TRACK-TBI: A 15 Year Journey to Transform Research and Clinical Knowledge in TBI

Geoffrey Manley, MD PhD

on behalf of the TRACK-TBI Network Investigators

TRACK-TBI NET

Transforming Research and Clinical Knowledge in Traumatic Brain Injury Network

Disclosures

Grant funding from:

- National Institutes of Health (NIH)
- U.S. Department of Defense
- Abbott

Philanthropic support from:

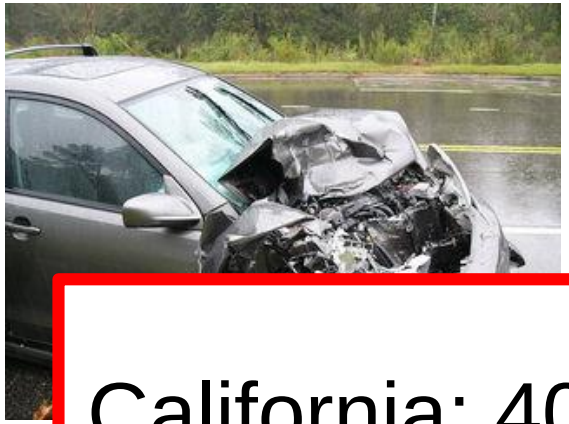
- One Mind
- NFL
- Many Grateful Patients

In-Kind support from:

- GE, Pfizer, Abbott, Neurotrauma Sciences, Quanterix, ImmunoArray, Banyan

Travel support for academic/professional activities.

The Many Faces of Traumatic Brain Injury

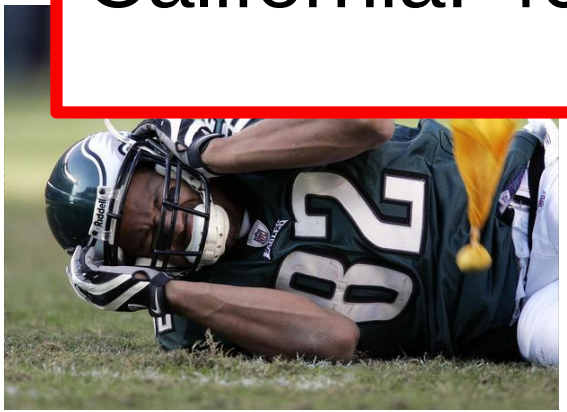


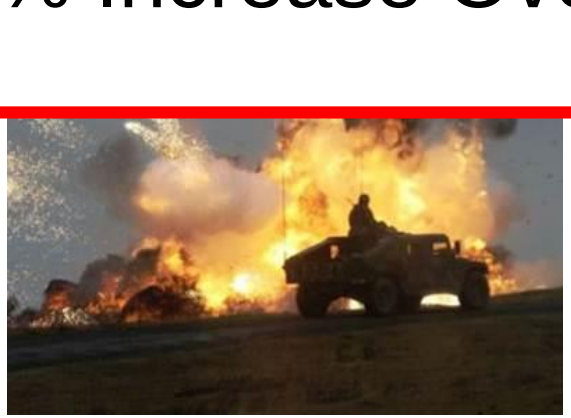
At least
4.8 million seek

e

California: 40% Increase Over Past 10 Years

BMJ,2019





And Increasing!

Traumatic Brain Injury: 2024

Classification

GCS

(Glasgow Coma Scale)

Severe

Mild

Concussion

Outcome

GOS

(Glasgow Outcome Scale)

Vegetative

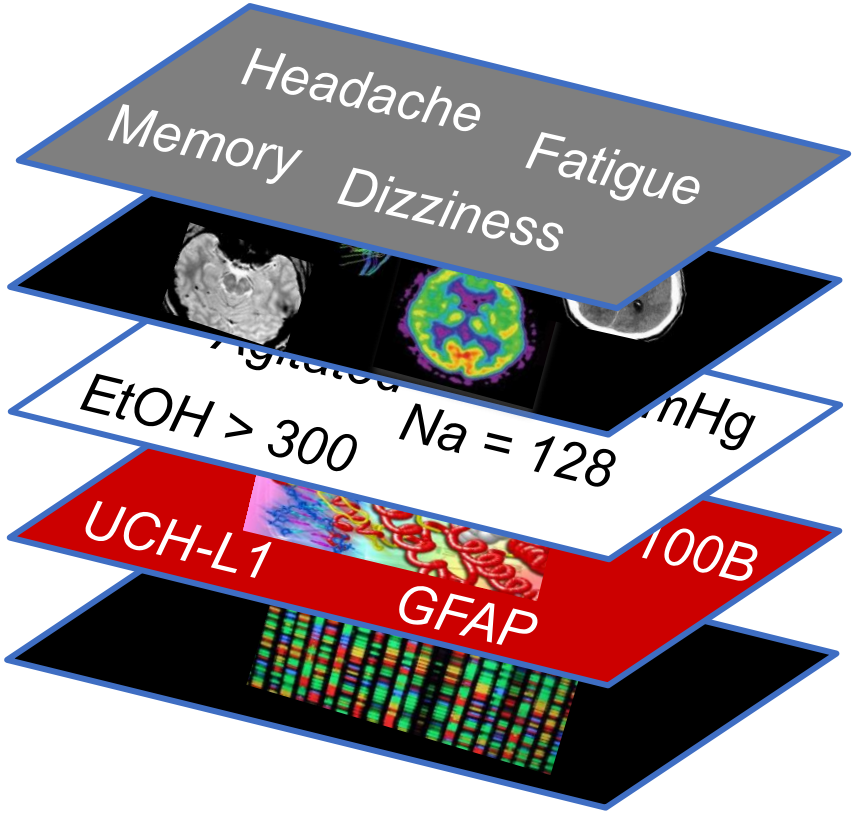
Death

Good Recovery

A Complex and Heterogeneous Disease

A “Precision Medicine” Approach to TBI

GCS



TRACK-TBI

Transforming Research and Clinical Knowledge in Traumatic Brain Injury

International Traumatic Brain Injury Research Initiative

Prospective Longitudinal Observational Study

- **3000 subjects**, including **Controls**

-Across the spectrum from concussion to coma

Goals

- Improve TBI diagnosis and classification/taxonomy
- Improve TBI outcome assessment
- Identify the health and economic impact of **Mild TBI**
- Create an “Information Commons” to promote collaboration and acceleration of TBI research

Clinical Sites

1. Baylor College of Medicine/ TIRR Memorial Hermann
2. Denver Health Medical/ Craig Rehabilitation
3. Emory University
4. Hennepin County Medical Center
5. Indiana University
6. Medical College of Wisconsin
7. Spaulding Rehabilitation Hospital/ Massachusetts General Hospital
8. University of California, San Francisco
9. University of Cincinnati
10. University of Maryland
11. University of Miami
12. University of Pennsylvania
13. University of Pittsburgh
14. University of Utah Health Care
15. University of Washington
16. UT Austin-Seton
17. UT Health Houston
18. UT Southwestern
19. Virginia Commonwealth University

