

**FITBIR Annual Report**

**September 16, 2014**

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## **I. Introduction**

The Federal Interagency Traumatic Brain Injury Research (FITBIR) Informatics System was developed to advance research in support of improved diagnosis and treatment for service members and civilians who have sustained a traumatic brain injury (TBI). This extensible, scalable informatics platform for TBI relevant imaging, assessment, genomics, and other data types will enable the Department of Defense (DoD), the National Institutes of Health (NIH), and other Federal agencies and stakeholders to (1) utilize a common platform for standardization of definitions and data elements, tools, and outcome measurements, (2) apply bioinformatics solutions to data collection, storage, access, and analysis, (3) leverage current and future investments in TBI research by integrating datasets from numerous small and large studies, and (4) share de-identified data and collaborate on scientific research projects, including comparative effectiveness research studies on optimal treatments and diagnostic tools.

This report covers July 01, 2013 through September 10, 2014 (FY2014)

## **II. Review of Accomplishments in FY 2014**

### **Technology Development**

FITBIR is based on the Biomedical Research Informatics Computing System (BRICS) which builds upon the systems and tools developed for National Database for Autism Research (NDAR). BRICS is a collaborative, web-based system to aid and support the collection and collaboration of research studies and patient trials. The BRICS system consists of a collection of modular components which include: Global Unique Identifier (GUID), User Management, Data Dictionary Tool (DDT), Data Repository, Query, and Protocol and Form Research Management System (ProFoRMS). Since its inception, BRICS continues to uphold the vision of the system by improving its usability through the use of cutting edge technology.

In the prior year, semantic web technologies were integrated throughout the BRICS modules by creating the query tool from the ground up with semantic web technologies as its foundation. The ability to search by facets and join study data by subject ID's provided unparalleled capability for researchers to query data from the system without having to open any additional analytical tool. This year the BRICS team, using lessons learned from the query tool, introduced semantic web technologies into the dictionary tool. These new technologies paved the way to introduce a more robust data dictionary searching capability. In addition to some of the more common searching mechanisms like keyword searches and single-layered facets, researchers will be able to filter results by disease, classification, domain, and sub-domain combinations. Thanks to our researcher-centric design approach, users of the system will also enjoy a plethora of usability improvements to the data dictionary in addition to the newly streamlined searching mechanisms. Although, semantic web technology may seem like it is only used for searching, it is only the first step of our long term vision of ultimately being able to organize our research data into ontologies and ultimately federating them worldwide.

Versioning was also developed this year to allow users to track and monitor the updates made to the Data Elements and Form Structures. After an edit has been performed, the review page will show the changes made and how they will affect the edited data element or form structure. This is much needed functionality as the dictionary continues to grow.

Over the past year, the ProFoRMS product has continued to grow as a capable and user-friendly data management resource. Data integrity and security has been a major theme this year with specific changes including adding the ability to save collections without exiting and adding the option for studies to require re-entering the user password when locking collections. Along with stability and audit improvements, these changes prepare the software for an upcoming application for 21 CFR Part 11 certification. Because of requests for more form formatting options, the system now includes the capability to create tables of questions and the ability to add fully-customizable text blocks for instructions or labelling. Overall usability has been improved with significant stability improvements, interface improvement, and performance enhancements – especially on pages with significant amounts of data. Finally, the entire form construction tool has been re-worked to provide a more responsive, more accurate, more transparent, and more flexible builder that should make the form creation process faster and easier. These changes increase current capability and user satisfaction while simultaneously preparing the system for significant upcoming improvements.

Behind the scenes, FITBIR has implemented and migrated to VMWare virtualization environment. This architecture provides high scalability in both processing power and storage capacity as well as providing durability and redundancy in case of a contingency event. This results in better performance and the ability to save and roll back to snapshots of the database. A new Redhat satellite server was installed and configured which allows for automatic patching, server deployment automation and configuration management across all the FITBIR servers. Also this year, all FITBIR security configuration was updated and improved, including firewall, VPN solution and web updates. The Heartbleed virus, a security bug disclosed in April 2014, was remediated quickly. The entire environment was patched and reconfigured without any issue.

In summary, there were many technological advances for FITBIR this past year both to the back end database and the front end user web based tools.

