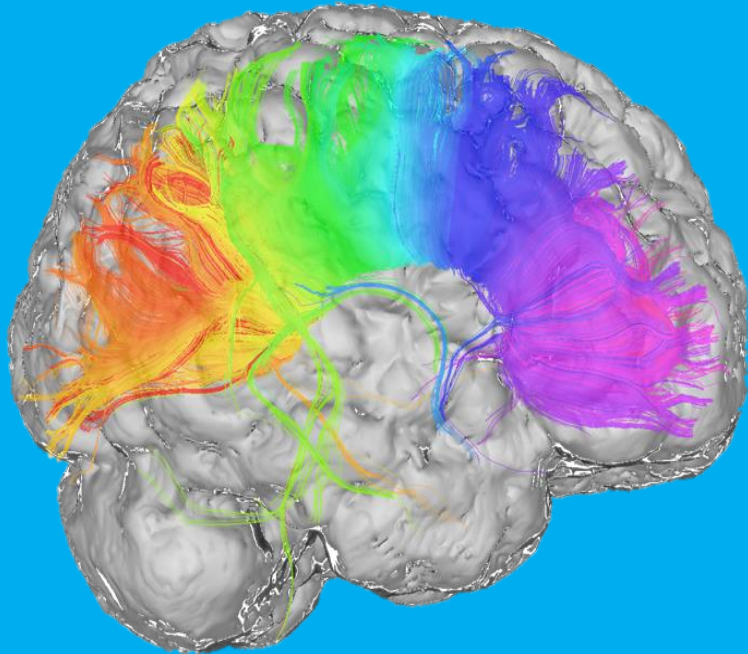


Brain Injury Research Center: Research Program Overview



**Mount
Sinai**

*Brain Injury
Research Center*



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The Brain Injury Research Center of Mount Sinai is committed to improving the health and life quality of people living with brain injury. Our center aims:

- To better understand TBI and its consequences
- To develop and evaluate the efficacy of innovative interventions
- To provide education, services and support to people with TBI and their families



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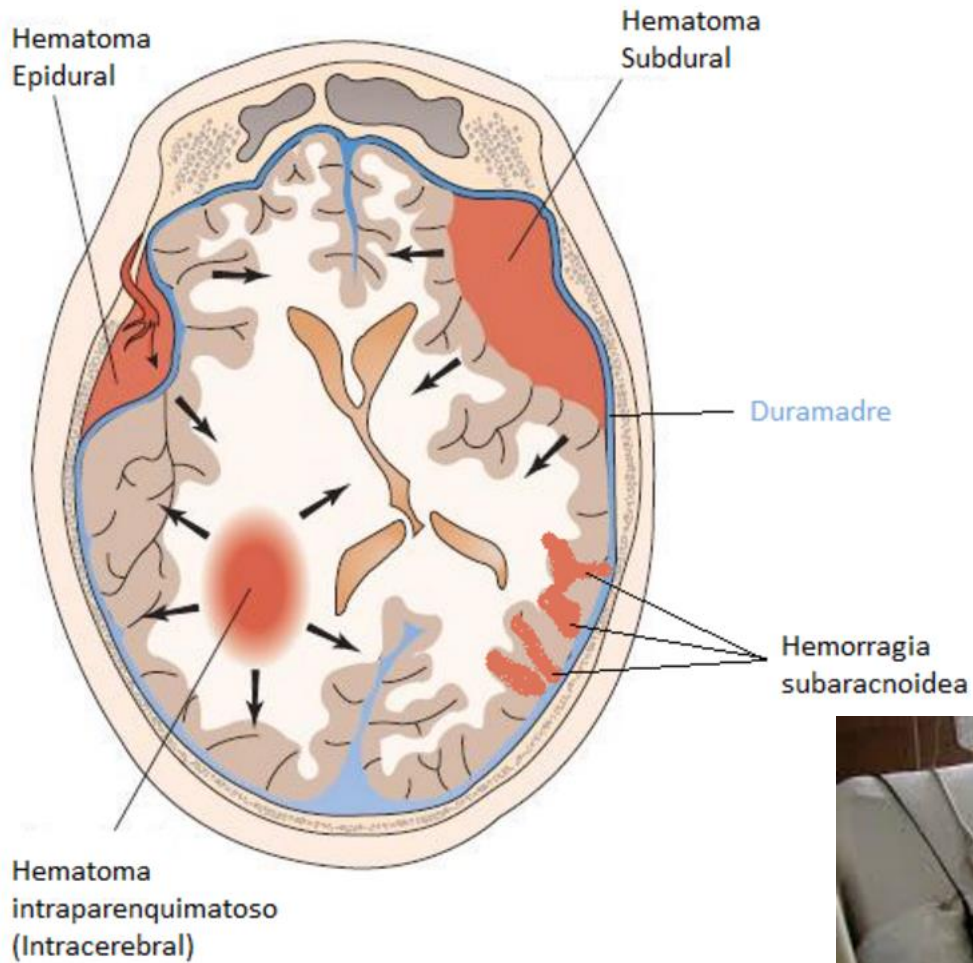
Overview

Mission: to improve the lives of people with TBI.

The BIRC-MS has been continually funded since 1987.

Current funding sources:

- National Institute on Disability, Independent Living and Rehabilitation Research (NIDILRR)
- Centers for Disease Control and Prevention (CDC)
- National Institutes of Health (NIH)
- Department of Defense (DoD)
- Patient Centered Outcomes Research Institute (PCORI)



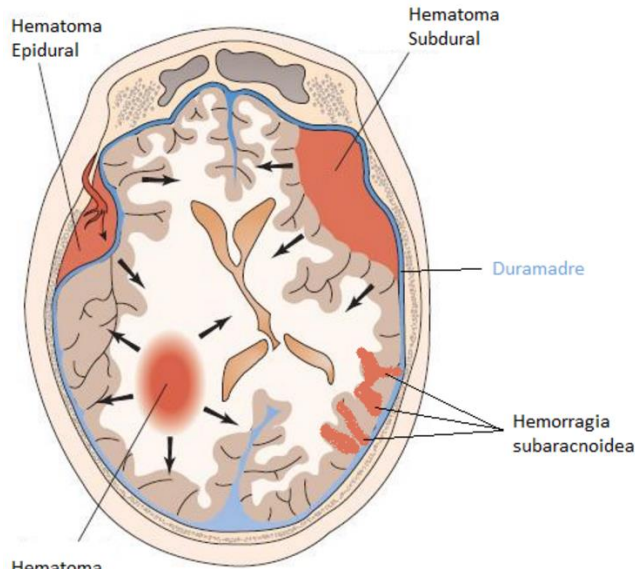
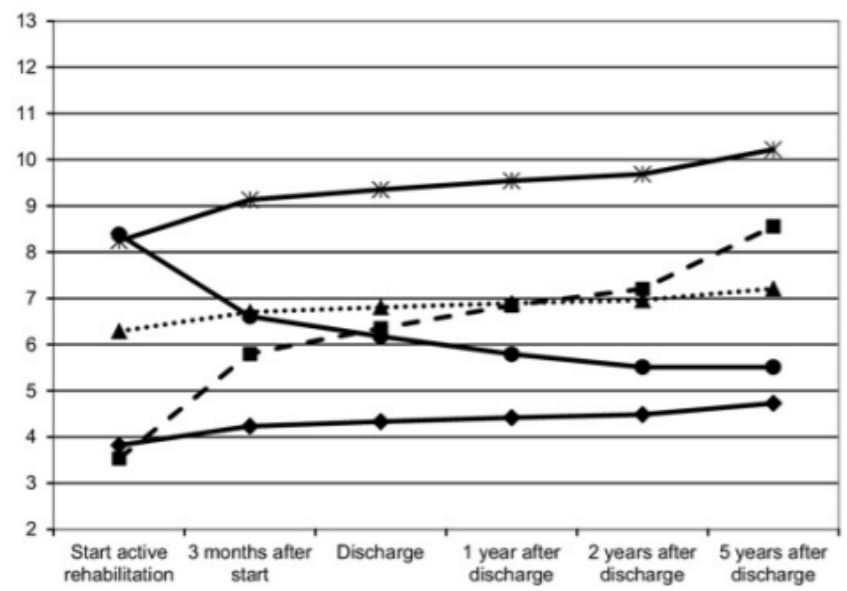
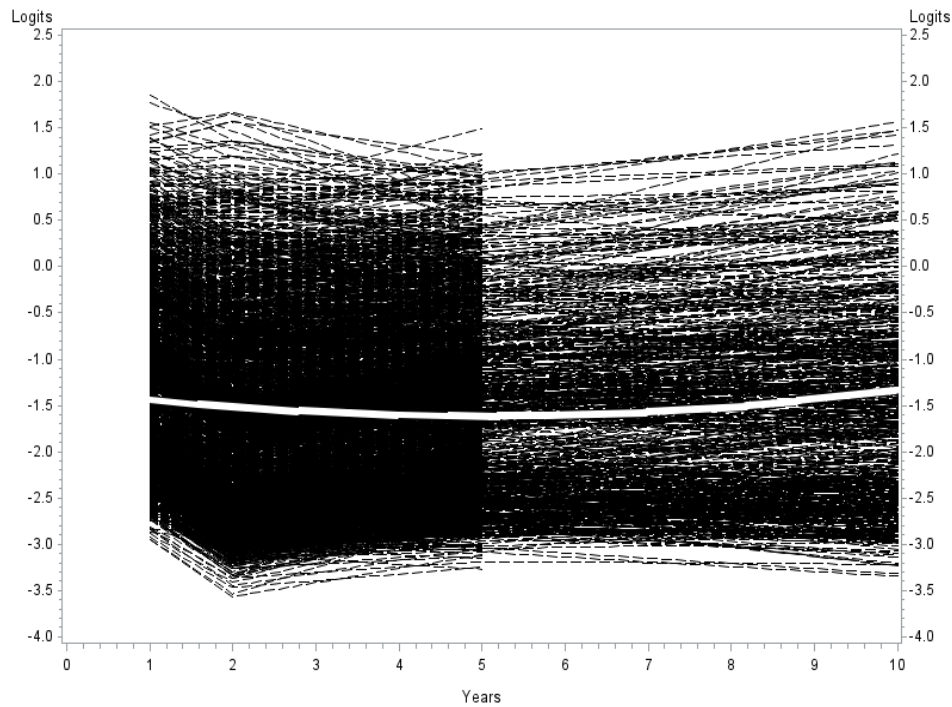