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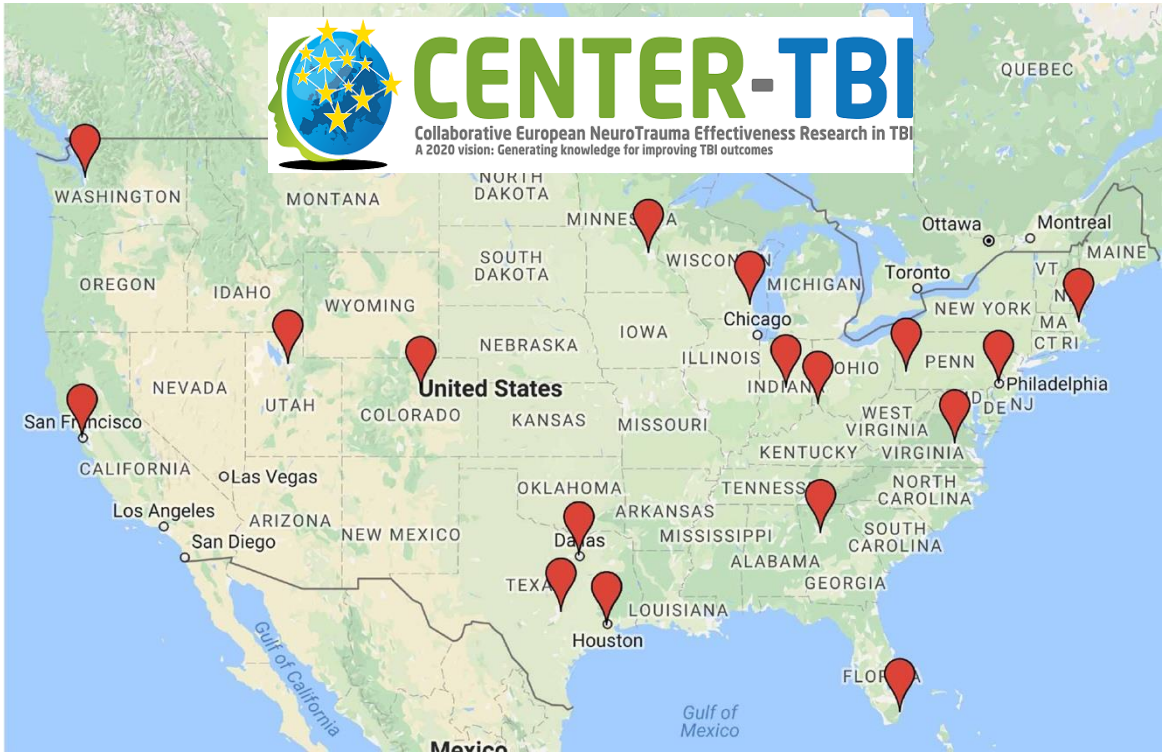
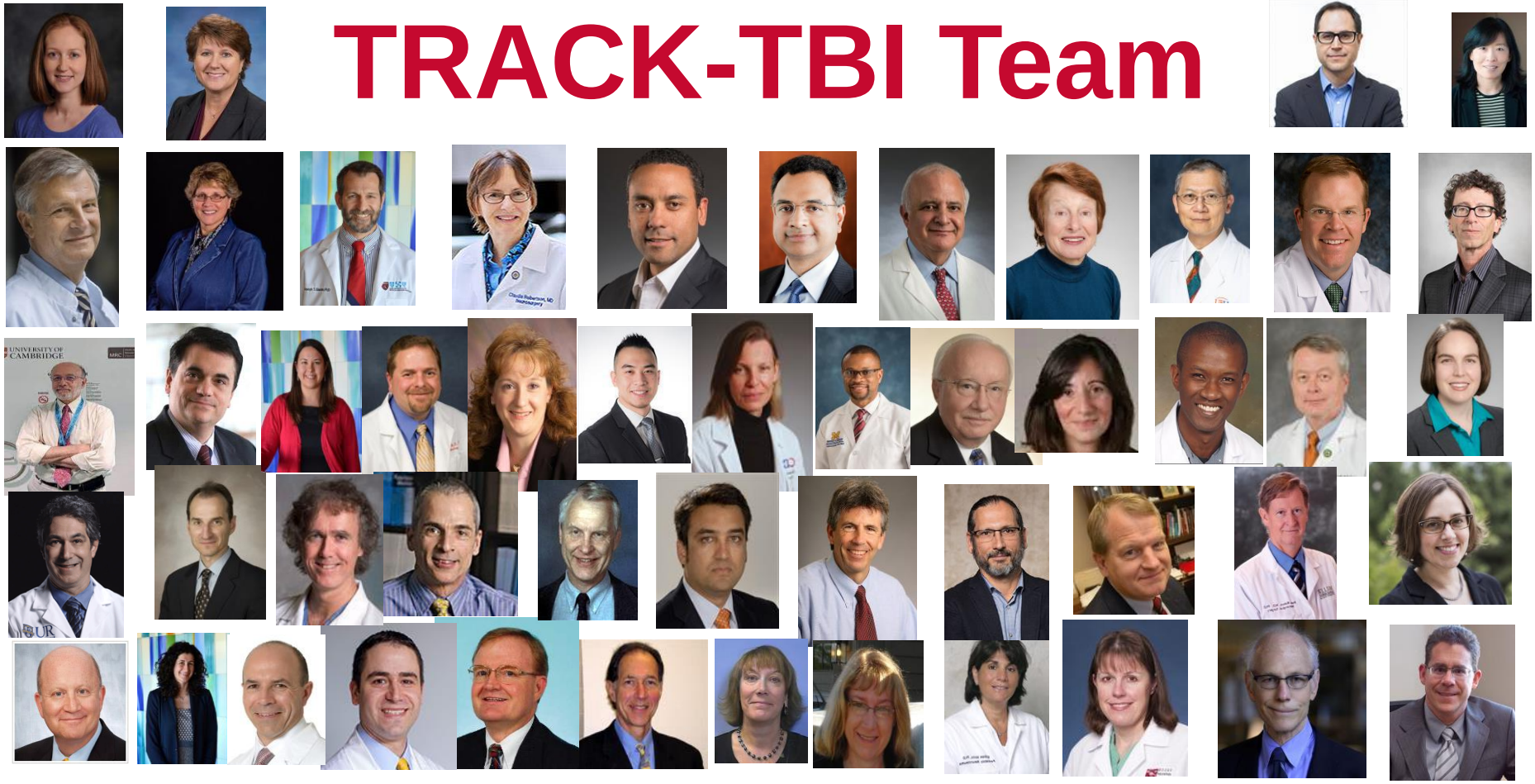
International Traumatic Brain Injury Research Initiative

CENTER-TBI
Collaborative European NeuroTrauma Effectiveness Research in TBI
A 2020 vision: Generating knowledge for improving TBI outcomes



The Top Trauma Centers in the Country

TRACK-TBI Team



Evolving from Competitors to Collaborators

TRACK-TBI Data

- **> 3000 TBI, 300 Ortho Controls, 300 Friend Controls**
- **Over 3000 data fields on each subject**
- **Battery of 21 outcome measures at 2w, 3m, 6m, 12m**
- **3,220 standardized Adult MRIs (2w and 6m)**
- **42,000 biospecimen samples (DNA, RNA, Plasma, Serum)**
- **Brain donation**

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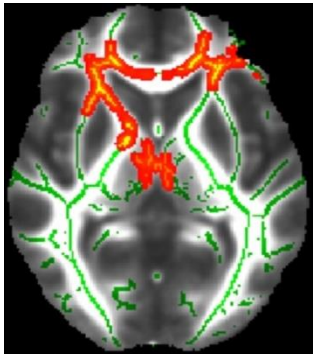
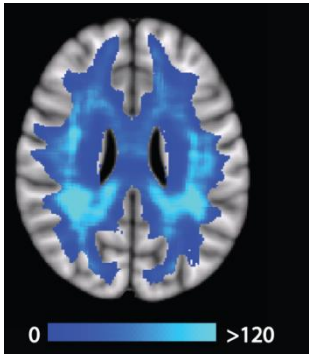
International Traumatic Brain Injury Research Initiative

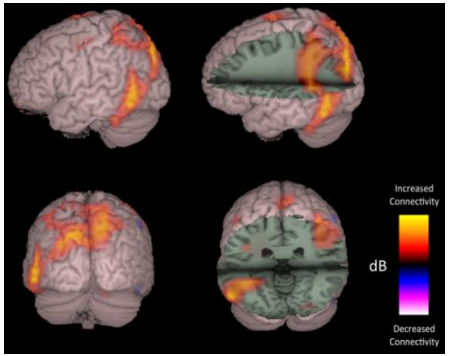
MRI Imaging Biomarkers

Innovation:

- Macro and Micro-Structural Imaging (Volumetric, rsfMRI, DTI, Etc)

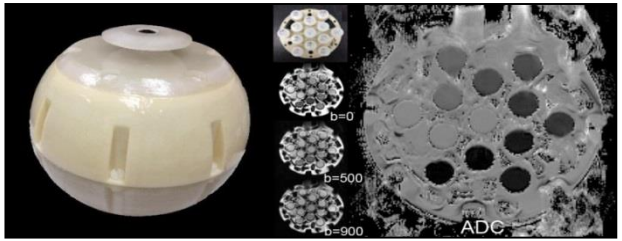


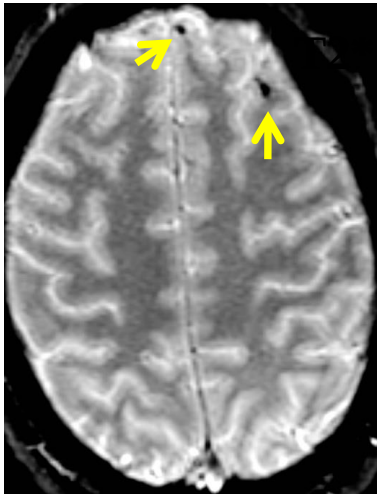


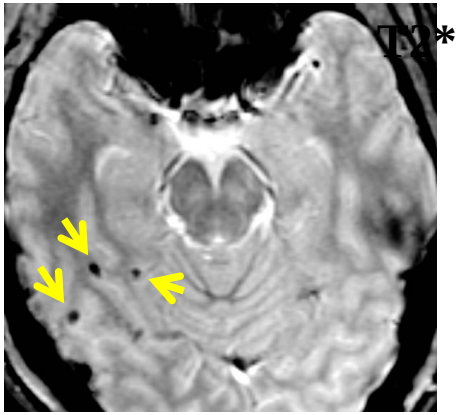


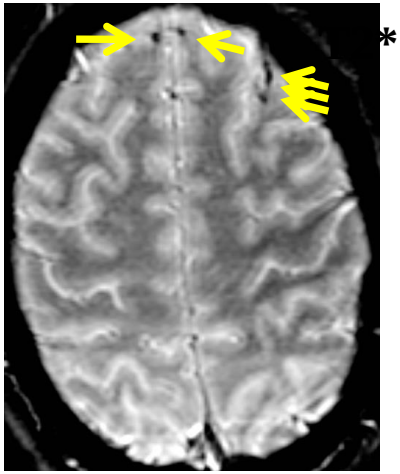
Standardization:

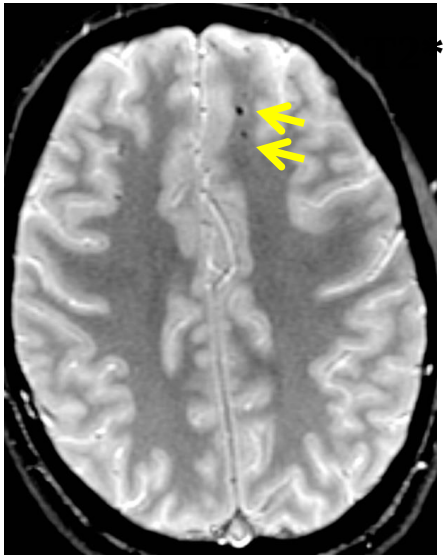
- Structural, Functional, and Diffusion Phantoms



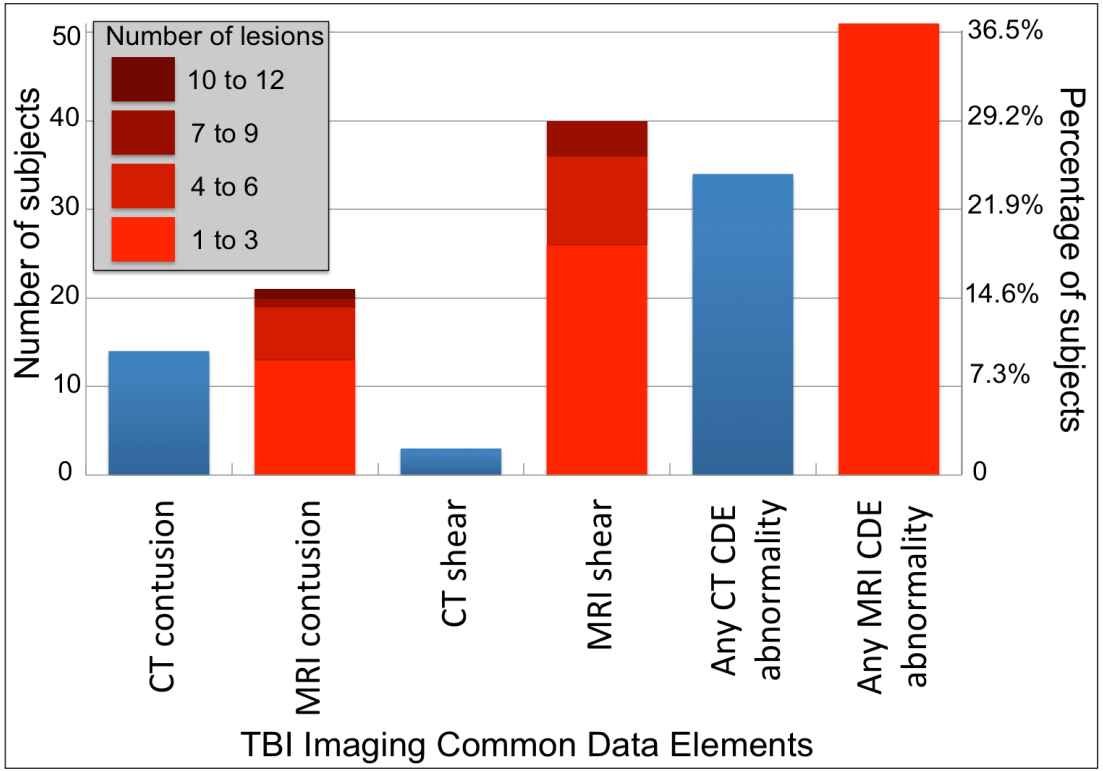






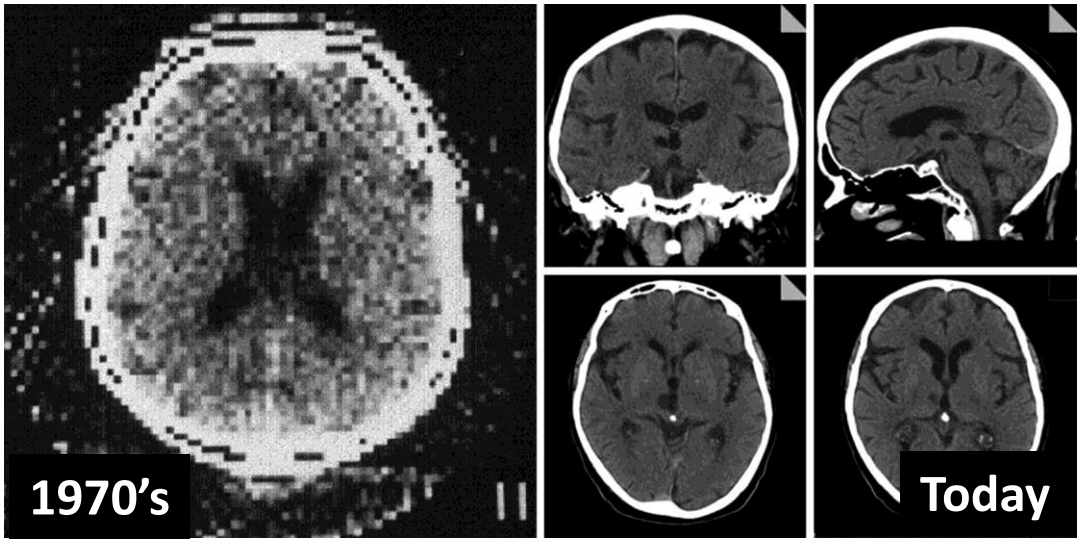


Imaging: CT vs. MRI Scan



1/4 with negative CT have positive MRI

Quiet Evolution of CT Imaging Biomarkers



The "work horse" of TBI Imaging

JAMA Neurology | Original Investigation

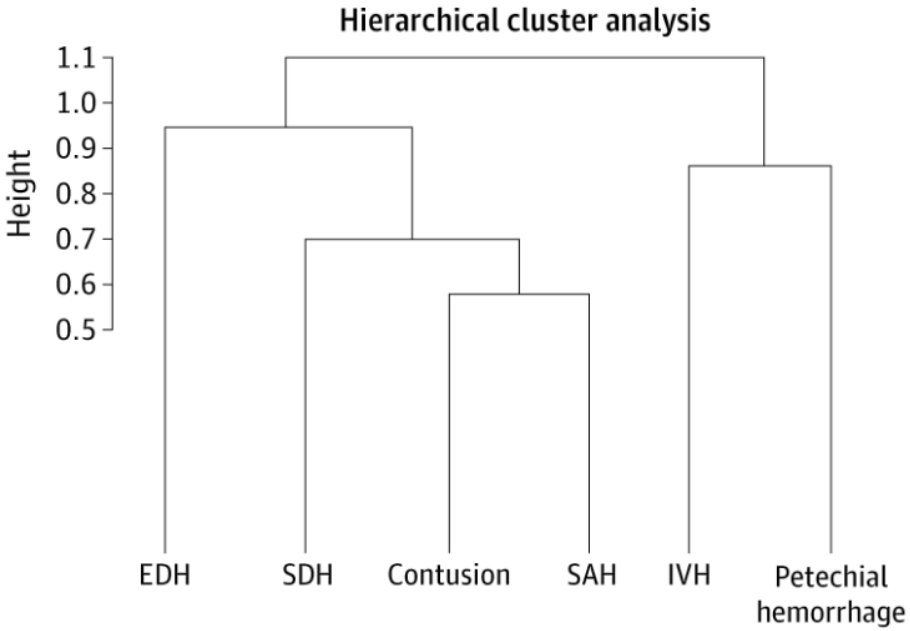
Pathological Computed Tomography Features Associated With Adverse Outcomes After Mild Traumatic Brain Injury

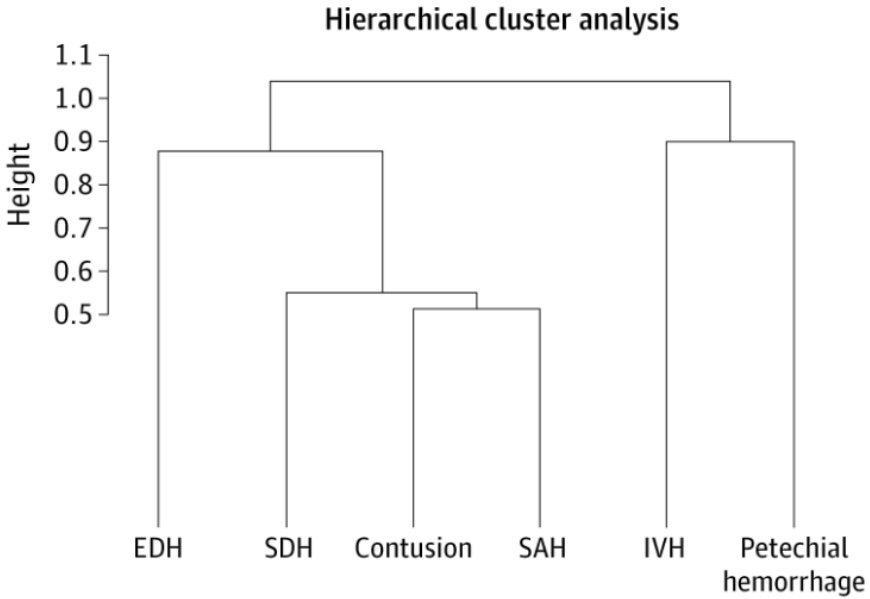
A TRACK-TBI Study With External Validation in CENTER-TBI