### **Policy Committee**

The Policy Committee is composed of Federal employees appointed by the Executive Committee and are predominantly program directors and policy staff from Federal granting agencies. (See membership list later in the report-Appendix A.) Their responsibilities include creating policies and guidelines that support the strategic vision and align with scientific and technological capabilities and operational procedures for data sharing & access, collaborations, adjudications, and publications. The FITBIR Data Access Committee (DAQC) members have expertise in science, policy or bioinformatics resources. Collectively, the FITBIR Data Access and Quality Committee will have overall responsibility for ensuring compliance with the FITBIR Policy.

During the past year, the Policy Committee revised the [FITBIR Data Sharing Policy](#) to accelerate access to data and to promote collaboration. A [NOTICE](#) summarizing the revisions to the Policy was published in March as shown below:

Six months after submission of the data, the Core (required) and Basic (recommended) TBI common data elements (CDEs) that are used in the study are expected to be made available to all qualified and approved researchers (Recipients) as determined by the Data Access and Quality Committee (DAQC). Other data fields can also be made available at the submitting program director/principal investigator's (PD/PI's), i.e. Submitter's, discretion. Outcomes data and other data elements needed by the PD/PI to test his/her hypotheses or research questions, referred to as Experimental Data, will be made available in a staged manner. Six months after the award period ends, Experimental Data will be open to other researchers who have submitted data to FITBIR (Submitters). Twelve months after the award period ends, Experimental Data will be open to all qualified and approved researchers (Recipients).

**Table 1. Summary of the FITBIR Data Sharing Schedule**

Core and Basic CDEs	Data are uploaded quarterly after subject enrollment begins and data are available six months after submission to all approved FITBIR Data Recipients. Specific CDEs can be exempted pending approval by the DAQC if they are needed to test the primary study hypothesis or research question.
Experimental Data	All approved FITBIR Data Recipients gain access either:  Six months after the award period ends if they are a FITBIR Submitter; or Twelve months after the award period ends for those who are not FITBIR Submitters.  Access can also be granted earlier if agreed to by the Submitters of ongoing study(s) or in rare cases when the DAQC over rules the Submitters' denial on the grounds that the request does not compromise completion of the ongoing study.

Investigators are also strongly encouraged to collaborate and share data throughout the study to accelerate research and advance knowledge on TBI. To facilitate collaboration, data access request forms may be submitted before the award period ends to the DAQC for initial review and then forwarded on to the relevant Submitters. The Submitters may choose to collaborate and/or to provide access to all or some of their Experimental Data, in which case the data will be made available to the data Recipients. Alternatively, the Submitters may choose to deny early access, in which case the request will be reviewed by the DAQC in consultation with the Submitters. In this case, approvals for

early access will only be granted by the DACQ if it is clear that the data request does not negatively impact the completion of the original study. For example, prospective data collection projects that are powered to answer specific questions would be jeopardized by premature analysis of these same questions. However, if important research can be accomplished without jeopardizing the study, the value of the FITBIR data will be greatly enhanced by data sharing that advances the science of TBI.

In addition, the Data Access and Data Submission Agreements were approved by the NIH Paperwork Reduction Office and the SF-424 form is no longer required.

### Strategic Vision Committee

The Strategic Vision Committee (SVC) consists of a mix of Federal liaisons and distinguished scientific experts from academia and other centers of excellence (members are listed later in this report-Appendix A). The committee has the responsibility for advising the Executive Committee on (1) strategies for maximizing the impact of the FITBIR Informatics System to address critical questions in TBI diagnosis and treatment, (2) the identification and prioritization of research questions and hypotheses to be supported by the FITBIR Informatics System, (3) the identification and leveraging of other related resources, tools, and projects, and (4) reviewing the draft FITBIR Annual Report and submitting strategic vision recommendations to the Executive Committee. The committee met on Nov. 19, 2013 and its recommendations and progress toward meeting them are summarized in the table below.