Figure 1. Individual Profiles Based on Logits and Unconditional Model Trajectory





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Physiological and Structural Biomarkers of Attentional Deficits

What is the Physiological and Structural Biomarkers of Attentional Deficits study?

This study evaluates attentional deficits using electroencephalogram (EEG), neuroimaging (MRI, PET), and neurobehavioral measures.

Who can participate?

Participants must be **18-75** years of age, have had a **complicated mild, or moderate-severe TBI** and be **within 6 months post-injury**.

What is involved?

Participation involves undergoing EEG, MRI, PET and neurobehavioral evaluation. Study procedures will either happen while participants are still inpatients at MSBIRU, outpatient at the BIRC or Weill Cornell Medical Center. Follow-up will occur over the telephone, and participants are invited to return for another neuroimaging study one year post-injury.

Coordinator: Alexandra Landau, 212-241-4820

Funded by the
National Institutes
of Health

The logo for the National Institutes of Health (NIH), featuring the letters 'NIH' in white on a dark blue arrow-shaped background pointing to the right.

NIH



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TBI Model Systems – a national program

What is the NY TBI Model System?

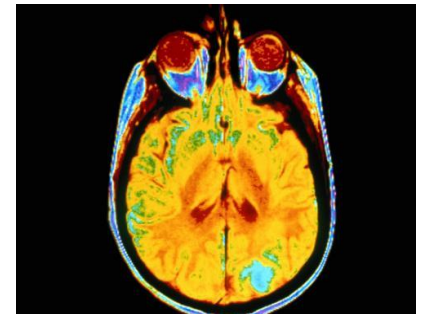
The TBI Model System at Mount Sinai (one of 19 U.S. centers) is part of a national effort to **improve TBI care through research**. We are part of the largest TBI outcome study in the world, with more than 13,000 TBI survivors across the country contributing information since 1987.

TBI Model Systems Research

- Longitudinal tracking of patients, from inpatient hospitalization, to 1-year post, then 2, 5, 10+ years
- Center-specific studies
- Collaborative studies with other centers

Current Focus

Conducting research that contributes to evidence-based rehabilitation interventions, as well as clinical practice guidelines that improve the lives of people with TBI.



Funded by the National
Institute on Disability,
Independent Living and
Rehabilitation Research





NY TBI Model System Research

Participation in the National Data Base

Why is this important?

This survey study is important to TBI survivors because it helps **us better understand long-term outcomes after TBI**, so we can better help them, as well as their families, caregivers and clinicians.

Who is eligible to participate?

Individuals with **moderate-severe TBI**, presenting to a Model Systems hospital **within 72 hours of injury**, and received **acute rehabilitation at Mount Sinai**.

What is involved?

Participation involves follow-up surveys and a 15 min test of thinking abilities that take place 1, 2, 5, 10, 15+ years after injury.

Module Projects:

Effect of light exposure during acute rehab on sleep after TBI

Cognitive testing in the TBI Model System

Long-term co-morbidity and functional decline following TBI

Understanding causes of death in the TBI Model Systems (verbal autopsy)

Integrating TBIMS Data into FITBIR

Coordinator:

Alexandra

Landau, 212-241-4820.

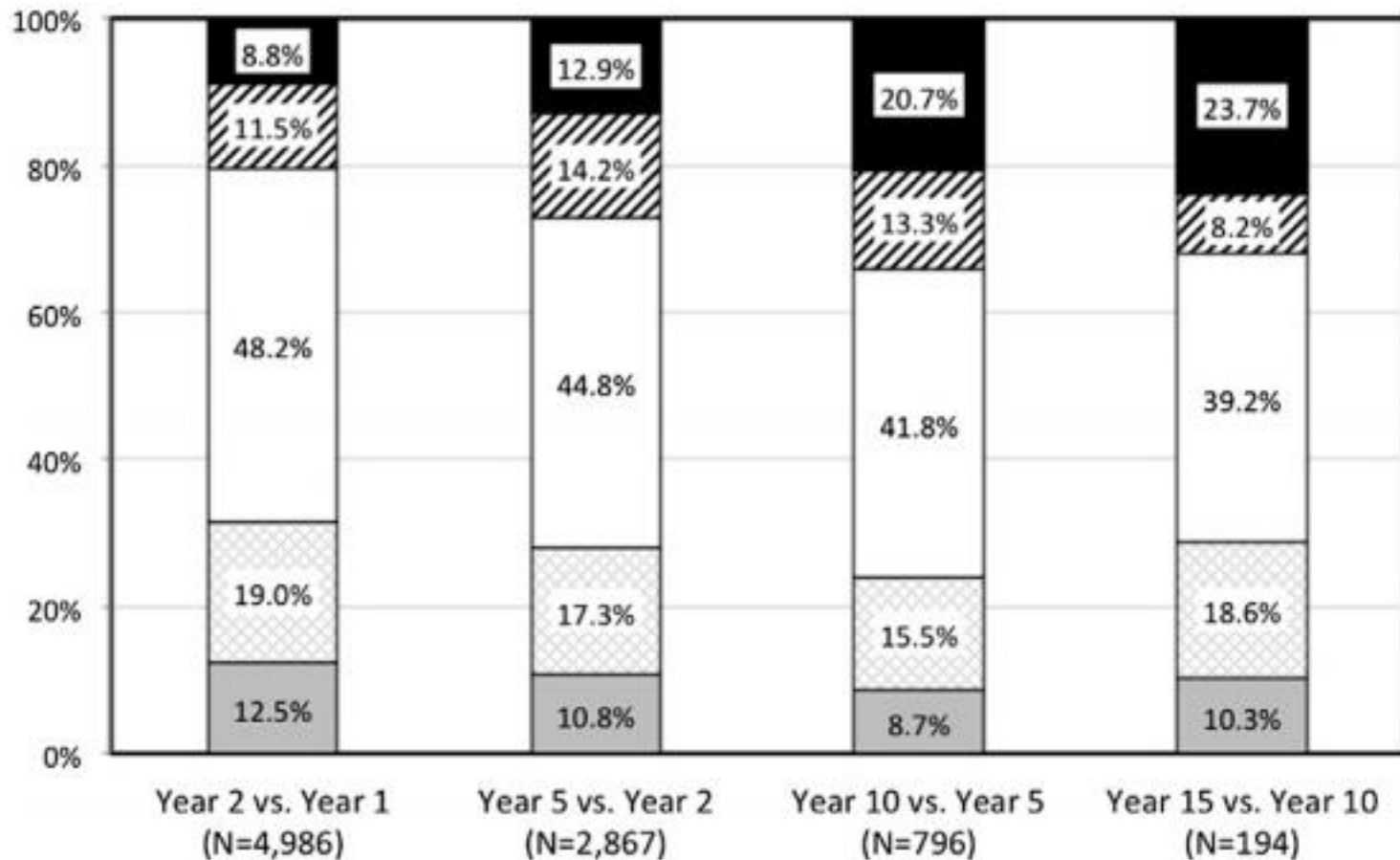
Funded by the National Institute on Disability, Independent Living and Rehabilitation Research