Esther L. Yuh, MD, PhD; Sonia Jain, PhD; Xiaoying Sun, MS; Dana Pisică, MD; Mark H. Harris, BS; Sabrina R. Taylor, PhD; Amy J. Markowitz, JD; Pratik Mukherjee, MD, PhD; Jan Verheyden, MS; Joseph T. Giacino, PhD; Harvey S. Levin, PhD; Michael McCrea, PhD; Murray B. Stein, MD, MPH; Nancy R. Temkin, PhD; Ramon Diaz-Arrastia, MD, PhD; Claudia S. Robertson, MD; Hester F. Lingsma, PhD; David O. Okonkwo, MD, PhD; Andrew I.R. Maas, MD, PhD; Geoffrey T. Manley, MD, PhD

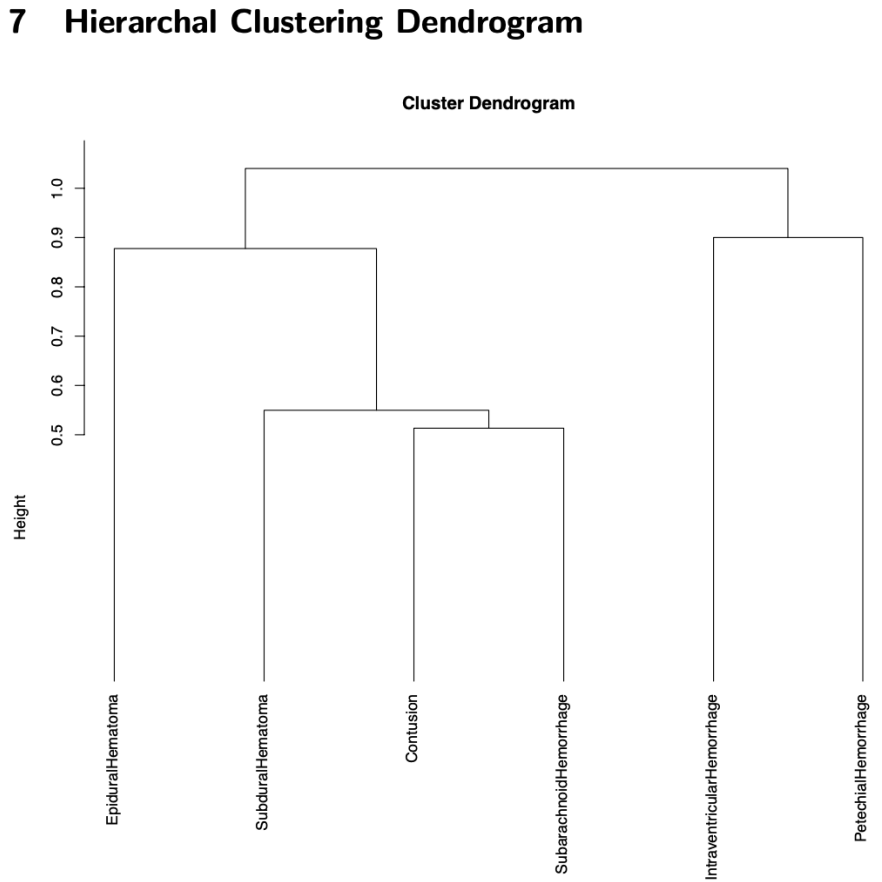
TRACK-TBI
Transforming Research and Clinical Knowledge in Traumatic Brain Injury
International Traumatic Brain Injury Research Initiative

CENTER-TBI





CT Imaging Phenotypes in GCS 13-15

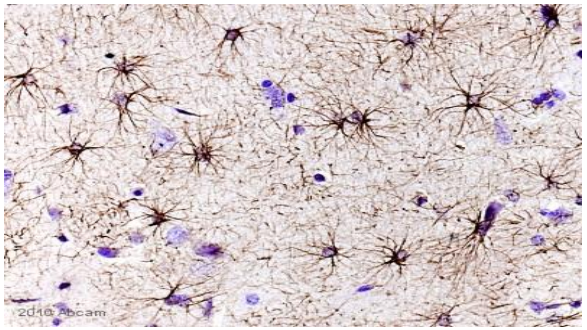


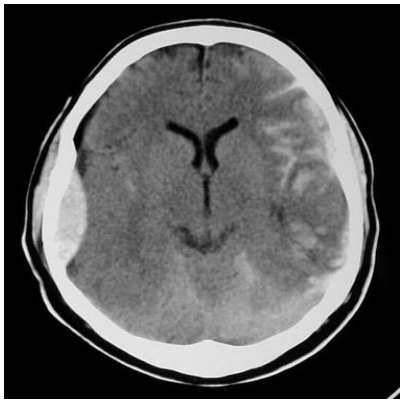
3 Clusters

- EDH
- SDH/SAH/Contusion
- IVH/PH

CENTER-TBI
Collaborative European NeuroTrauma Effectiveness Research in TBI
A 2020 vision: Generating knowledge for improving TBI outcomes