**Table 2. Strategic Vision Committee 2014 Recommendations and Progress**

Recommendation	Progress
Review the FITBIR Data Sharing Policy, Data Submission and Data Access Forms to determine if modifications are needed to meet international standards. Follow up with International Traumatic Brain Injury Research (InTBIR) partners for review, and incorporate legal expertise in the process.	The FITBIR Data Sharing Policy was presented at the 2014 InTBIR meeting. InTBIR plans to develop a Data Sharing Policy in the coming year. Once that is completed, steps to align it with FITBIR’s policy can be undertaken.
Require investigators who request early access to data to submit data analysis plans and put their meta-data back into FITBIR.	Tabled until the InTBIR Data Sharing Policy is developed.
Explore possibility of linking the NIMH Pediatric MRI data to FITBIR.	There are many neuroscience databases, and a breakout session to explore ways to link them was convened at the <b>“Joint ASNR-ACR HII-ASFNR TBI Workshop: Bringing Advanced Neuroimaging for TBI into the Clinic”</b> on May 23. Alan Evans maintains the LORENZ database where the NIMH Pediatric data is archived, and he expressed enthusiasm about potential collaborations, but a specific plan was not developed. Additional funding may be needed to federate the data.
Address IRB concerns about HIPAA regulations and clinical research by discussing issues and developing strategies with the National Research Action Plan (NRAP) working group, as well as other	NIH, DOD and VA have all been charged with developing data sharing policies. The NRAP has a “Data Sharing Workgroup” that is taking the lead on tracking Agency policies and communicating

groups overseeing databases and informatics systems, e.g. NDAR.	them to the rest of the NRAP participants. Also, the NIH Office of Extramural Research was made aware of the challenges that some of the grantees have faced, but did not see a conflict between HIPAA and FITBIR data sharing policies as they currently exist.
To promote collaboration, post the study abstracts on the FITBIR website outside the portal. Also, post success stories that emerge from FITBIR-facilitated collaboration.	Tabled until abstracts are available.
Convene the 2014 SVC meeting in conjunction with an User's meeting. Since InTBIR 2014 meeting is also scheduled for Fall in Washington, DC, a combined InTBIR and FITBIR meeting might be efficient. Other stakeholders and users could also be invited. A major topic might be ways to improve data access and analysis. Establish a planning committee to define the goals of the meeting, participants, and publication of the outcomes.	A FITBIR Stakeholders meeting is planned for April 2015 at which time we anticipate having data from 5 legacy studies with more than 3200 subjects uploaded and available in FITBIR.
Determine best ways to link TBI and PTSD and other PH data by working with NRAP partners.	Common data elements are being created for PTSD and other PH, and the possibility of expanding FITBIR to archive the data is being explored.
Developing a free alternative to Who Drug is outside of the scope of FITBIR. Contact other groups, e.g., the NINDS Office of Translational Research, to see if they are interested.	This suggestion has been forwarded to the NINDS Office of Translational Research.

### Communications and Outreach

During FY2014, outreach efforts were made in the TBI community to seek input on development and enhancements for the FITBIR informatics system. One such method was through the development of notices about FITBIR for the NIH Guide. In addition to regular updates to the public website, there were numerous outreach efforts in FY2014 including conference presentations, individual/group demonstrations, and webinars. Press releases also provided communication outreach about FITBIR. Complete listings of these activities are listed in Appendix B.

### III. Recap of FY 2014 and Plans for FY 2015

## **Upload of Legacy Data to FITBIR**

### **Transforming Research and Clinical Knowledge in Traumatic Brain Injury (TRACK-TBI Pilot)**

In FY 2014, legacy baseline and outcome data from Dr. Geoffrey T. Manley's 'Transforming Research and Clinical Knowledge in Traumatic Brain Injury (TRACK-TBI Pilot)' study were reanalyzed against the curated TRACK-TBI Pilot data set from Thompson Reuters. Due to changes in the Common Data Element (CDE) definitions, additional work was performed to make ensure the TRACK-TBI Pilot data conformed to the latest definitions prior to upload to FITBIR.

In FY 2014, the outcome data from the TRACK-TBI Pilot study were cross mapped and UDEs were created as needed when there was a mismatch in the definitions or when there was no definition at all. Form structures were built and validated for thirteen outcome data sets. Imaging data from the study were prepared for upload to FITBIR. Imaging data were collected on 287 subjects with approximately 4100 CT volumes and 3200 MR volumes (structural, DTI, resting state fMRI).

The TRACK-TBI Pilot data are undergoing final quality checks data and reanalysis in FITBIR and are expected to be published in late September, 2014. All of the TRACK-TBI Pilot data will become publically available in FITBIR in FY 2015.