NATIONAL INSTITUTE ON DISABILITY,
INDEPENDENT LIVING, AND
REHABILITATION RESEARCH

NIDILRR

Heterogeneity of Change in GOS-E score 2-15 years post TBI



■ % 2 category declined ▨ % 1 category declined □ % no change
 ▩ % 1 category improved ◼ % 2 category improved

Mortality after surviving TBI: Risks Based on Age Groups

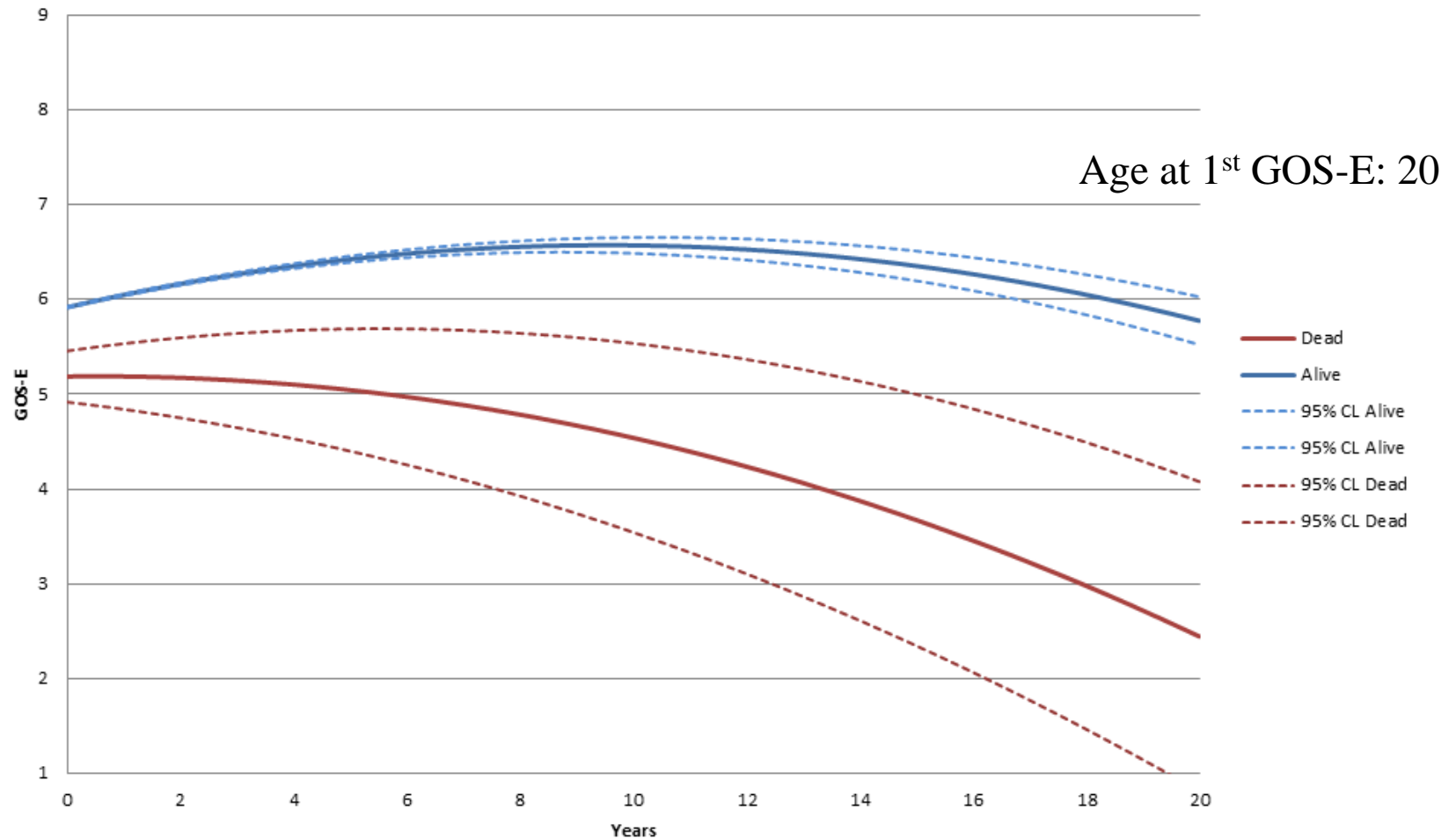
TABLE 6 *Significant standardized mortality ratios by age and cause of death*

	Standardized mortality ratios								
	15-19 y	20-24 y	25-34 y	35-44 y	45-54 y	55-64 y	65-74 y	75-84 y	85+ y
All circulatory 390-459				2.27	2.58		1.46		
All external causes E800-E999	4.20	2.29	2.72	5.51	3.88	4.94	4.44	3.48	
Unintentional E800-E949	4.15		3.78	6.54		7.78		4.45	
Poisoning E850-E869		10.91	10.12	11.54					
Vehicular E800-E848				4.87		8.22			
Homicide E960-E969	5.12				12.25				
Fall E880-E888					28.50			11.44	
All respiratory 460-519				9.02	11.42	4.68	2.44	1.85	2.40
Pneumonia 480-486				18.43	27.12	9.23	5.49	3.19	
Aspiration pneumonia 507						51.93	11.55	7.41	10.70
Sepsis 038					27.42	14.12	8.78	6.42	
Nervous system 320-389						6.64			
Digestive 520-579				4.76	4.24				
Seizure 780.3			37.52						
Mental disorders 290-319							8.59		

Harrison-Felix, Kolakowsky-Hayner, Hammond, Wang, Englander, Dams-O'Connor, Krieder, Novack, Diaz-Arrastia, 2012

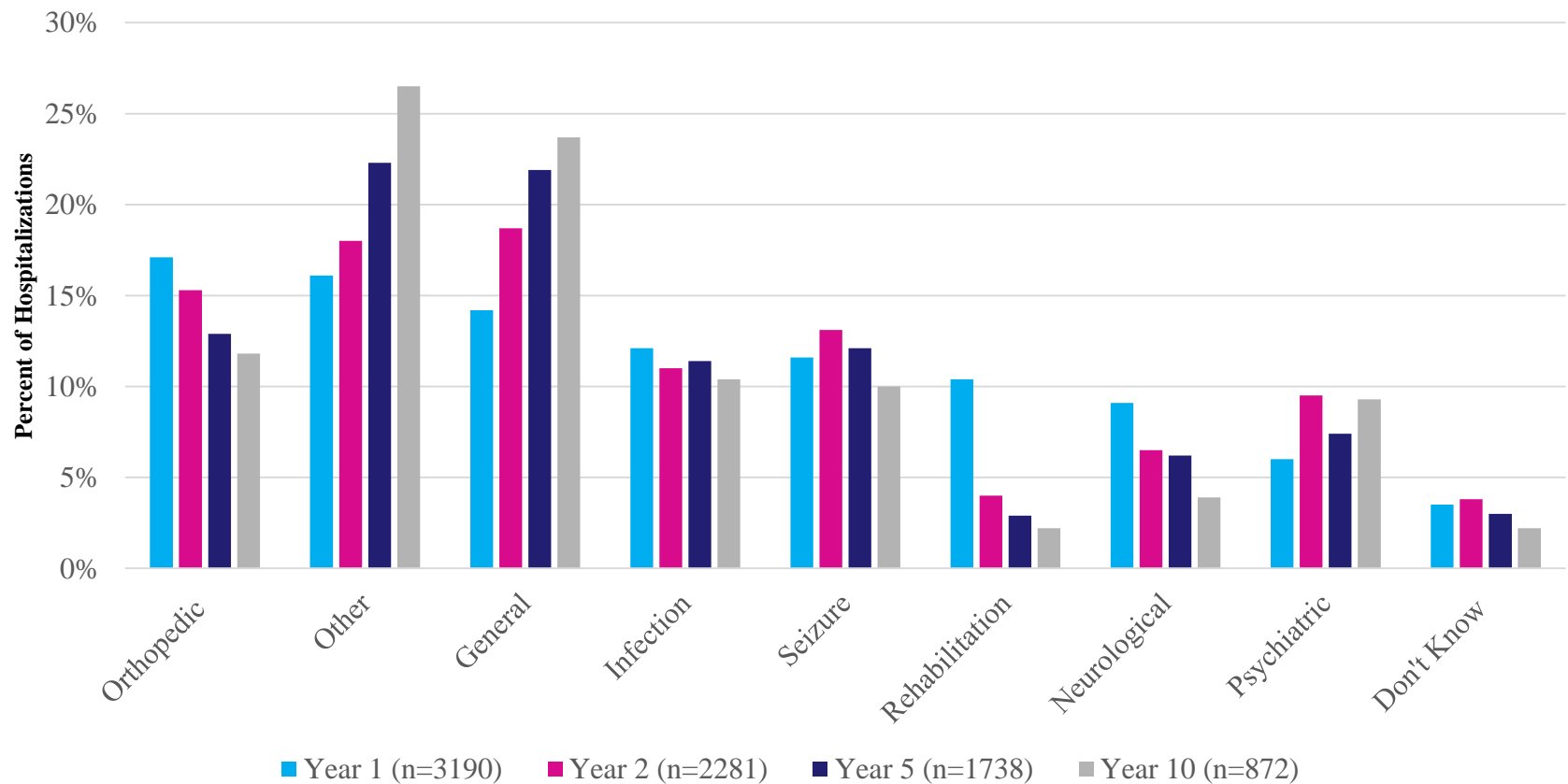
Functional Trajectories of Survivors vs. Nonsurvivors: A TBI Model Systems Study

