)	13 636 (37.6)
Discharged/transferred to hospice	395 (1.4)	359 (4.8)	754 (2.1)
Other	987 (3.4)	10 (0.1)	997 (2.7)

Williamson, et al, JAMA Surg, 2020
(ACS TQIP Program Database: 825 sites; N= 37,931

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ORIGINAL ARTICLE CLINICAL STUDIES

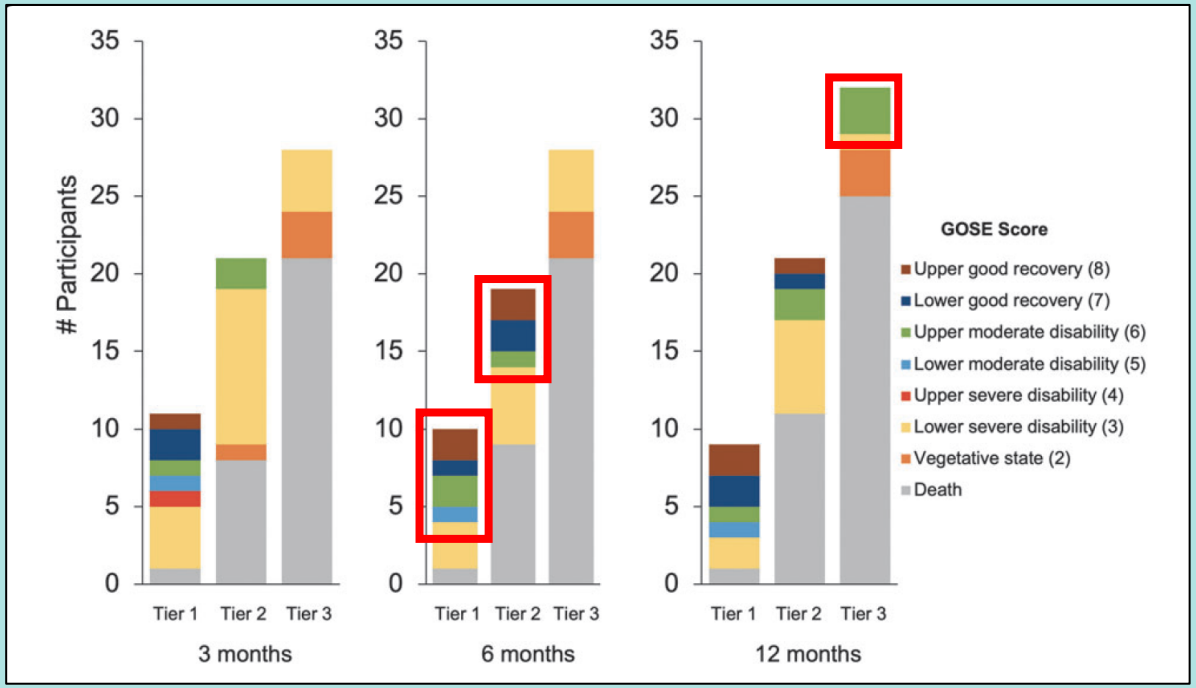
Recovery Potential in Patients Who Died After Withdrawal of Life-Sustaining Treatment: A TRACK-TBI Propensity Score Analysis

William R. Sanders,[1,2,**] Jason K. Barber,[3,**] Nancy R. Temkin,[3,4] Brandon Foreman,[5] Joseph T. Giacino,[6,7] Theresa Williamson,[8] Brian L. Edlow,[1,9] Geoffrey T. Manley,[10] Yelena G. Bodien[1,6,7,*]; and the TRACK-TBI Investigators[***]

Outcome of WLST- patients who were matched to WLST+ patients by propensity for WLST

Propensity for WLST

- Tier 1: 0-11%
- Tier 2: 12-27%
- Tier 3: 28-70%



TRACK-TBI
Transforming Research and Clinical Knowledge in Traumatic Brain Injury
International Traumatic Brain Injury Research Initiative

Myth 2

Failure to demonstrate early improvement in behavioral responsiveness predicts lack of subsequent improvement.