### **NINDS and DOD Funded Legacy Grants**

To accelerate the process of populating FITBIR with data, the NIH requested one year R03 applications from investigators who were interested in archiving their legacy data or federating their existing database with FITBIR (RFA NS14-002, Adding Legacy Clinical Data to the Federal Interagency Traumatic Brain Injury (FITBIR) Informatics System). NINDS received twelve applications in response to the RFA, six of which received meritorious scores. Three were funded by NINDS. The other three with meritorious scores are pending approval for funding by the DOD. Summaries of all six studies are below:

#### **NINDS Funded Legacy Studies**

PI Name: Rivara, Frederick  
Institution: University of Washington  
Title: Addition of Pediatric TBI Data to FITBIR

The Child Health After Injury study was funded by the CDC (9/2006 to 8/2012) to determine the population-based rates of disability after TBI in children and adolescents. This study was one of the largest prospective longitudinal studies on pediatric TBI, had outstanding follow-up over three years, included controls, provided a comprehensive examination of functional outcomes after TBI and collected a wealth of clean and validated data. Specifically, the study collected data on 729 children with mild, moderate or severe TBI and 197 control children with isolated arm injuries and evaluated the disability and functional outcome of these children at 3, 12, 24, and 36 months after injury. There are still a number of questions which could be explored using these legacy data alone or in combination with other pediatric TBI data to be entered into FITBIR.

PI Name: Gullapalli, Rao  
Institution: University of Maryland

Title: Traumatic Brain Injury Data for FITBIR Informatics system

Description:

This project combines data from four separate TBI studies and will add 800 advanced MRI datasets on nearly 400 patients, along with neuropsychological assessments, to the FITBIR informatics system. All data will be stringently quality controlled prior to upload to ensure other researchers access high quality data. Uploading the data into FITBIR will provide access to a large amount of data that is not possible to generate at a single site, and allow individual investigators to test their hypotheses using novel algorithms. Besides data from conventional MR, the data include advanced imaging techniques such as diffusion tensor imaging, diffusion kurtosis imaging, MR spectroscopy, arterial spin labeling, high-resolution volumetrics, susceptibility-weighted imaging, and resting state and task based fMRI. The dataset also includes longitudinal imaging data across 18 months (four total time points) on a subset of these patients. Making this high quality imaging data available to other researchers will significantly accelerate the development of an imaging biomarker for TBI and provide a valuable resource to the research community.

PI Name: Pan, Huaqin

Institution: Research Triangle Institute

Title: Adding Legacy Clinical Data to the Federal Interagency Traumatic Brain Injury (FITBIR)

Description:

The goal of this proposed work is to archive legacy data from The Citicoline Brain Injury Treatment Trial (COBRIT). COBRIT is a randomized, double-blind, placebo-controlled, multicenter trial studying the effects of 90 days of Citicoline on improving functional outcome in patients with complicated mild, moderate, and severe TBI. A comprehensive TBI assessment and drug test data were collected using 43 Case Report Forms in 16 modules containing more than 1,600 variables from approximately 1,200 patients over a 4 year period across eight clinical sites. The archiving of COBRIT data in a standardized and harmonized format will help TBI investigators perform cross-study analyses about the natural history of TBI and the feasibility of new TBI therapeutics. The data is of high value because of the large numbers of subjects, the focus on subacute/rehabilitation phases of TBI and the rigorous data collection associated with the study.

**Table 3. NINDS Legacy Data Submissions to FITBIR (through 9/10/14)**

PI	Notes	# Subjects (to date)	# FS-Clinical	# FS-Imaging	# Scans	FITBIR Notes
Gullapalli	NINDS Legacy	126	1	3 (Diffusion, MR, CT)	654 (133- Diffusion; 464-MR; 57-CT)	For a total of 57 CT scans for 57 subjects, 464 MR scans for 66 subjects, and 133 Diffusion MR scans for 66 subjects. 126 subjects uploaded for clinical assessment data
Manley	Legacy	599	23	2 (MR, CT)	2709 (987-MR; 1722-CT)	For a total of 1562 CT volumes from 260 subjects, and 987 MR volumes from 198 subjects.
Pan	NINDS Legacy	953	1			
Rivara	NINDS Legacy	926	2			

In summary, it is anticipated that all data from the NINDS legacy studies (Gullapalli, Manley, Pan, and Rivara) will be available in FITBIR by April 2015.

In addition to the above mentioned studies, there is one additional legacy study, Progesterone for the Treatment of *Traumatic Brain Injury (ProTECT™)*, which was a randomized clinical trial using progesterone for acute traumatic brain injury. Data from this study will also upload data to FITBIR in FY 2015.