GOS-E (Covariate=Death) Controlling for Age at First Measure



Rehospitalization after Mod-Sev TBI: a NIDILRR TBI Model Systems Study

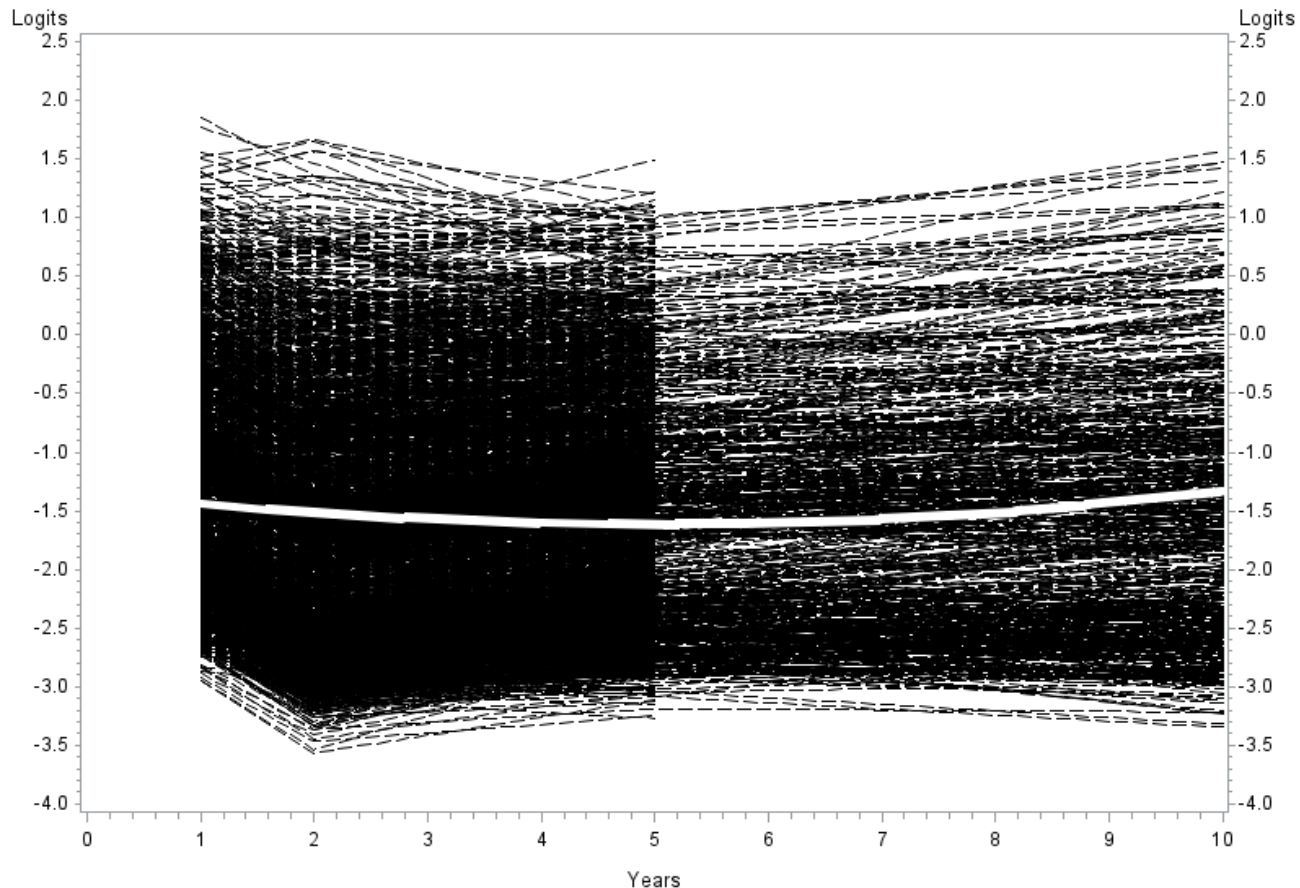
Reasons for Hospitalizations



Dams-O'Connor K, Pretz C, Hammond FM, Landau A, Dreer L, Hoffman J, Zafonte R. Rehospitalization over 10 years among survivors of TBI: A NIDILRR TBI Model Systems Study J Head Trauma Rehabil. Under Review.

Rehospitalization after Mod-Sev TBI: a NIDILRR TBI Model Systems Study

Figure 1. Individual Profiles Based on Logits and Unconditional Model Trajectory



Dams-O'Connor K, Pretz C, Hammond FM, Landau A, Dreer L, Hoffman J, Zafonte R. Rehospitalization over 10 years among survivors of TBI: A NIDILRR TBI Model Systems Study J Head Trauma Rehabil. Under Review.



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TBI and Health in Older Adults

What is the TBI and Health in Adults project?

TBI and Health in Older Adults is an exploratory study investigating traumatic brain injury and its relationship to the aging process.

Why is this research important to adults with TBI?

This survey study is important to adults with TBI because it collects information about health and thinking skills among TBI-survivors in order to learn more about specific factors that may help people with TBI to stay healthy as they age.

Who can participate?

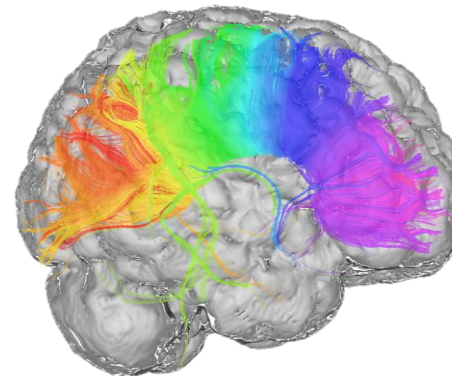
Individuals must be 40 or older at the time of injury, have had a moderate-severe TBI, and received hospital care at Mount Sinai or another hospital.

What is involved?

Participation involves surveys about health and functioning in the past year, 1 year and 2 years post injury, and a brief cognitive exam.

In the unlikely event that a participant dies during the course of the study, we invite their NOK to participate in a postmortem interview.

Coordinator: Carly Swenson, 212-241-5190



Funded by the Centers
for Disease Control
and Prevention



Health in Adults with TBI: Sneak peak

- ▶ 85% of the sample (n=86) report 3 or more chronic medical conditions (avg: 6 conditions (range: 3-14))

Health Condition	Frequency
Chronic Pain	29
Anxiety/Depression/Emotional disorder	28
Heart trouble	27
Hypertension	26
Headaches or other problems	21
Stroke, seizures, bone or joint disease	20
Sciatica or recurring backache	19
Cancer	19
Diabetes or high blood sugar	14
Chronic sleep problems	10

50% rated their health as Excellent or Very Good



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Late Effects of TBI (LE-TBI)

What is the LE-TBI study?

The *Late Effects of Traumatic Brain Injury: Brain Donor Program* aims to **learn more about the long-term effects of TBI** in the general community. It is unique in that it **involves brain-banking** - TBI has never been studied in the general population with brain autopsy as a major focus.

Why is this research important to people with TBI?