Blood-Based Biomarkers





GFAP

UCH-L1

S100

NSE

CRP

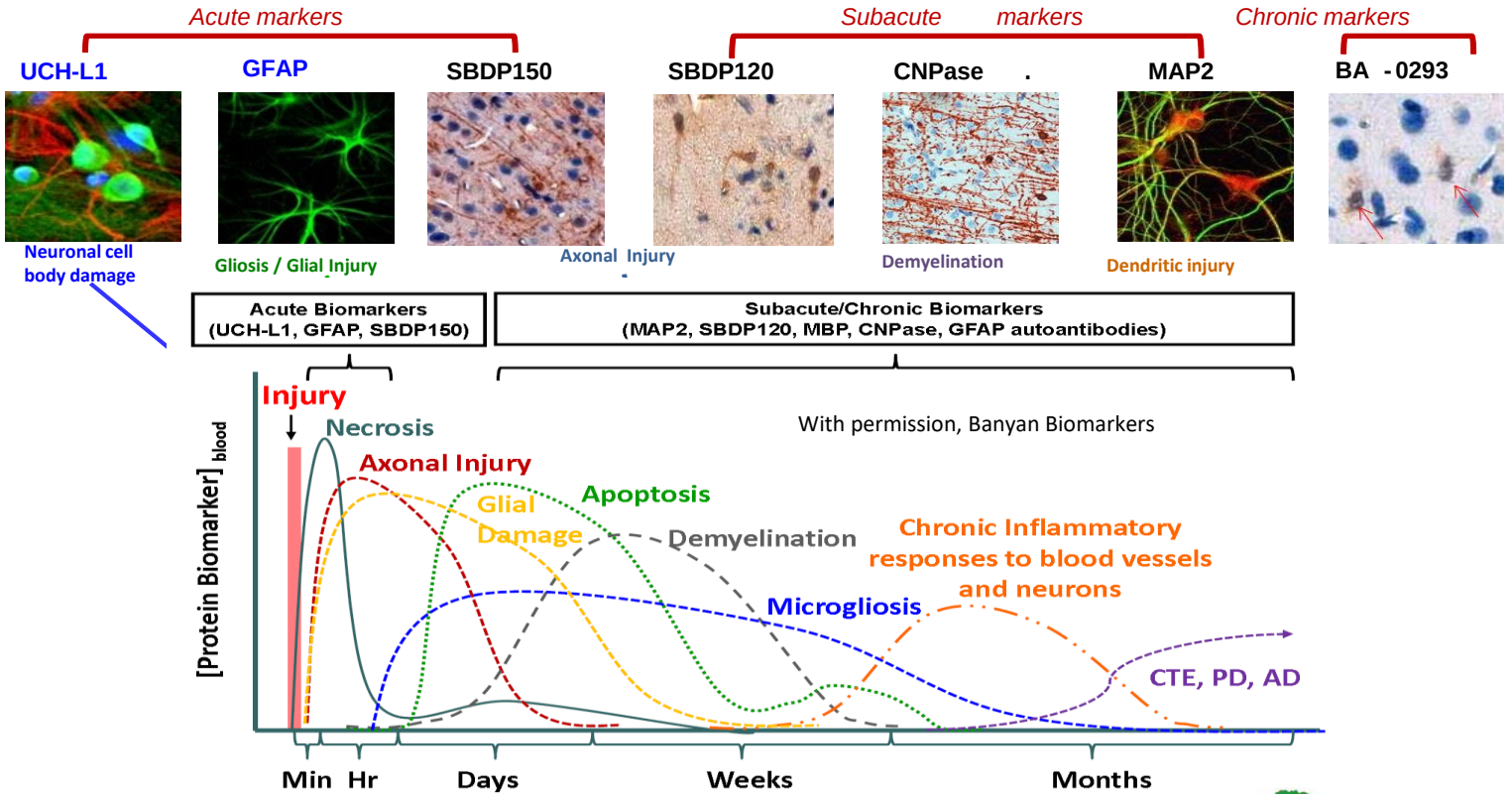
NF-L

Tau

P-Tau

IL6, IL10, TNF

BIOMARKER COVERAGE



DIAGNOSTIC, PROGNOSTIC UTILITY FROM CONCUSSION TO COMA

Journal of Neurotrauma, Ahead of Print | Original Article

Full Access

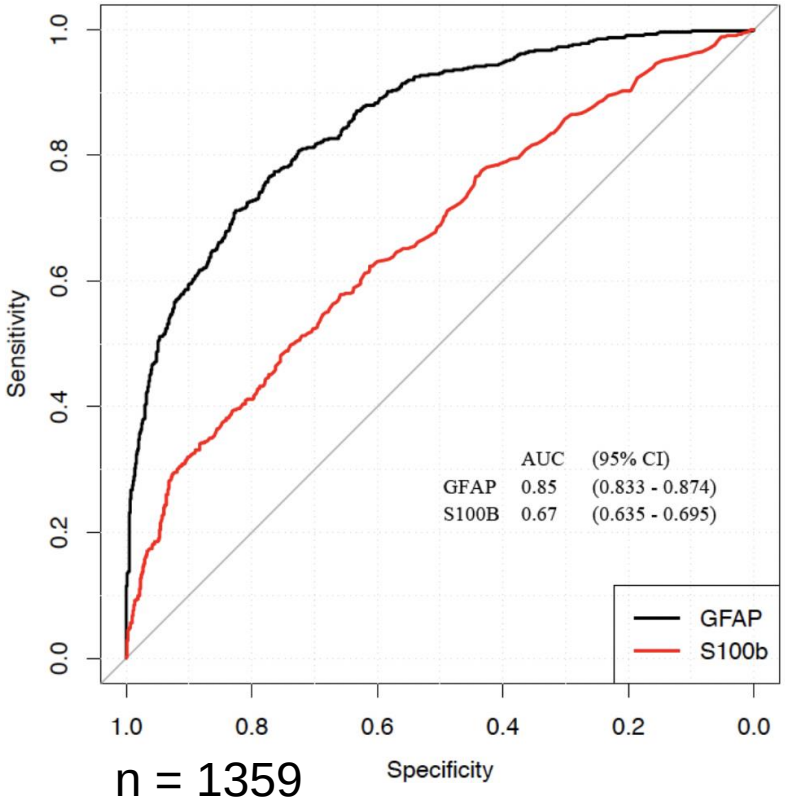
Point-of-Care Platform Blood Biomarker Testing of Glial Fibrillary Acidic Protein versus S100 Calcium-Binding Protein B for Prediction of Traumatic Brain Injuries: A Transforming Research and Clinical Knowledge in Traumatic Brain Injury Study

David O. Okonkwo, Ross C. Puffer, Ava M. Puccio, Esther L. Yuh, John K. Yue, Ramon Diaz-Arrastia, Frederick K. Korley, Kevin K. W. Wang, Xiaoying Sun, Sabrina R. Taylor, Pratik Mukherjee, Amy J. Markowitz, Sonia Jain, Geoffrey T. Manley, The Transforming Research and Clinical Knowledge in Traumatic Brain Injury (TRACK-TBI) Investigators ... See all authors

Published Online: 14 Sep 2020 | https://doi.org/10.1089/neu.2020.7140

2020

GFAP vs S100b for Prediction of TBI on CT



n = 1359

- GFAP outperforms S100
- Across the full spectrum of TBI (GCS 3 -15)
- Up to 24 hours

CENTER-TBI
Collaborative European NeuroTrauma Effectiveness Research in TBI
A 2020 vision: Generating knowledge for improving TBI outcomes

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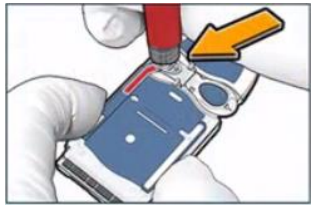
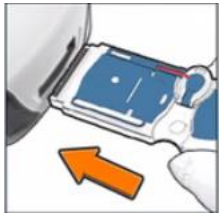
047496 REV A 01/17



Able to accept pinprick dot of whole blood



Assay cartridge placed into iSTAT for analysis

i-STAT

<15 minutes!!!

*** GFAP and UCHL-1 assays are research assays under development and not FDA approved at present**

i-STAT Alinity Results Form

Printout

RUO i-STAT TBI

Start of Record

Patient ID: 302-EW

Result Date: 30NOV2017 13:35

Result Info

GFAP	703	pg/mL
UCHL1	427	pg/mL

Sample Type: Whole Blood

Operator ID: 302-RUO

Cartridge Lot: F17289

Internal Simulator: Pass

Instrument: 400851

Profile: 9XY-02-TBI06 Profile

Firmware: DevKernel2-0

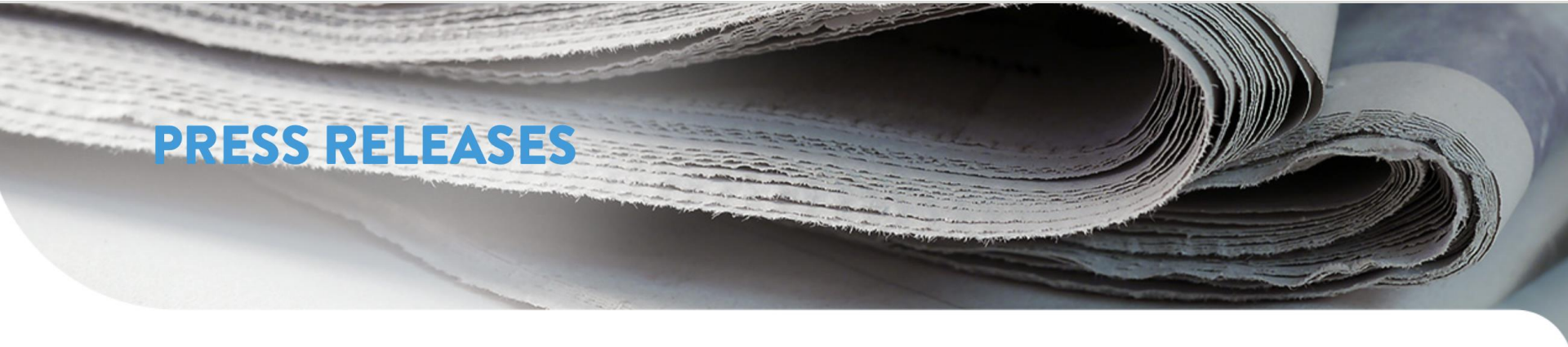
CLEW: TBX

Record Printed: 30NOV2017 13:37

Physician Name

End of Record

Tear Here



« BACK TO PRESS RELEASES

ABBOTT RECEIVES FDA 510(K) CLEARANCE FOR THE FIRST RAPID HANDHELD BLOOD TEST FOR CONCUSSIONS

Mild TBI (GCS 13-15)
less than 12 hours

35 pg/ml

January, 2021

THE LANCET
Neurology
Volume 18, Issue 10, October 2019, Pages 953-961

Association between plasma GFAP concentrations and MRI abnormalities in patients with CT-negative traumatic brain injury in the TRACK-TBI cohort: a prospective multicentre study

Yue JK, Yuh EL, Korley FK, Winkler EA, Sun X, Puffer RC, Hansen D, Choy Wm, Taylor SR, Ferguson AR, Huie R, Rabinowitz M, Puccio AM, Mukherjee PM, Vassar MJ, Wang KKW, Diaz-Arrastia R, Okonkwo DO, Jain S, Manley GT, and the TRACK-TBI Investigators. *The Lancet Neurology*. 2019 Oct;18(10):953-961

- **Blood-based biomarkers are more sensitive than CT**
- **Potential to improve diagnosis and triage of TBI patients**

August, 2019

GFAP: Comparison to Imaging Status

	N	Mean	SD	Min	Q1	Median	Q3	Max	p.value
GFAP									
CT-	454	307.925	529.346	0	22.975	108.45	352.325	4095.1	<0.001
CT+	217	1701.42	2243.346	0	375.9	948.8	2175.9	16643	
CT-MRI-	333	167.532	249.927	0	17.8	75.2	212.9	1864.5	<0.001
CT-MRI+	121	694.296	824.466	5.2	139.3	416.7	830.5	4095.1	
CT-MRI-	333	167.532	249.927	0	17.8	75.2	212.9	1864.5	<0.001
CT+/MRI+	670	3378.471	7197.167	0	365.75	1073.7	3094.45	50000	
TBI	1375	1804.204	5272.965	0	68.85	335.9	1196	50000	<0.001
OrthoControl	122	23.741	37.218	0	6.925	13.1	19.975	216.8	
HealthyControl	209	10.957	12.693	0	3	8	14	98	