### **DOD (still under negotiation) Legacy Studies**

PI Name: Miller, Emmy  
 Institution: BAYLOR COLLEGE OF MEDICINE  
 Title: Conversion of Clinical Data from the NABISH I & II into FITBIR

This application proposes to load data into FITBIR from Guy Clifton's National Acute Brain Injury Study: Hypothermia (NABISH) projects. The three NABISH studies collected detailed structured data sets from over 500 patients with severe TBI and included hourly physiologic data, detailed data about treatment activity and intensity. The data also included a battery of nine recognized outcome measures that were correlated with clinical and neurologic findings at 6 months after injury. The review panel noted that NABISH used Glasgow coma scores to exclude all but the most severe TBI patients and focused upon the role of hypothermia on clinical course.

PI Name: Robertson, Claudia  
 Institution: BAYLOR COLLEGE OF MEDICINE  
 Title: Legacy Clinical Data from the Epo TBI Trial

The application proposes to load legacy data from 200 patients that were enrolled in the "Effects of Erythropoietin (Epo) on Cerebral Vascular Dysfunction and Anemia in Traumatic Brain Injury (TBI)" Phase II clinical trial into FITBIR. The "Epo" trial completed enrollment in 2012 and there is good multi-modal monitoring data including SjvO2 monitoring, brain tissue pO2 (PbtO2) monitoring, dynamic TCD data,

stable xenon CT CBF measurements and microdialysis monitoring. Collectively the proposal offers a set of rare but potentially highly informative continuous data for FITBIR, and the applicant proposes to create a number of new data elements for the physiological variables which do not currently exist in the CDEs.

PI Name: Harrison-Felix, Cindy  
Institution: CRAIG HOSPITAL  
Title: Integrating Traumatic Brain Injury Model Systems Data into the Federal Interagency Traumatic Brain Injury Research Informatics System

The application proposes to test the feasibility of loading legacy data from TBIMS into FITBIR. Six steps have been identified (1) Compare policies, (2) Data Crosswalks, (3) Convert TBIMS Data, (4) Transfer TBIMS Data, (5) Pilot addition of GUID, and (6) Pilot Adding CDEs. After the feasibility study is complete, decisions will be made about future participation in FITBIR, potential adoption of more CDEs in the TBIMS, and use of the GUID.

PI Name: Riedy, Gerard  
Institution: HENRY M. JACKSON FDN  
Title: Submitting legacy clinical data from the NICoE to the FITBIR Informatics System

Data from 200 active duty military with a history of TBI that has been collected since 2008 at the National Intrepid Center of Excellence and the Walter Reed Army Medical Center will be uploaded into FITBIR. The data include demographic information, injury history, self-reports and detailed neuropsychiatric testing. Patients also were given extended neuroimaging modalities that include high-resolution T1W, T2W, T2-FLAIR imaging, functional MRI, diffusion weighted imaging, DTI, susceptibility weighted imaging, multi-voxel MRI spectroscopy, and FDG-PET images.

**Note:** Since the DOD legacy grantees are still under negotiation, none of these studies have started work.

All legacy studies combined (DOD and NINDS) will provide approximately 4000 cases in FITBIR in FY2015.

### Upload of Prospective Data to FITBIR

In FY2014, four prospective studies uploaded data to FITBIR.

**Table 4. Prospective Data Submissions to FITBIR (through 9/10/14)**

PI	Notes	# Subjects			# Scans	FITBIR Notes
		(to date)	# FS-Clinical	# FS-Imaging		
ADAPT (Bell/Wisniewski)	NINDS Prospective- 1st upload	5	5			
Broglio	NINDS Prospective- 1st upload	27	16			
Lipton	NINDS Prospective- 1st upload	33	7	3	(112-MR; 28- Diffusion)	28 unique subjects across all imaging data sets. The datasets contain 112 MR image acquisitions and 28 DTI acquisitions.
Riedy	DOD Prospective- 1st upload	1	0	1	1-MR	

It was anticipated that additional studies would have uploaded to FITBIR this year, but due to various reasons this did not occur. Common reasons for delays include IRB issues, inadequate team resources, and the amount of time it takes to cross map CDEs. Extensive UDE creation is required as many instruments and scales used in the TBI community do not have CDE definitions. Also there are a limited number of CDE definitions for sports medicine studies, studies collecting physiological variables, as well as neuropathology studies. There are also some imaging modalities (i.e., MEG) and other data source (i.e., EEG) which still need to be defined so the MIPAV tool can upload these varied data types into FITBIR.