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JOURNAL OF NEUROTRAUMA 37:357–365 (January 15, 2020)
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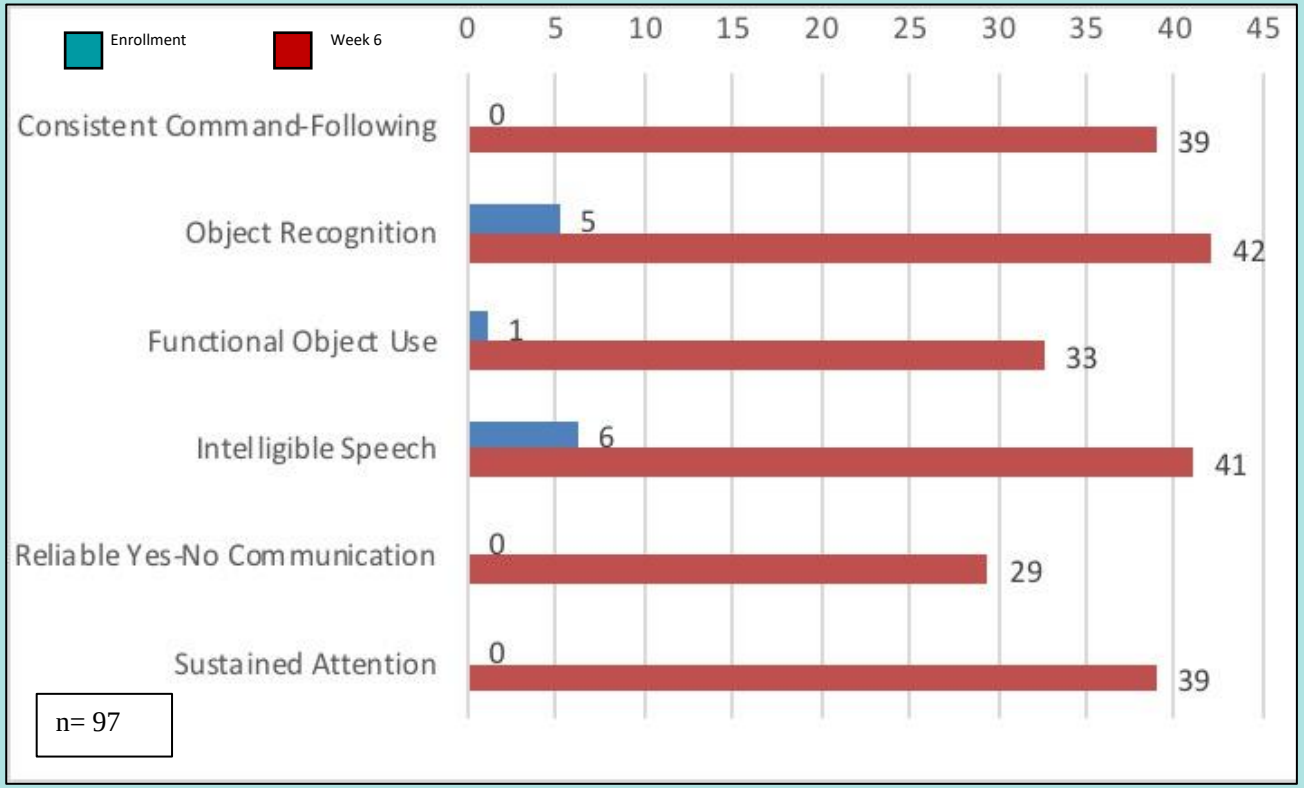
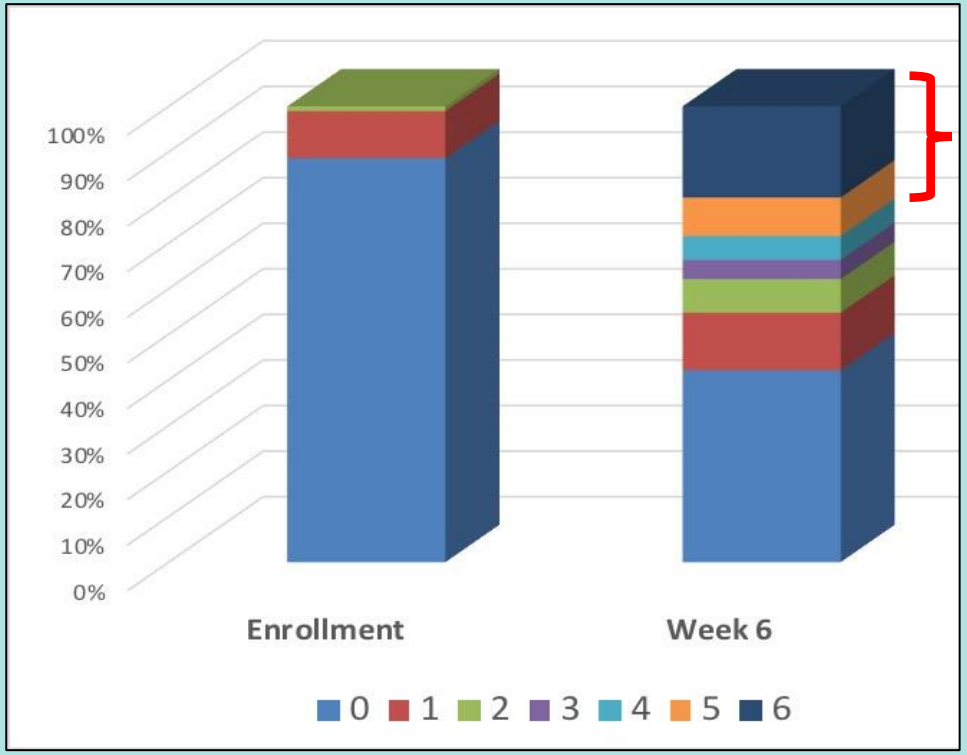
DOI: 10.1089/neu.2019.6429