Median GFAP

CT+ 949

CT- 108

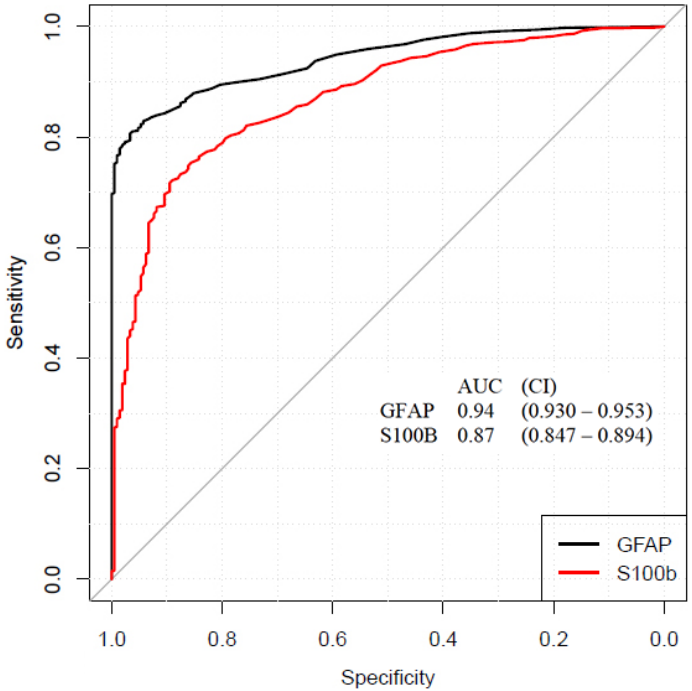
CT-/MRI+ 417

CT-/MRI- 75

Ortho 13

GFAP for Aid in Diagnosis of TBI

- GFAP (plasma) cutoffs for TBI vs Healthy Controls



For aid in diagnosis of TBI, **POC GFAP** significantly outperformed core lab S100B

GFAP AUC 0.94 95% CI 0.93-0.95
S100B AUC 0.87 95% CI 0.85-0.89

TRACK-TBI NET selected as research network for BARDA-sponsored trial of Abbott TBI Aid-In-Diagnosis Trial

BARDA is partnering with Abbott to broaden the company's current traumatic brain injury (TBI) test that will aid healthcare providers in diagnosing and determining severity of TBI in adults and children.

TBI is a significant injury seen in over 5 million patients annually during standard emergency care and is a major clinical consequence resulting from mass casualty incidents, as well as everyday accidents. The National Academies of Sciences, Engineering, and Medicine have identified TBI as an injury of significant concern with long-term impact. The time from injury to treatment is critical and patients are often directed to imaging procedures for diagnosis such as CT and MRI scans. With few objective diagnostic evaluation tools beyond a CT scan, and the inability to quickly and definitively map severity, there is much variability in the triage of patients that may result in

September, 2022

Discordance between Documented Criteria and Documented Diagnosis of Traumatic Brain Injury in the Emergency Department

Martin R. Cota, Anita D. Moses, Neekita R. Jikaria, Katie C. Bittner, Ramon R. Diaz-Arrastia, Lawrence L. Latour, and L. Christine Turtzo

Published Online: 5 Apr 2019 | https://doi.org/10.1089/neu.2018.5772

53% of Mild TBI were missed

“Normal” CT, no LOC

Translating Observational Studies into Improved Clinical Care

JAMA Neurology | Original Investigation

Recovery After Mild Traumatic Brain Injury in Patients Presenting to US Level I Trauma Centers

A Transforming Research and Clinical Knowledge in Traumatic Brain Injury (TRACK-TBI) Study

Lindsay D. Nelson, PhD; Nancy R. Temkin, PhD; Sureyya Dikmen, PhD; Jason Barber, MS; Joseph T. Giacino, PhD; Esther Yuh, MD, PhD; Harvey S. Levin, PhD; Michael A. McCrea, PhD; Murray B. Stein, MD, MPH; Pratik Mukherjee, MD, PhD; David O. Okonkwo, MD, PhD; Ramon Diaz-Arrastia, MD, PhD; Geoffrey T. Manley, MD, PhD; and the TRACK-TBI Investigators

- **“Mild” TBI is not mild**
- **At 12 months, 53% still reporting functional limitations**

2019

What is driving this disability?

Specific Symptoms Endorsed	mTBI	Ortho	
	% Endorsed (95% CI)		Risk Ratio (95% CI)
Headache	36% (33, 39)	9% (5, 16)	**3.41** (1.88, 6.17)
Dizziness	26% (23, 29)	9% (5, 16)	**2.47** (1.36, 4.49)
Nausea	10% (8, 13)	5% (2, 11)	1.44 (0.69, 3.03)
Noise sensitivity	28% (25, 31)	11% (6, 18)	**2.40** (1.36, 4.24)
Sleep disturbances	36% (33, 40)	26% (18, 35)	1.37 (0.97, 1.95)
Fatigue	41% (37, 44)	22% (15, 31)	**1.67** (1.16, 2.41)
Irritability/anger	33% (30, 37)	9% (5, 16)	**3.50** (1.87, 6.57)
Depression/tearfulness	26% (23, 29)	11% (6, 18)	**2.24** (1.27, 3.96)
Frustration/impatience	35% (31, 38)	11% (6, 18)	**2.95** (1.68, 5.18)
Forgetfulness/poor memory	47% (43, 50)	11% (6, 18)	**4.04** (2.31, 7.07)
Poor concentration	37% (34, 40)	11% (6, 18)	**3.20** (1.82, 5.61)
Taking longer to think	41% (38, 45)	9% (5, 16)	**4.33** (2.31, 8.11)
Blurred vision	20% (17, 23)	4% (1, 9)	**4.69** (1.78, 12.36)
Light sensitivity	20% (17, 23)	7% (3, 13)	**2.63** (1.27, 5.44)
Double vision	9% (7, 11)	1% (0, 4)	**8.14** (1.14, 57.98)
Restlessness	25% (22, 28)	12% (7, 20)	**1.82** (1.08, 3.06)

JAMA Network | Open™

Original Investigation | Neurology

Employment and Economic Outcomes of Participants With Mild Traumatic Brain Injury in the TRACK-TBI Study

Étienne Gaudette, PhD; Seth A. Seabury, PhD; Nancy Temkin, PhD; Jason Barber, MS; Anthony M. DiGiorgio, DO, MHA; Amy J. Markowitz, JD; Geoffrey T. Manley, MD, PhD; for the TRACK-TBI Investigators

- **59% reported not working at 2 weeks**
- **At 12 months, 17% still not working**
- **Employer assistance associated with working at 12 months**

2022

Translating Observational Studies into Improved Clinical Care

JAMA Network | Open™

Original Investigation | Emergency Medicine

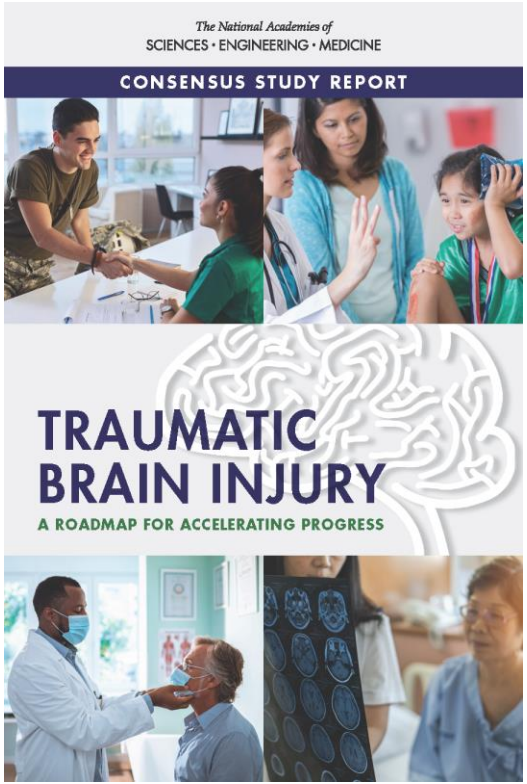
Assessment of Follow-up Care After Emergency Department Presentation for Mild Traumatic Brain Injury and Concussion
Results From the TRACK-TBI Study

Seth A. Seabury, PhD; Étienne Gaudette, PhD; Dana P. Goldman, PhD; Amy J. Markowitz, JD; Jordan Brooks, BA; Michael A. McCrea, PhD; David O. Okonkwo, MD, PhD; Geoffrey T. Manley, MD, PhD; and the TRACK-TBI Investigators

- **Major gaps in follow up and treatment**
- **Substantial number of patients with undiagnosed depression, anxiety, and other symptoms**
- **“Mild” TBI is not always MIld**
- **We need a system of follow up care for TBI**

2019

Introduction to the Forum's Action Collaborative on TBI Care



Committee on Accelerating Progress in Traumatic Brain Injury Research and Care

Conclusions

- TBI care in the United States often fails to meet the needs of individuals, families, and communities affected by this condition.
- High-quality care for TBI requires that it be managed as a condition with both acute and long-term phases.
- Public and professional misunderstandings are widespread with respect to the frequency; manifestations; long-term consequences; and proper detection, treatment, and rehabilitation of TBI.
- The United States lacks a comprehensive framework for addressing TBI.