Large, prospective studies of interest to watch in FY2015 include:

- ADAPT
- CARE
- CENC
- TRACK-TBI

**Current FITBIR Grantees****NINDS Grantees**

Throughout FY 2014, as a result of several Council rounds at NINDS, the following grantees were selected to submit their data to FITBIR (please note that previous year grantees are below in **RED** ). Studies in this table are presented in the order that they were given to the FITBIR Operations team.

**Table 5. NINDS Grantees**

<b>Proposal Title</b>	<b>PI Name</b>	<b>Organization</b>	<b>Anticipated 1st Data Upload to FITBIR</b>
<i>Transforming Research and Clinical Knowledge in Traumatic Brain Injury (TRACK-TBI Pilot)</i>	<i>Manley, Geoffrey</i>	<i>California, University of, San Francisco</i>	<i>Legacy-September 2014</i>
Managing severe TBI without ICP monitoring-guidelines development and testing	Chesnut, Randall	University of Washington	February 2015
The Impact of Concussive and Sub-Concussive blows on brain network activity	Broglio, Steven	University of Michigan at Ann Arbor	June 2014
Multimodality image-based assessment system for traumatic brain injury	Aylward, Stephen	KITWARE, INC	Not required to submit data- at own discretion
In Vivo Measurement of Brain Biomechanics	Bayly, Philip	Washington University	October 2014
Multiple Medical Therapies for Pediatric TBI: Comparative Effectiveness Approach	Bell, Michael J. & Wisniewski Stephen	University of Pittsburgh at Pittsburgh	June 2014

Proposal Title	PI Name	Organization	Anticipated 1st Data Upload to FITBIR
Brain Injury Due to soccer heading and opportunities for its mitigation	Lipton, Michael Lawrence	Albert Einstein College of Medicine Yeshiva University	August 2014
The Cerebellum's Contribution to Working Memory Following Traumatic Brain Injury	Medaglia, John	Pennsylvania State University--State Park	December 2014
Phase 2 Pediatric Autologous BMMNC for Severe TBI	Cox, Charles	University of Texas Health Science Center, Houston	Unknown
Default Mode Interference and Working Memory in Mild Traumatic Brain Injury	Sours, Chandler	University of Maryland, Baltimore	Unknown
Neurosensory Assessment of Concussion	Tommerdahl, Mark A	University of North Carolina, Chapel Hill	Unknown
Quantitative MRI and 1H-MRS in Traumatic Brain Injury	LUI, YVONNE W	New York University School of Medicine, New York City	Check Status in October 2014
Examining the role of neuronal injury in concussion-related cognitive dysfunction	RABINOWITZ, AMANDA R	UNIVERSITY OF PENNSYLVANIA SCHOOL OF MEDICINE,	Unknown
Transforming Research and Clinical Knowledge in Traumatic Brain Injury	MANLEY, GEOFFREY T (contact);	UNIV OF CALIFORNIA, SAN FRANCISCO	January 2015 (granted extension)
Imaging and Biomarkers in Adolescents Cleared for Return to Play After Concussion	LEVIN, HARVEY (Contact); DASH, PRAMOD K; OTT, SUMMER	Baylor College of Medicine, Houston	Unknown
Cortical GABA in pediatric sports concussion	OJEMANN, JEFFREY G	University of Washington, Seattle	December 2014
CTE and Posttraumatic Neurodegeneration: Neuropathology and Ex Vivo	MCKEE, ANN C.	Boston University School of Medicine	June 2015. Granted a 1 year extension because there are no

Proposal Title			
Imaging			neuropathology CDES.
Neuropathology of CTE and Delayed Effects of TBI: Toward In-Vivo Diagnostics	GORDON, WAYNE A	MOUNT SINAI SCHOOL OF MEDICINE, New York City	June 2015. Granted a 1 year extension because there are no neuropathology CDES.
Somatosensory Processing- Assessing Youth Sport- Related Concussion and Recovery	SUSKAUER, STACY , JENNIFER MARCUS	HUGO W. MOSER RES INST KENNEDY KRIEGER, Baltimore	December 2014*
Evaluation of Spot Light: A concussion injury management app for youth sports	TRIFILETTI MCKENZIE, LARA BETH (contact); COMSTOCK DAWN	CHILDREN'S RESEARCH INSTITUTE, Columbus	Unknown *
Eye movement dynamics: a rapid objective involuntary measure of concussion/mTBI	PORT, NICHOLAS LINDMAN	Indiana University School of Optometry Department of Neuroscience, Bloomington	Spring 2015 *
iTAKL: Imaging Telemetry And Kinematic modelIng in youth football	MALDJIAN, JOSEPH A (contact); GIOIA, GERARD A.; STITZEL, JOEL DOUGLAS	WAKE FOREST UNIVERSITY HEALTH SCIENCES, Winston Salem	October 2014
Impact of Aging on the Immune Response to Traumatic Brain Injury	Thompson, Hilaire	University of Washington, Seattle	December 2014