There is no brain bank in the U.S. that focuses on collecting brain tissue from TBI survivors. **Studies using donated brain tissue are the most promising avenue for researchers to learn how to prevent and cure disorders of the brain.**

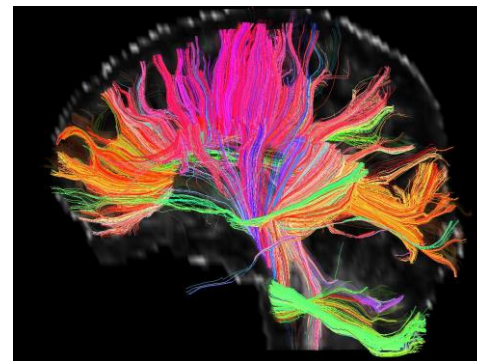
Who can participate?

Individuals must be **40 or older** and at least **1 year post-injury** and have been **hospitalized** for a **moderate-severe TBI**.

What is involved?

Participation involves an assessment of cognitive, emotional, and behavioral functioning, an MRI scan, and a blood draw. Participants will also be asked to consider becoming brain donors.

Coordinator: Elissa Flannery, 212-241-4706



Funded by the
National Institutes
of Health



RESEARCH PAPER

Risk for late-life re-injury, dementia and death among individuals with traumatic brain injury: a population-based study

Kristen Dams-O'Connor,¹ Laura E Gibbons,² James D Bowen,³ Susan M McCurry,⁴
Eric B Larson,^{2,5} Paul K Crane²

Table 3 Time ratios baseline report of TBI with LOC for any dementia and Alzheimer's disease, adjusting for age, sex, education and *APOE* ϵ 4

Age at first TBI with LOC	TR (95% CI)
Any dementia	
<25	1.02 (0.87 to 1.20)
25–54	1.04 (0.78 to 1.38)
55-baseline	1.06 (0.81 to 1.39)
Probable or possible AD	
<25	0.99 (0.84 to 1.15)
25–54	1.01 (0.76 to 1.34)
55-baseline	1.15 (0.86 to 1.53)

Time ratios indicate the ratio of the time to dementia or AD in the given group, compared to those with no TBI with LOC; time ratios greater than one correspond to longer time to dementia or AD.

APOE ϵ 4, apolipoprotein-E ϵ 4 allele; AD, Alzheimer's disease; LOC, loss of consciousness; TBI, traumatic brain injury; TR, time ratio.

Association of Traumatic Brain Injury With Late-Life Neurodegenerative Conditions and Neuropathologic Findings

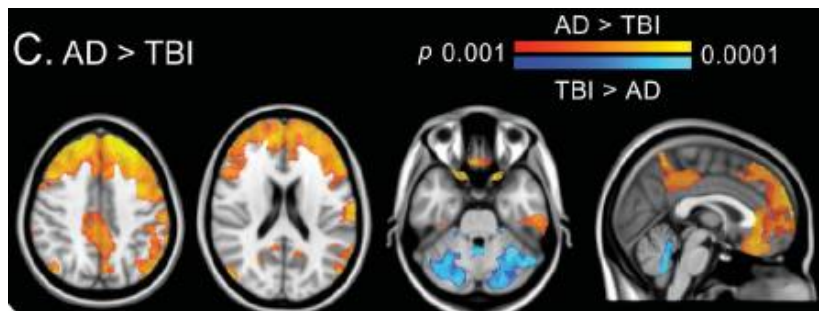
Paul K. Crane, MD, MPH; Laura E. Gibbons, PhD; Kristen Dams-O'Connor, PhD; Emily Trittschuh, PhD; James B. Leverenz, MD; C. Dirk Keene, MD, PhD; Joshua Sonnen, MD; Thomas J. Montine, MD, PhD; David A. Bennett, MD; Sue Leurgans, PhD; Julie A. Schneider, MD, MS; Eric B. Larson, MD, MPH

Table 5. Adjusted associations between traumatic brain injury with loss of consciousness younger than age 25 and neuropathological findings from joint analysis of data from all three studies*

Outcome	TBI with LOC < 1 hr (n=67)		TBI with LOC ≥1 hr (n=19)	
	RR (95% CI)	P value	RR (95% CI)	P value
Braak Stage 5 or 6	1.00 (0.66, 1.52)	0.99	1.03 (0.50, 2.14)	0.94
CERAD intermediate or frequent	1.09 (0.89, 1.32)	0.41	0.91 (0.62, 1.35)	0.65
Amyloid angiopathy	1.07 (0.89, 1.29)	0.44	0.86 (0.62, 1.20)	0.38
Cystic infarcts	0.83 (0.58, 1.21)	0.33	0.84 (0.45, 1.60)	0.60
Hippocampal sclerosis	1.42 (0.68, 2.97)	0.35	1.33 (0.37, 4.76)	0.66
Cerebral Microinfarcts				
Any	1.04 (0.78, 1.40)	0.77	1.66 (1.19, 2.32)	0.003
Any cortical	1.10 (0.77, 1.57)	0.60	1.29 (0.71, 2.35)	0.41
Any deep	1.06 (0.72, 1.58)	0.76	1.24 (0.64, 2.40)	0.53
Lewy bodies				
Any	0.95 (0.56, 1.62)	0.86	1.86 (1.03, 3.35)	0.040
Substantia Nigra or Locus Ceruleus	1.03 (0.59, 1.80)	0.91	1.84 (0.94, 3.60)	0.08
Frontal or temporal cortex				
Amygdala / limbic	1.09 (0.60, 1.98)	0.78	1.77 (0.86, 3.64)	0.12

Late life Consequences of TBI: not AD??

- Several studies suggest TBI → earlier onset of dementia
- TBI → shortened lifespan (4-9 years)
- ACT/ROS/MAP exclude those who die or become demented <65y



Scott 2016 Neurology

Study entry requires free of dementia and willing to volunteer

At least 40 year lag between TBI exposure and joining the study

(Those lost here may be of particular interest)

TBI < age 25

Study eligibility

0 10 20 30 40 50 60 70 80

Age

late effects of traumatic brain injury project



MGH A.A.
Martinos
Center



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late effects of traumatic brain injury project

In Vivo

Ex Vivo

Neurocognitive Testing and
Behavioral Evaluation
(MSSM, UW)



Motor
Examination
(MSSM, UW)



Clinico-
Pathological
Correlation

Gross Pathology
(USUHS, BWH)



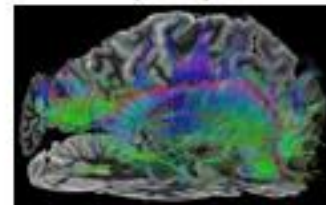
Histopathology
(UW, USUHS)



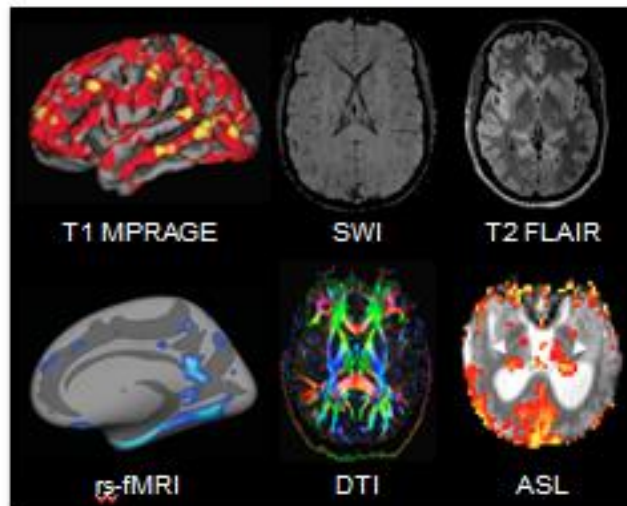
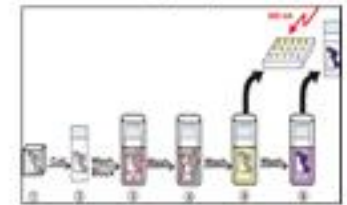
Structural and Functional MRI
(MSSM, UW)



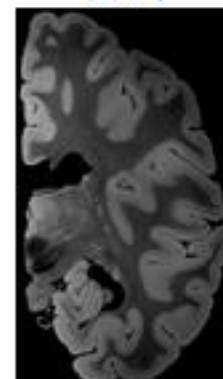
3 Tesla MRI
(MGH)



Histelide
(UW)



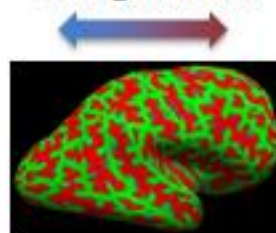
7 Tesla MRI
(MGH)