Behavioral Recovery and Early Decision Making in Patients with Prolonged Disturbance in Consciousness after Traumatic Brain Injury

Joseph T. Giacino,[1–3] Mark Sherer,[4,5] Andrea Christoforou,[1,2] Petra Maurer-Karattup,[6] Flora M. Hammond,[7,8] David Long,[9] and Emilia Bagiella[10]





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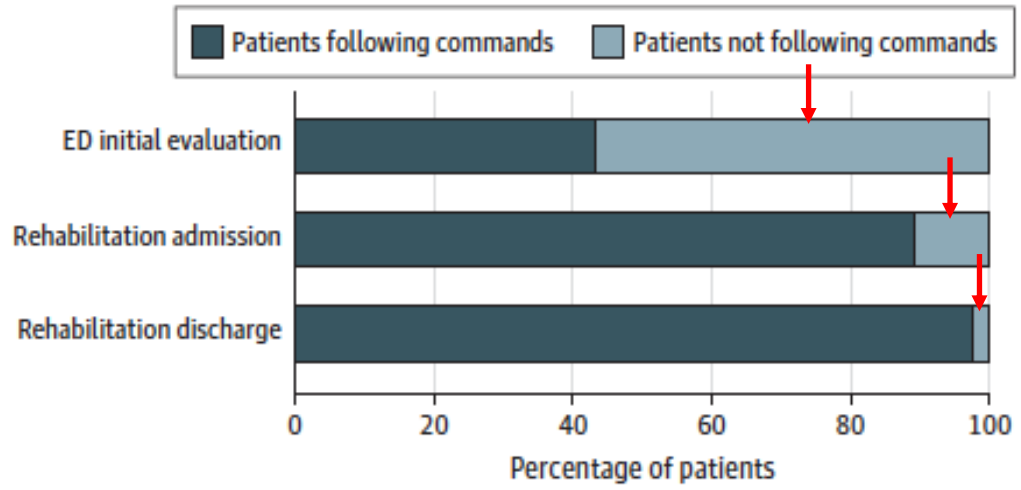
Research