<b>Proposal Title</b>	<b>PI Name</b>	<b>Organization</b>	<b>Anticipated 1st Data Upload to FITBIR</b>
<i>ProTECT III</i>	<i>WRIGHT, DAVID</i>	<i>Emory University, Atlanta</i>	<i>Unknown</i>
White Matter Damage in Subconcussive Blast	MOREY, RAJENDRA A.	DUKE UNIVERSITY, Durham	Tentative for Sept. 2014 council approval
Exposure Measuring Biomarkers in Various Biological Compartments after TBI	AGOSTON, DENES	DAGOSTON, Rockville	Tentative for Sept. 2014 council approval
Examining MEG source imaging for the diagnosis of mild TBI	HUANG, MINGXION G	UNIVERSITY OF CALIFORNIA SAN DIEGO	Tentative for Sept. 2014 council approval
<i>Addition of Pediatric TBI Data to FITBIR Traumatic Brain Injury Data for FITBIR Informatics system</i>	<i>RIVARA, FREDERICK P.</i>	<i>UNIVERSITY OF WASHINGTON, Seattle</i>	<i>September 2014</i>
<i>Traumatic Brain Injury Data for FITBIR Informatics system</i>	<i>GULLAPALL I, RAO P</i>	<i>UNIVERSITY OF MARYLAND, BALTIMORE</i>	<i>July 2014</i>
<i>Adding Legacy Clinical Data to the Federal Interagency Traumatic Brain Injury (FI</i>	<i>PAN, HUAQIN</i>	<i>RESEARCH TRIANGLE INSTITUTE, Research Triangle Park</i>	<i>August 2014</i>

\*Awards by other NIH Institutions where Program Directors will ask PIs for FITBIR Cooperation (awards not restricted)- from Mona's RFA NS-13-014, -015

*Denotes Legacy data projects*

**Prior year grantees**

**DOD Grantees**

The FITBIR Operations team has been working throughout the year with Dwayne Taliaferro and Holly Campbell Rosen (most recently also with Christie Vu), all science officers at CDMRP, to coordinate education and dissemination of information amongst the science officers overseeing DOD FITBIR grantees. A biweekly meeting with CDMRP was set up in FY2014 to facilitate better communication amongst FITBIR Ops and the science officers. The following grantees were designated in FY 2014 to submit data to FITBIR (please note that previous year grantees are below in **RED**). Studies in this table are presented in the order that they were given to the FITBIR Operations team.

**Table 6. DOD Grantees**

<b>Proposal Title</b>	<b>PI Name</b>	<b>Organization</b>	<b>Anticipated 1<sup>st</sup> Data Upload to FITBIR</b>
<i>Transforming Research and Clinical Knowledge in Traumatic Brain Injury (TRACK-TBI Pilot)</i>	<i>Manley, Geoffrey</i>	<i>California, University of, San Francisco</i>	<i>Legacy-September 2014</i>
Low-level Laser Therapy for Traumatic Brain Injury	Vakoc, Benjamin	Massachusetts General Hospital	Unknown
A Novel Tool for Field Assessment of Mild Traumatic Brain Injury	Espinoza, Tamara	Emory University	Unknown
Miniature Field Deployable System for Rapid TBI Assessment	Koppes, William	BrainScope Company, Inc.	Unknown
Battlefield Seizure Detector for TBI Assessment (SeizTBI)	Bibian, Stephane	NeuroWave Systems, Inc.	Unknown