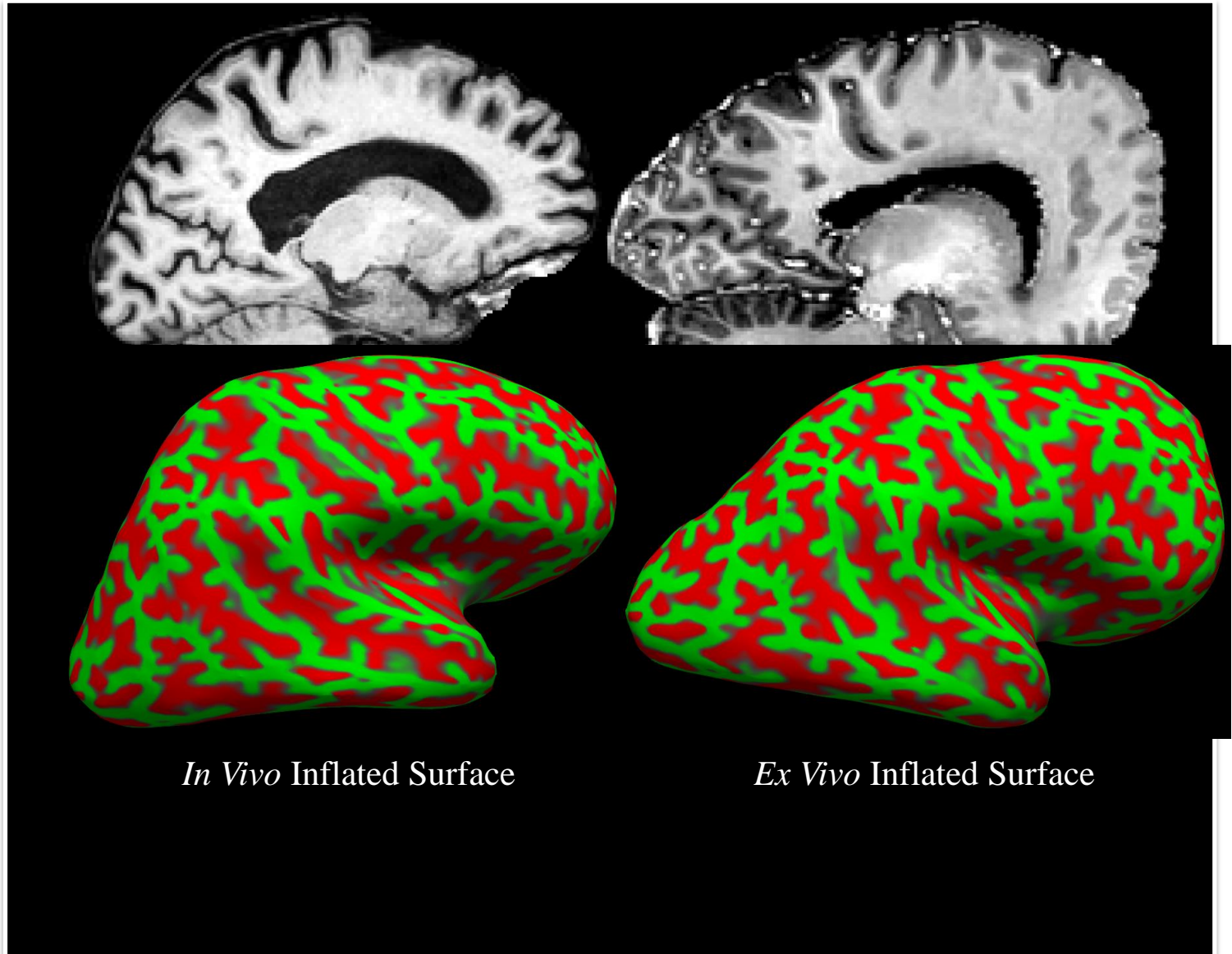
Whole Mount
(USUHS)



Coregistration



Linking *Ex Vivo* to *In Vivo* MRI



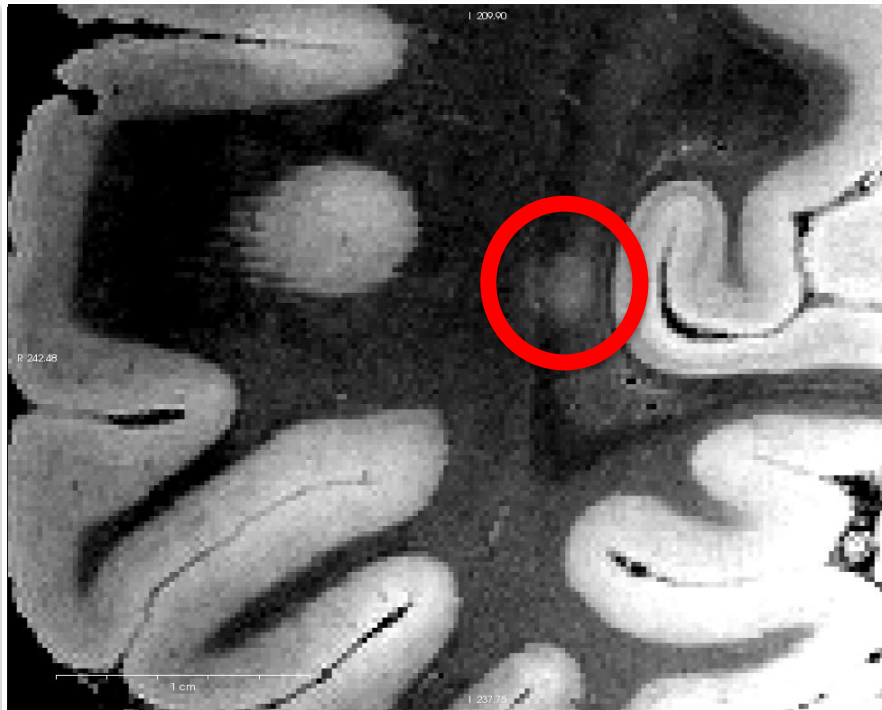
In Vivo Inflated Surface

Ex Vivo Inflated Surface

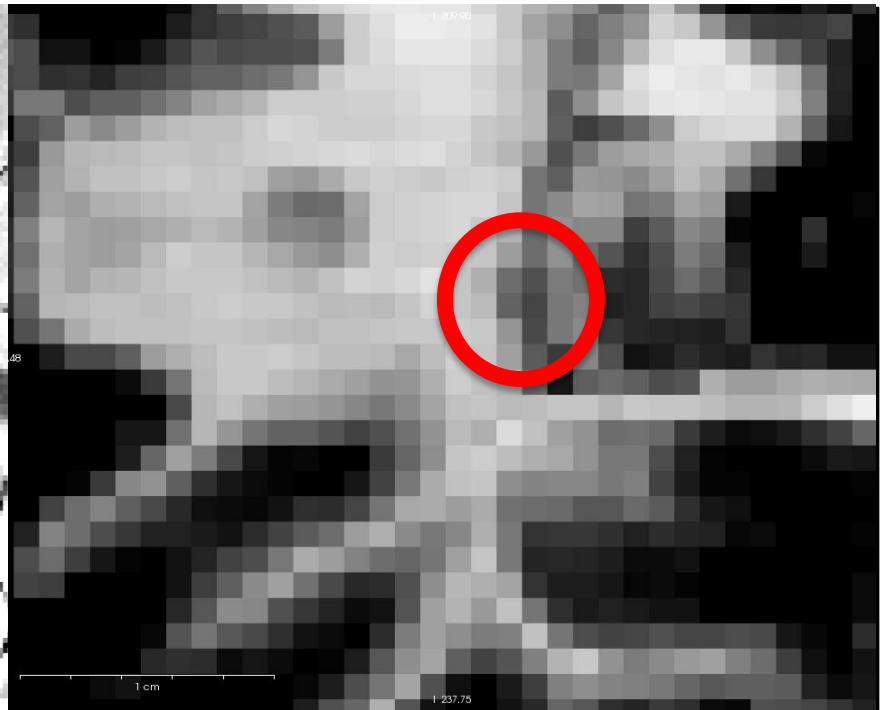
In vivo data courtesy of Christine Mac Donald, Paul Crane and Tom Grabowski

Ex vivo data courtesy of Bruce Fischl, Lilla Zöllei

Ex Vivo Guidance of *In Vivo* Lesion Localization



Ex Vivo 200 μm



In Vivo 1 mm



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Light Therapy

The Brain Injury Research Center offers two studies involving light therapy: inpatient and outpatient.