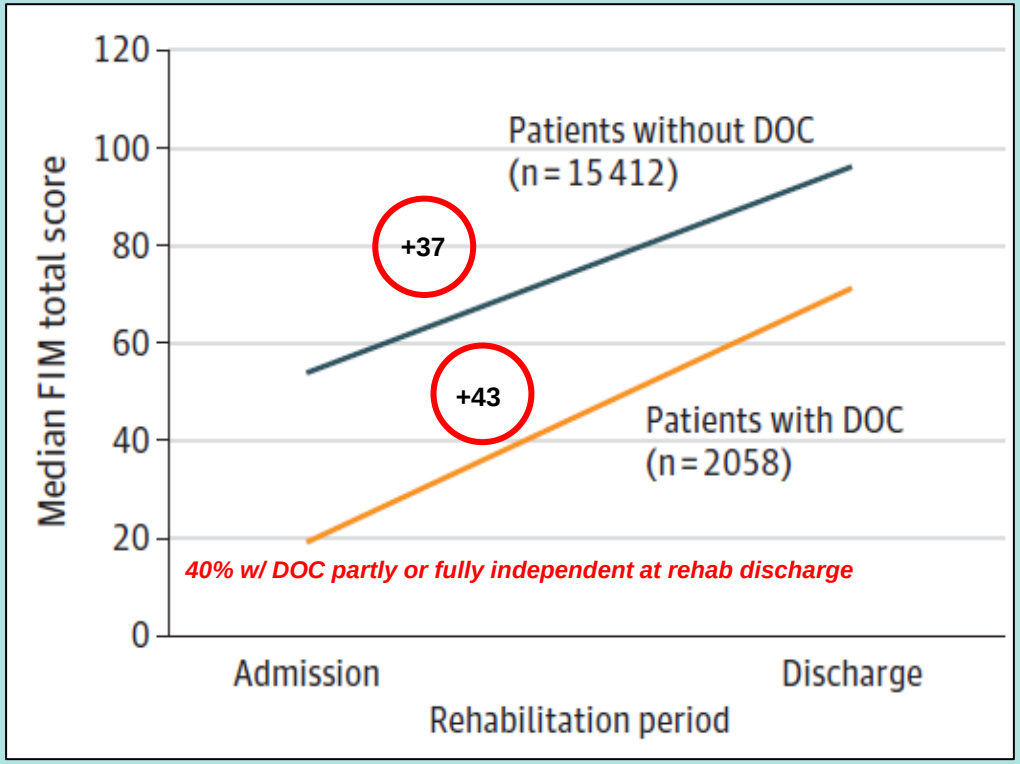
JAMA Neurology | Original Investigation

Recovery of Consciousness and Functional Outcome in Moderate and Severe Traumatic Brain Injury

Robert G. Kowalski, MBBCh, MS; Flora M. Hammond, MD; Alan H. Weintraub, MD; Risa Nakase-Richardson, PhD; Ross D. Zafonte, DO; John Whyte, MD, PhD; Joseph T. Giacino, PhD

Figure 1. Progression in Percentage of Patients With Disorder of Consciousness During Treatment





Myth 3

Spontaneous recovery rapidly trails off after the first 3 months post-injury and plateaus by 12 months.

TRACK-TBI
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International Traumatic Brain Injury Research Initiative

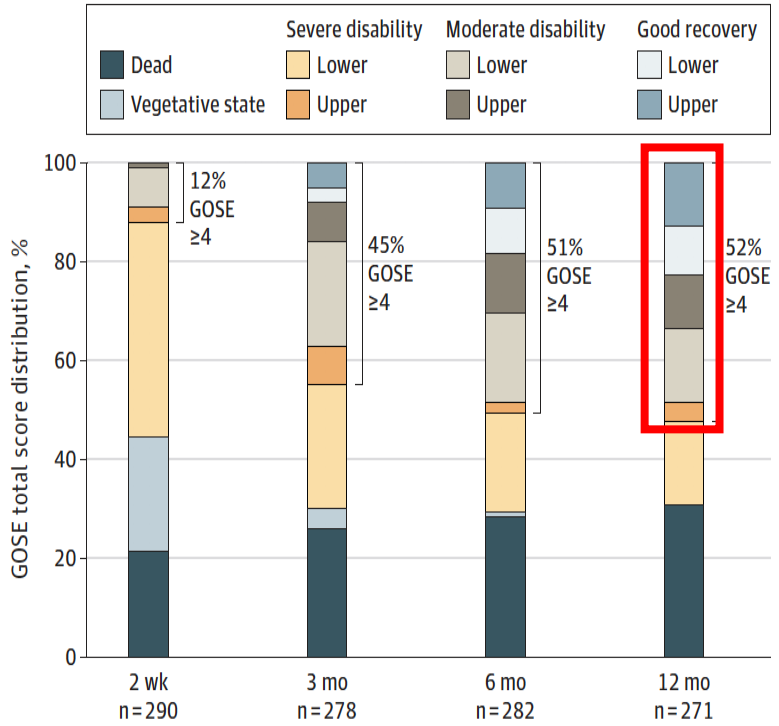
Research

JAMA Neurology | Original Investigation

Functional Outcomes Over the First Year After Moderate to Severe Traumatic Brain Injury in the Prospective, Longitudinal TRACK-TBI Study