The Action Collaborative is gathering inputs on the essential components required to develop a learning health care system for **community-acquired TBI**, focusing on:

- Follow-Up Care after TBI, addressing the questions of Who, When, and How
- Clinical Practice Guidelines for outpatient TBI programs for the continuum of care
- TBI Education, Discharge, and Ongoing Care Instructions
- Design of a Learning Health Care System for TBI Care

Is “Severe” TBI Always Severe?

JAMA Neurology | Original Investigation

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

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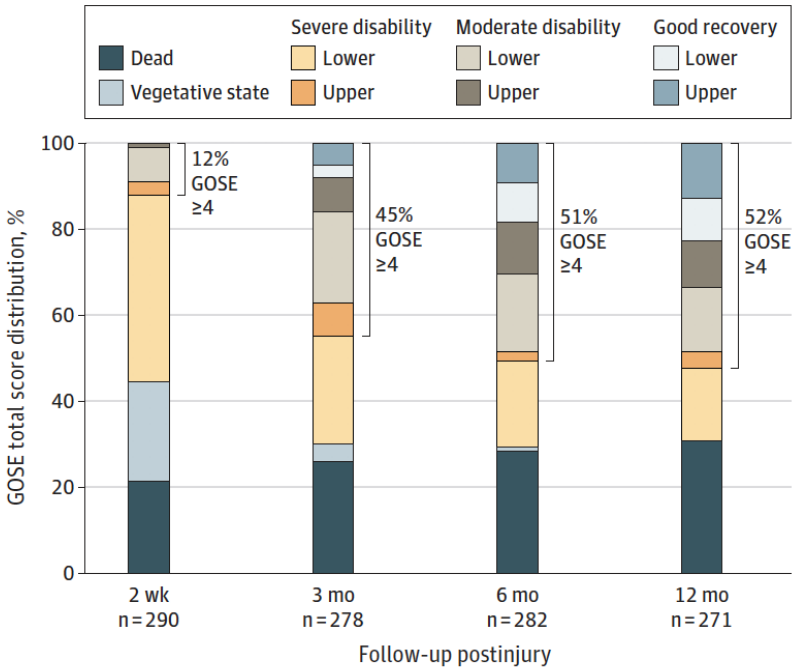
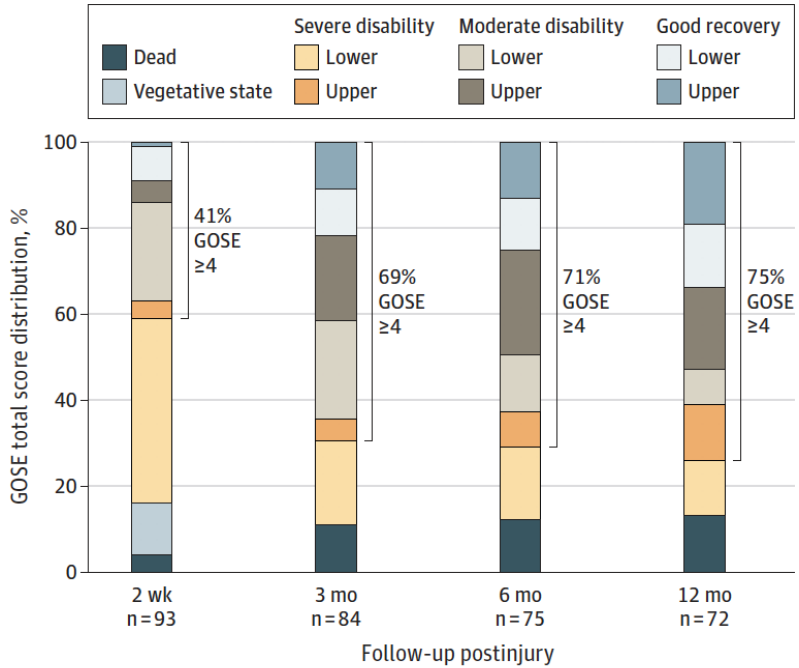
2021

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



GCS 9-12

Table 2. Frequencies Within Each Glasgow Outcome Scale–Extended (GOSE) Domain for Severe and Moderate Traumatic Brain Injury (TBI) Groups at 2 Weeks and 3, 6, and 12 Months Postinjury

GOSE domain severity in unweighted analyses	No. (%)[a]							
	2 wk		3 mo		6 mo		12 mo	
	Severe (n = 290)	Moderate (n = 93)	Severe (n = 278)	Moderate (n = 84)	Severe (n = 282)	Moderate (n = 75)	Severe (n = 271)	Moderate (n = 72)
Vegetative state and death								
Vegetative state	68 (23.4)	11 (12)	10 (3.6)	0	4 (1.4)	0	1 (0.4)	0
Died	60 (20.7)	4 (4)	73 (26.3)	9 (11)	78 (27.7)	9 (12)	83 (30.6)	9 (13)
Independence in the home								
No assistance	31 (10.7)	36 (39)	115 (41.4)	55 (65)	139 (49.3)	51 (68)	137 (50.6)	50 (69)
Infrequent assistance	5 (1.7)	2 (2)	9 (3.2)	3 (4)	6 (2.1)	2 (3)	5 (1.8)	4 (6)
Frequent assistance	126 (43.4)	40 (43)	71 (25.5)	17 (20)	55 (19.5)	13 (17)	45 (16.6)	9 (13)
Independence in shopping								
No assistance	33 (11.4)	36 (39)	115 (41.4)	54 (64)	140 (49.6)	48 (64)	135 (49.8)	47 (65)
Assistance	128 (44.3)	42 (45)	80 (28.8)	21 (25)	60 (21.3)	18 (24)	52 (19.2)	16 (22)
Independence in traveling								
No assistance	33 (11.4)	34 (37)	110 (39.6)	54 (64)	139 (49.3)	47 (63)	133 (49.1)	46 (64)
Assistance	128 (44.1)	44 (47)	85 (30.6)	21 (25)	61 (21.6)	19 (25)	54 (19.9)	17 (24)
Work[b]								
No deficit	2 (1.0)	8 (10)	25 (11.8)	21 (29)	57 (26.9)	23 (37)	70 (34.0)	30 (49)
Reduced capacity	3 (1.4)	4 (5)	25 (11.8)	12 (17)	26 (12.3)	12 (19)	20 (9.7)	7 (11)
Limited or unable to work	133 (63.3)	55 (70)	125 (59.2)	34 (47)	94 (44.3)	22 (35)	79 (38.3)	19 (31)

Nearly 1 in 5 participants with severe TBI and 1 in 3 with moderate TBI reported no disability (DRS score 0) at 12 months.

Among participants in a vegetative state at 2 weeks, 78% regained consciousness and 25% regained orientation by 12 months.

CONCLUSIONS AND RELEVANCE In this study, patients with msTBI frequently demonstrated major functional gains, including recovery of independence, between 2 weeks and 12 months postinjury. Severe impairment in the short term did not portend poor outcomes in a substantial minority of patients with msTBI. When discussing prognosis during the first 2 weeks after injury, clinicians should be particularly cautious about making early, definitive prognostic statements suggesting poor outcomes and withdrawal of life-sustaining treatment in patients with msTBI.

We need to RAPIDLY change our approach to TBI Care across the spectrum of Concussion to Coma

We need to STOP using the terms of Mild, Moderate, and Severe

What would be more precise?

GCS

Imaging

Blood-Based Biomarker

Traumatic Brain Injury Classification Workshop

Rethinking TBI Classification for Clinical Care and Research

National Institute of Neurological Disorders and Stroke

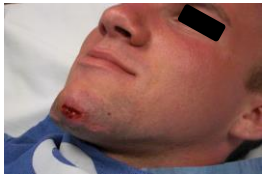
January 2024

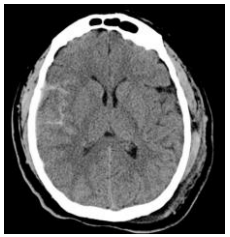
A NEW ERA IN TBI

28 yo s/p fall +LOC

"Mild" TBI or not so mild?

GCS 14, GFAP 400 , SAH

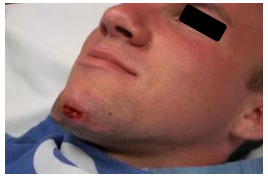


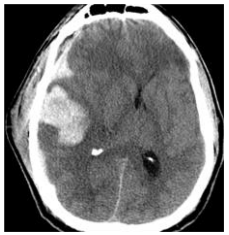


28 yo s/p fall +LOC

"Mild" TBI or not so mild?

GCS 14, GFAP 3,200, SAH/Contusion



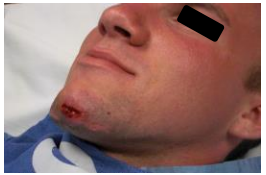


A NEW ERA IN TBI

28 yo s/p fall +LOC

"Mild TBI: How many modifiers affect outcome?