Why is this research important to people with TBI?

These studies hope to improve our understanding of how light therapy works and whether certain types of light exposure can help **improve sleep and fatigue** in a TBI population.

Who can participate?

Inpatient: Individuals must be between **18-70 years** old, have experienced a **moderate-severe TBI**, presented to a hospital within 3 months of injury, and currently be receiving rehabilitation at Mount Sinai.

Outpatient: Individuals must be over 18 years old, have experienced a TBI of any severity at least 6 months ago and currently experiencing fatigue.

What is involved?

Inpatient: Patients receive light therapy for 30 minutes during breakfast for 10 days and wear an Actiwatch to monitor physical activity and sleep.

Outpatient: Individuals receive light therapy at home for 1 month and wear an Actiwatch to monitor physical activity and sleep. Follow-up assessments are administered at 1 month intervals to determine lasting effects.

Coordinator: Lauren Nelson, 212-241-5190



Funded by the National
Institute on Disability,
Independent Living and
Rehabilitation Research





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Improving Transitions from Acute to Post-acute Care for Individuals with TBI

Project BRIDGE – **Brain Injury Rehabilitation Innovation after DischarGE**

A multi-center collaboration among 7 TBIMS centers to improve TBI care through research.

Pragmatic Trial

- Compare standard case management to Enhanced Discharge Planning

Outcomes

Patients: Quality of Life, Participation, Service utilization

Caregivers: Burden, Health-related quality of life

Funded by the Patient
Centered Outcomes Research
Institute (PCORI)





Executive Plus/Short-Term Exec Plus

What is Exec Plus/STEP?

Comprehensive holistic brain injury rehabilitation programs that rely on cognitive and behavioral interventions to increase awareness, adjustment, compensation and social skills, individualized goal setting, and transdisciplinary team programming within a therapeutic milieu to improve functioning and life quality after BI.

What is the rationale?

Integration of theoretical and empirical literature on cerebral organization, cognitive behavioral therapy, and learning theory, led to our model:

- Attention = Foundation
- Executive Functions = instruments of change
 - Problem Solving
 - Emotional Regulation

What is involved?

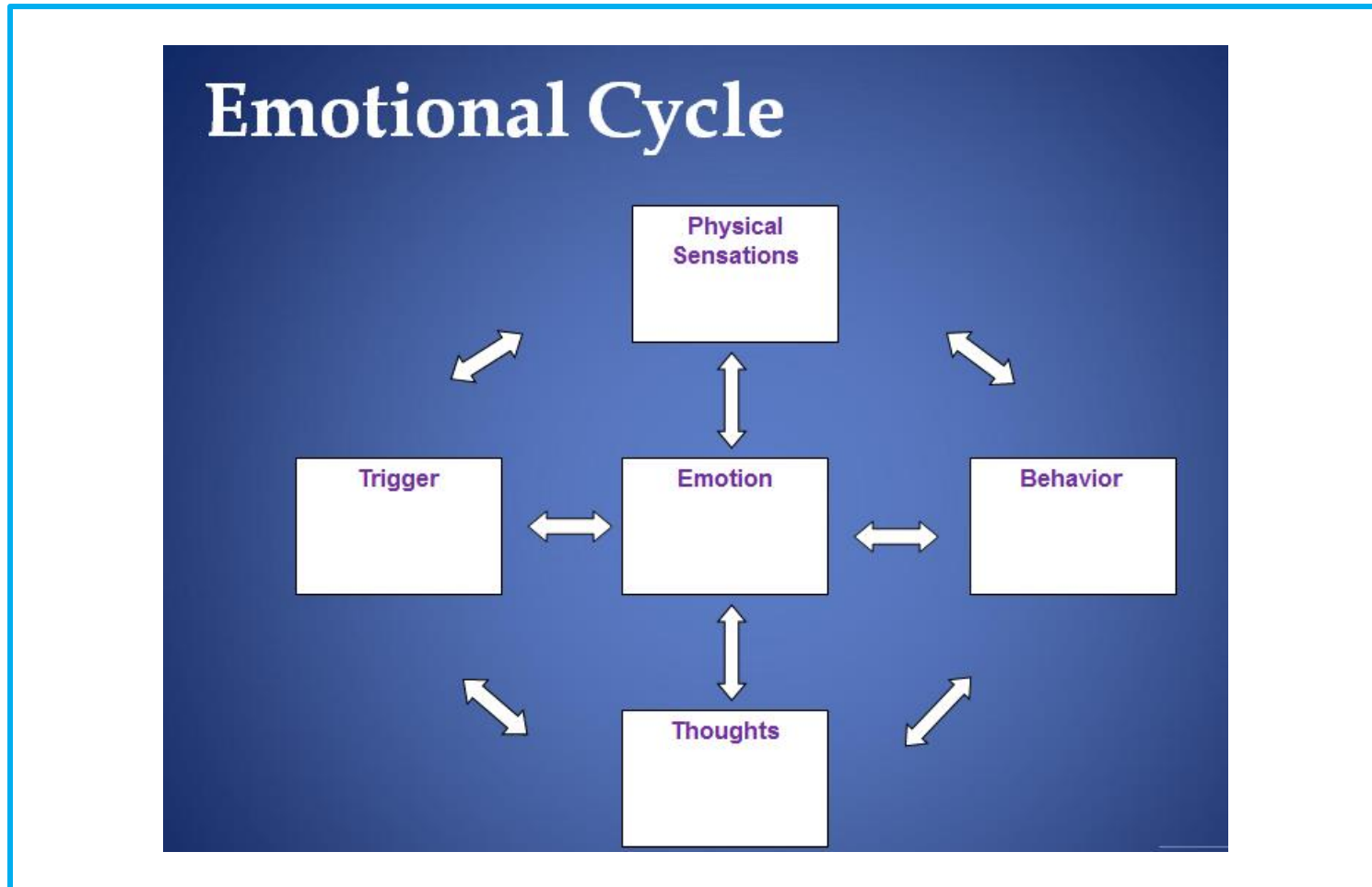
- STEP: 12-week day treatment program (2 group sessions and 1 individual session) 3x week
- Sessions consisted of emotional regulation and problem solving group sessions (45 minutes each) and individual attention training and advising session (60-minutes)