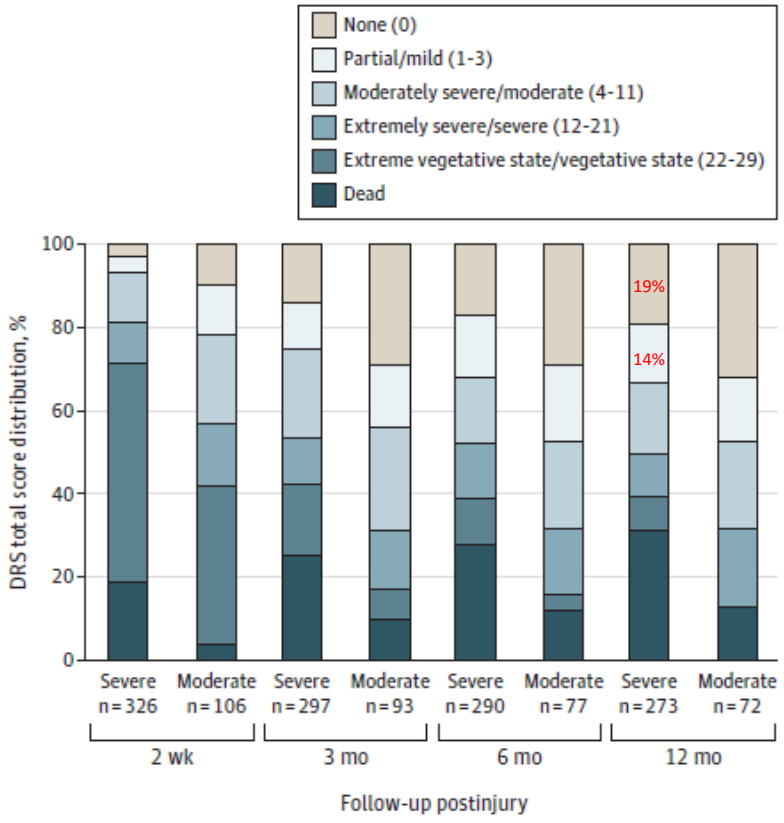
Michael A. McCrea, PhD; Joseph T. Giacino, PhD; Jason Barber, MS; Nancy R. Temkin, PhD; Lindsay D. Nelson, PhD; Harvey S. Levin, PhD; Sureyya Dikmen, PhD; Murray Stein, MD, PhD; Yelena G. Bodien, PhD; Kim Boase, BA; Sabrina R. Taylor, PhD; Mary Vassar, RN, MS; Pratik Mukherjee, MD, PhD; Claudia Robertson, MD; Ramon Diaz-Arrastia, MD, PhD; David O. Okonkwo, MD, PhD; Amy J. Markowitz, JD; Geoffrey T. Manley, MD, PhD; and the TRACK-TBI Investigators

Figure 1. Glasgow Outcome Scale-Extended (GOSE) Total Score Distribution for Patients With Severe Traumatic Brain Injury at 2 Weeks and 3, 6, and 12 Months Postinjury