GCS 14, GFAP 400 , SAH

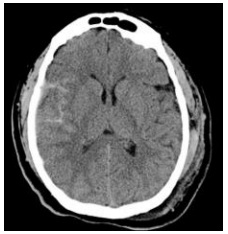


Graduate education
Employed
Supportive family environment

28 yo s/p fall +LOC

"Mild TBI: How many modifiers affect outcome?

GCS 14, GFAP 400 , SAH



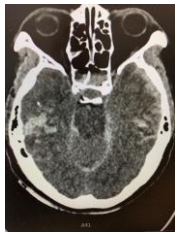
10th grade education
Unemployed
Alcohol use disorder
Homeless

A NEW ERA IN TBI

46 yo s/p fall +LOC, Intubated in Field

"Severe" TBI or not so severe?

GCS 6T, GFAP 8000, SAH/SDH/Contusion



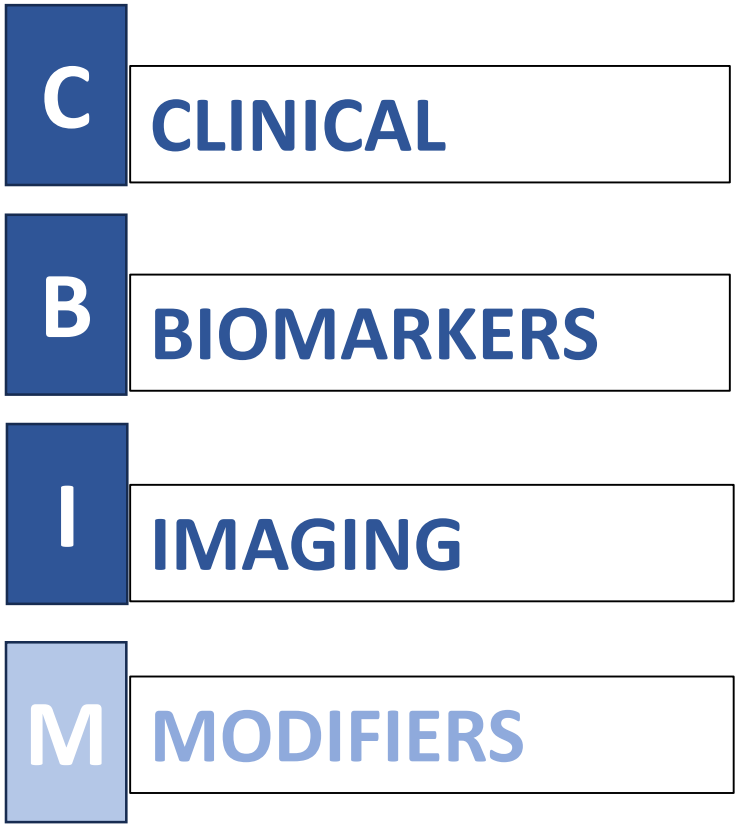
46 yo s/p fall +LOC, Intubated in Field

"Severe" TBI or not so severe?

GCS 6T, GFAP 10, , Normal CT, Blood Alcohol 400

NEW TBI NOMENCLATURE

Moving Beyond the Limitations of "Mild, Moderate, Severe"




PAST
FUTURE
PRESENT

1. Establish a multidisciplinary team for clinical outcome and biomarkers for potential FDA-qualified drug development tools
2. Validate candidate outcomes and biomarkers by existing research infrastructure and clinical networks for potential qualification as DDTs. Continue FDA qualification and develop Implementation and Dissemination Transition Plan.
3. Received Neuroimaging and Biofluid Biomarker FDA Letters of Support; MDDT proposal in Qualification State; CPIM meeting convened. Using existing TRACK-TBI infrastructure to enroll 'Friend Controls'

Funding: DHA/MRDC

TRACK-TBI
Precision Medicine
Transforming Research and Clinical Knowledge in Traumatic Brain Injury Precision Medicine

1. Validate biomarkers of DAI, MVI, and neuroinflammation using blood-based assay platforms and MRI in existing TRACK-TBI subjects. Enroll new TBI patients through TRACK-TBI network and the military partner site of WRNMMC with advanced imaging and biomarker protocols; IF APPROVED BY DOD:
2. Validate early and ultra-early blood-based and imaging biomarkers as predictive and pharmacodynamic biomarkers in new MOD-SEV TBI cohort; IF APPROVED BY DOD:
3. Conduct multicenter exploratory clinical trial comparing e.g., impact of CSA on imaging and blood-based biomarkers

Funding: DoD

TRACK-TBI NET
Transforming Research and Clinical Knowledge in Traumatic Brain Injury Network

1. Establish the TRACK-TBI NETWORK, an innovative Phase 2 TBI adaptive clinical trials network that delivers on DoD and NIH recommendations.
2. 5-year, Phase 2 multi-arm, multi-stage adaptive platform design for multi-site, randomized, controlled clinical trials for patients with moderate to severe TBI.

Funding: USAMMDA via MTEC

TRACK-TBI BIO
Transforming Research and Clinical Knowledge in Traumatic Brain Injury Biomarker Project

Clinical Validation of NF-L of prognostic biomarker of TAI

Funding: NINDS

Weill Neurohub
Data & Analytics Center (NDAC)
Funding: Weill

TRACK-TBI Tau/pTau
Transforming Research and Clinical Knowledge in Traumatic Brain Injury Tau/pTau

Validation of Tau & pTau as prognostic biomarker for complicated mild TBI

Funding: NINDS

2009 2011 2013 2014 2018 2019 2020 2022 2024 2025

Funding: NINDS

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

1. Modular Case Report Form (CRF) with web-based data entry, automated data checks for use in TBI consistent with the project to create NINDS Common Data Elements (TBI-CDE).
2. Test modular TBI-CDE in a prospective observational study and to use this experience to fine tune and improve the system.
3. Create TBI-CDE Neuroimaging and Biospecimen data repositories.
4. Make the standardized formats for data collection in TBI widely available with open source access.

Funding: NINDS

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

1. Create TBI Information Commons integrating clinical, imaging, proteomic, genomic, and outcome biomarkers from subjects across the age and injury spectra, and provides analytic tools and resources to support TBI research.
2. Validate imaging, proteomic, and genetic biomarkers for classification of TBI for selection and stratification of patients for clinical trials, contribute to development of a new taxonomy for TBI.
3. Evaluate a flexible outcome assessment battery of TBI common data elements that enables assessment of multiple outcome domains across all phases of recovery and at all levels of severity.
4. Determine which tests, treatments, and services are effective and appropriate for which TBI patients, and use this evidence to recommend practices that offer the best value.

Funding: NFL

TRACK-TBI LONG Pilot
Transforming Research and Clinical Knowledge in Traumatic Brain Injury Longitudinal Pilot

1. Characterize the long-term effects of TBI in the TRACK-TBI cohort for evidence of neurodegenerative disease, psychiatric disease, and post-traumatic disorders to identify those at risk for these unfavorable long-term outcomes.
2. Characterize the relationship of imaging biomarkers to the long-term trajectory of neurocognitive/psychological function in TBI.
3. Characterize the relationship of proteomic biomarkers to the long-term trajectory of neurocognitive/psychological function in TBI.

TRACK-TBI GERI
Transforming Research and Clinical Knowledge in Traumatic Brain Injury Geriatrics

2-site study of geriatric TBI investigating clinical outcomes and predictors as well as diagnostic prognostic biomarkers

Funding: NINDS

TRACK-TBI EPI
Transforming Research and Clinical Knowledge in Traumatic Brain Injury Epileptogenesis

Funding: DHA/MRDC

1. Extend follow-up of TRACK-TBI participants from 1 to 5 yrs.
2. Extend follow-up period of the TRACK-TBI affiliated studies.
3. Conduct specialist epileptologist evaluation for all TBI patients who screen positive for PTEo 2 years.
4. Measure candidate blood biomarkers.

Spreading Depolarization II (U Cinn /Hartings)

1. Develop single-process methods for automated bedside detection of spreading depolarizations
2. Determine incidence of spreading depolarizations and if they are associated with worse neurologic outcome

Funding: DHA/MRDC

Department of Energy (DOE) / Nat'l Labs Collaboration

Utilize DOE Artificial Intelligence and high-performance computing to operationalize Precision Medicine approaches

Funding: DOE

High Definition Fiber Tracking (UPMC / Okonkwo)

1. Perform advanced HDFT on subset of TRACK-TBI subjects
2. Create a Biospecimen Repository of samples collected from 3000 TRACK-TBI subjects
3. Create a Bioinformatics Core that will accelerate input of TRACK-TBI data into FITBIR

Funding; Naval Health Research Center

Abbott

iSTAT
Partnership with Abbott to test prototype TBI point-of-care device

Clinical Evaluation of the Pediatric TBI Test
Demonstrate performance and intended use of the TBI test assay in a clinical setting

Alinity i TBI Test Fresh Sample Testing
Evaluate the performance of the Abbott TBI Test with the Alinity *i* instrument system in fresh collected plasma specimens

Science in A Golden Age

Traumatic Brain Injury