Executive Plus/Short-Term Exec Plus

Problem Solving Training

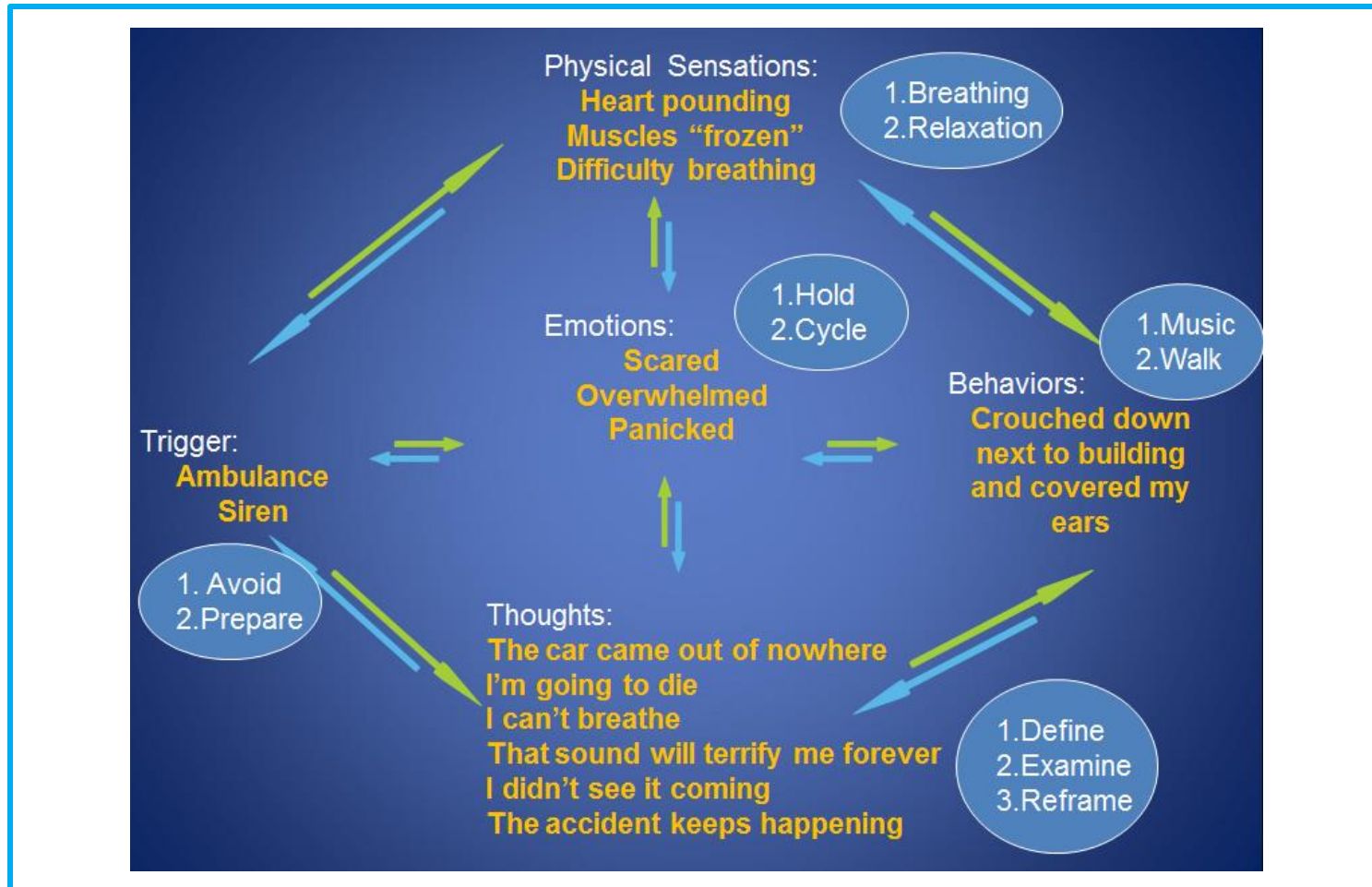
1. **S**top! Is there a problem? - recognize that the situation may be problematic and deploy the SWAPS strategy
2. **W**hat is the problem and should I try to solve it? - break down the problem into its component elements in order to understand it and generate an appropriate array of solutions
3. **A**lternatives and Options? - brainstorm and suspend judgments
4. **P**ick, Plan and Prioritize! - systematically assess each alternative, eliminate those you don't want to try and plan how to implement those that you choose to use
5. **S**atisfied? - assess satisfaction with your plan and (after implementing it) its outcome. Repeat steps 2 to 5 as necessary

Executive Plus/Short-Term Exec Plus





Executive Plus/Short-Term Exec Plus





RESEARCH QUARTERLY UPDATE

Office of Research and Development

www.research.va.gov

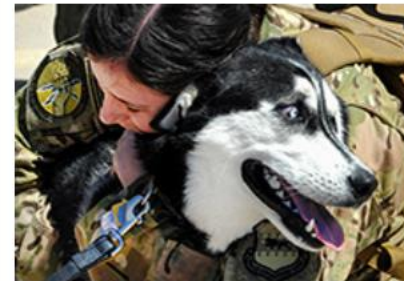
This Issue: **The Returning Veteran** | [Table of Contents: Winter 2017](#)

Noteworthy Publications

STEP-Home: Improving reintegration for OEF/OIF Veterans

Researchers at the VA Boston Health Care System have adapted a civilian rehabilitation program to create a 12-week workshop to help Veterans who have returned home to the U.S. after serving in Iraq or Afghanistan. The aim of the "STEP-Home" workshop is to strengthen behavioral and emotional skills so that Veterans are better equipped to rejoin their families and civilian communities.

STEP-Home is a short-term treatment program (12 two-hour weekly group meetings, plus three to six individual sessions) based on a mild traumatic brain injury rehab program for civilians called STEP. STEP-Home meetings take key ingredients from the civilian program and modify them to better address problem areas for Veterans. The treatment topics adapted from the STEP program include problem-solving, emotional regulation, and attention training. Researchers added topics that Veterans are more likely to have problems with, such as vocational counseling, substance misuse, and anger management.



Air Force 1st Lt. Katie Connelley returns to Davis-Monthan Air Force Base, Arizona.
(Photo by: Carolyn Herrick, U.S. Air Force)

Other Injuries to the Head: Brain Injury Screening Questionnaire

For each event listed, record the number of times you experienced a blow in that type of situation.

In this section, you should **ONLY report head injuries NOT previously reported**. For each blow to the head recorded in **Column A**, please answer the questions in **Column B**.

"Tertiary." For each blow to

COLUMN A

COLUMN B

Have you ever experienced a blow to the head in the following situation?

Have you ever been dizzy or confused?

(if yes, what was the longest duration?)

1. In a motor vehicle crash?
 No
 Yes: ___ times

No
 Yes: ___ times

No
 Yes: ___ times

2. In a motorcycle or ATV crash?
 No
 Yes: ___ times

No
 Yes: ___ times

No
 Yes: ___ times

3. As a pedestrian hit by a motor vehicle?
 No
 Yes: ___ times

No
 Yes: ___ times

No
 Yes: ___ times

4. Being hit by equipment?
 No
 Yes: ___ times

No
 Yes: ___ times

No
 Yes: ___ times

5. Falling down stairs?
 No
 Yes: ___ times

No
 Yes: ___ times

No
 Yes: ___ times

6. Falling from a high place?
 No
 Yes: ___ times

No
 Yes: ___ times

No
 Yes: ___ times

7. Falling during a fainting spell?
 No
 Yes: ___ times

No
 Yes: ___ times

No
 Yes: ___ times

8. ...

No
 Yes: ___ times

No
 Yes: ___ times

77% of adult men in an urban homeless shelter

54% of individuals seeking substance abuse treatment through NYS OASAS

76% of kids in the El Paso Juvenile Justice system

12% of "Healthy Controls"

J Head Trauma Rehabil
Vol. 29, No. 6, pp. 479-489
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Screening for Traumatic Brain Injury: Findings and Public Health Implications

Kristen Dams-O'Connor, PhD; Joshua B. Cantor, PhD; Margaret Brown, PhD;
Marcel P. Dijkers, PhD; Lisa A. Spielman, PhD; Wayne A. Gordon, PhD

BIRC Products



Objective: To provide an overview of a series of projects that used a structured self-report screening tool in diverse settings and samples to screen for lifetime history of traumatic brain injury (TBI). **Setting:** Diverse community settings. **Participants:** Homeless persons ($n = 111$), individuals with HIV seeking vocational rehabilitation ($n = 173$), youth in the juvenile justice system ($n = 271$), public schoolchildren ($n = 174$), substance users ($n = 845$), intercollegiate athletes ($n = 90$), and other community-based samples ($n = 396$). **Design:** Cross-sectional. **Main Measure:** Brain Injury Screening Questionnaire. **Results:** Screening using the Brain Injury Screening Questionnaire finds that 27% to 54% of those in high-risk populations report a history of TBI with chronic symptoms. Associations between TBI and social, academic, or other problems are evident in several studies. In non-high-risk community samples, 9% to 12% of individuals report TBI with chronic symptoms. **Conclusion:** Systematic TBI screening can be implemented efficiently and inexpensively in a variety of settings. Lifetime TBI history data gathered using a structured self-report instrument can augment existing estimates of the prevalence of TBI, both as an acute event and as a chronic condition. Identification of individuals with TBI can facilitate primary prevention efforts, such as reducing risk for reinjury in high-risk groups, and provide access to appropriate interventions that can reduce the personal and societal costs of TBI (tertiary prevention). **Key words:** prevention, public health; screening, traumatic brain injury

Guidelines for the Rehabilitation and Chronic Disease Management of Adults with Moderate to Severe Traumatic Brain Injury

The goals of this project are to:

- Determine the evidence for various rehabilitative treatments and, based on that evidence and/or expert opinion, make recommendations for treatment and management in various settings;
- Document recommendations to improve quality and consistency of rehabilitation treatment; and
- Broadly disseminate the recommendations to payer, provider, patient, and advocacy communities in an effort to increase access to and quality of care.





Icahn
School of
Medicine at
Mount
Sinai

*Brain Injury
Research Center*

Services

Clinical Services

- Neuropsychological Evaluations
- Cognitive Remediation Treatment
- Individual, Group, and Family Therapy (co-treatment)

Training Opportunities

- Post-doctoral fellowship program in neuropsychology and rehabilitation research
- Psychology internship program
- Undergraduate volunteer program

Support Groups

- Women's TBI Support Group
- Brain Injury Brown Bag group
- Caregiver Support Group
- Young People with Brain Injury Support Group (and Minds in Motion)

Resources

- Information useful to people with TBI, their family members, clinical and research professionals interested in TBI