GCS 3-8

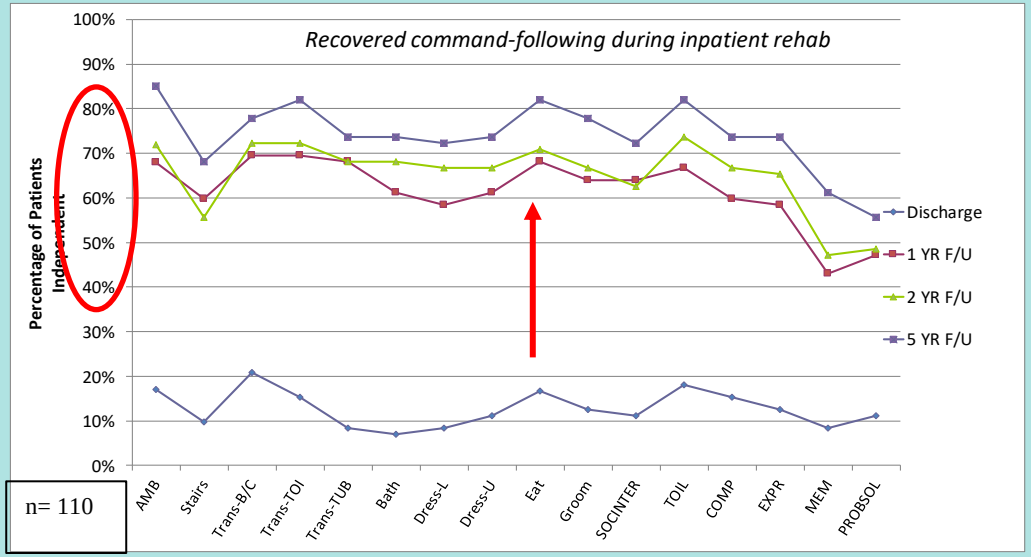
Figure 3. Disability Rating Scale (DRS) Total Score Distribution for Patients With Moderate or Severe Traumatic Brain Injury at 2 Weeks and 3, 6, and 12 Months Postinjury

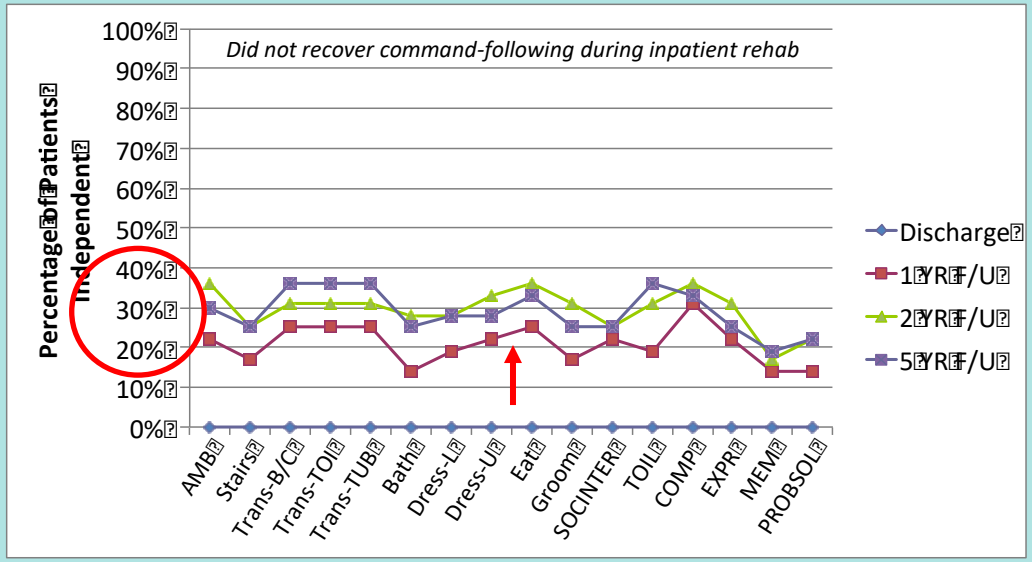


Archives of Physical Medicine and Rehabilitation

Functional Outcomes in Traumatic Disorders of Consciousness: 5-Year Outcomes From the National Institute on Disability and Rehabilitation Research Traumatic Brain Injury Model Systems

John Whyte, MD, PhD,[a] Risa Nakase-Richardson, PhD,[b,c,d] Flora M. Hammond, MD,[e,f] Shane McNamee, MD,[g] Joseph T. Giacino, PhD,[h] Kathleen Kalmar, PhD,[i] Brian D. Greenwald, MD,[j] Stuart A. Yablon, MD,[k,l] Lawrence J. Horn, MD[m]

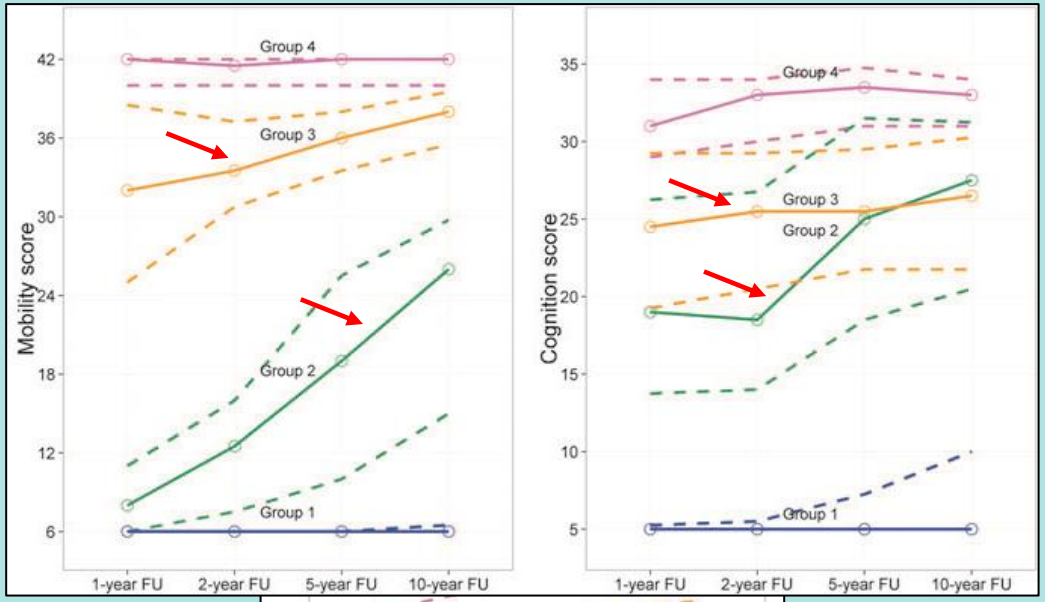


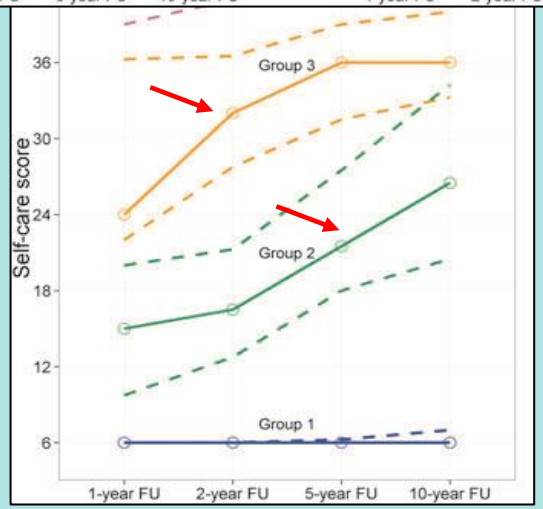


JOURNAL OF NEUROTRAUMA 36:1136–1146 (April 1, 2019)
Mary Ann Liebert, Inc.
DOI: 10.1089/neu.2018.5954

Disorders of Consciousness due to Traumatic Brain Injury: Functional Status Ten Years Post-Injury

Flora M. Hammond,[1] Joseph T. Giacino,[2] Risa Nakase Richardson,[3,4] Mark Sherer,[5] Ross D. Zafonte,[6] John Whyte,[7] David B. Arciniegas,[8] and Xinyu Tang[9]





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Facts about recovery after severe TBI

- Critical prognostic decisions (including WLST) are typically made within 72 hours of injury, *prior to* the window for emergence of signs of consciousness.
- >95% of patients with disturbance in consciousness persisting across the ICU stay who survive to 1 year recover consciousness.
- Rate of recovery and injury severity are inversely related during the subacute phase- persons who have disturbance in consciousness recover faster than those who do not.
- Approximately 20% of persons who are admitted to inpatient rehabilitation unable to follow commands achieve independence in self-care, mobility and cognitive function within 5 years.
- Recovery of functional independence continues between 5 and 10 years post-injury.