<b>Proposal Title</b>	<b>PI Name</b>	<b>Organization</b>	<b>Anticipated 1<sup>st</sup> Data Upload to FITBIR</b>
Transitioning the Defense Automated Neurobehavioral Assessment (DANA) to Operational Use	Lathan, Corinna	AnthroTronix, Inc	Unknown
NKI Concussion Score	Kiderman, Alexander	Neuro Kinetics, Inc.	Clinical trial
Fieldable Multiplex Test for TBI Assessment	Debad, Jeff	Meso Scale Diagnostics, LLC.	December 2014
Virtual Environment TBI Screen (VETS)	Wright, W. Geoffrey	Temple University	Unknown
Safety and Efficacy of the BrainPort V100 Device in Individuals Blinded by Traumatic Injury	Grant, Patricia (previously Beckman, Robert/Richard Hogle)	Wicab, Inc.	December 2014
Early Recognition of Chronic Traumatic Encephalopathy Through FDDNP PET Imaging	Bernick, Charles	Cleveland Clinic Foundation	Unknown
Harnessing Neuroplasticity To Promote Rehabilitation: CI Therapy for TBI	Taub, Edward	Alabama, University of, at Birmingham	Unknown
Evaluation of EYE-TRAC's Ability to Assess Attention in Service	Russell, Michael	Geneva Foundation/MEDCOM HQ	Unknown

<b>Proposal Title</b>	<b>PI Name</b>	<b>Organization</b>	<b>Anticipated 1<sup>st</sup> Data Upload to FITBIR</b>
Cognitive rehabilitation: ACTION training for Soldiers with Executive Dysfunction	Radomski, Mary	Abbott Northwestern Hospital	Unknown
rTMS: A Treatment To Restore Function After Severe TBI	Pape, Theresa	Chicago Association for Research and Education in Science	Unknown
Targeted Evaluation, Action, & Monitoring of TBI (TEAM-TBI)	Okonkwo, David	Pittsburgh, University of	Unknown
Removing Barriers to Full Recovery	Hess, Robert/Farivar-Mohseni, Reza	McGill University Health Centre Research Institute (RI MUHC)	Unknown
Bright Light Therapy for Treatment of Sleep Problems Following Mild TBI	Killgore, William	McLean Hospital	Unknown
Chronic Effects of Neurotrauma Consortium	Cifu, David/Diaz-Arrastia, Ramon/Williams, Rick(CENC)	Virginia Commonwealth University	Unknown
Comprehensive study of acute effects and recovery after concussion	McCrea, Michael	The Medical College of Wisconsin	Unknown
Enhancing the detection and management of mTBI in military personnel	Alberts, Jay	Cleveland Clinic Foundation	Unknown

<b>Proposal Title</b>	<b>PI Name</b>	<b>Organization</b>	<b>Anticipated 1<sup>st</sup> Data Upload to FITBIR</b>
Rapid Isolation and Detection for RNA Biomarkers for TBI Diagnostics	Heller, Michael	UCSD	Unknown
Advanced Imaging Acquisition and Data Analysis for a Military TBI Neuroimaging Database	Riedy, Gerard	National Intrepid Center of Excellence	Unknown
THE NCAA-DOD GRAND ALLIANCE: Concussion Assessment, Research and Education Consortium (CARE)	McAllister, Thomas	Indiana University	Unknown
<i>Integrating Traumatic Brain Injury Model Systems Data into FITBIR</i>	<i>Harrison-Felix, Cynthia</i>	<i>Craig Hospital</i>	<i>Under negotiation</i>
<i>Legacy Clinical Data from the Epo TBI Trial</i>	<i>Robertson, Claudia</i>	<i>Baylor College of Medicine</i>	<i>Under negotiation</i>
<i>Conversion of Clinical Data from the NABISH I &amp; II into FITBIR</i>	<i>Miller, Emmy</i>	<i>Baylor College of Medicine</i>	<i>Under negotiation</i>

*Denotes Legacy data projects*

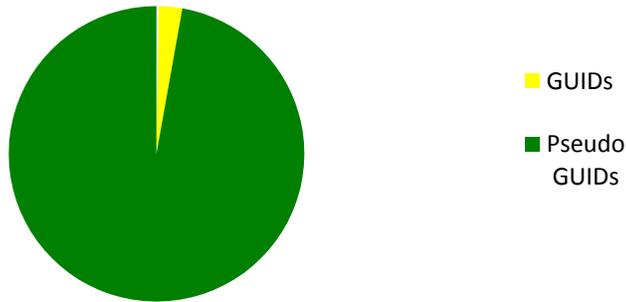
**Prior year grantees**

Please note that at the time of this report there were eleven additional DOD grants under negotiation that may be FITBIR eligible.

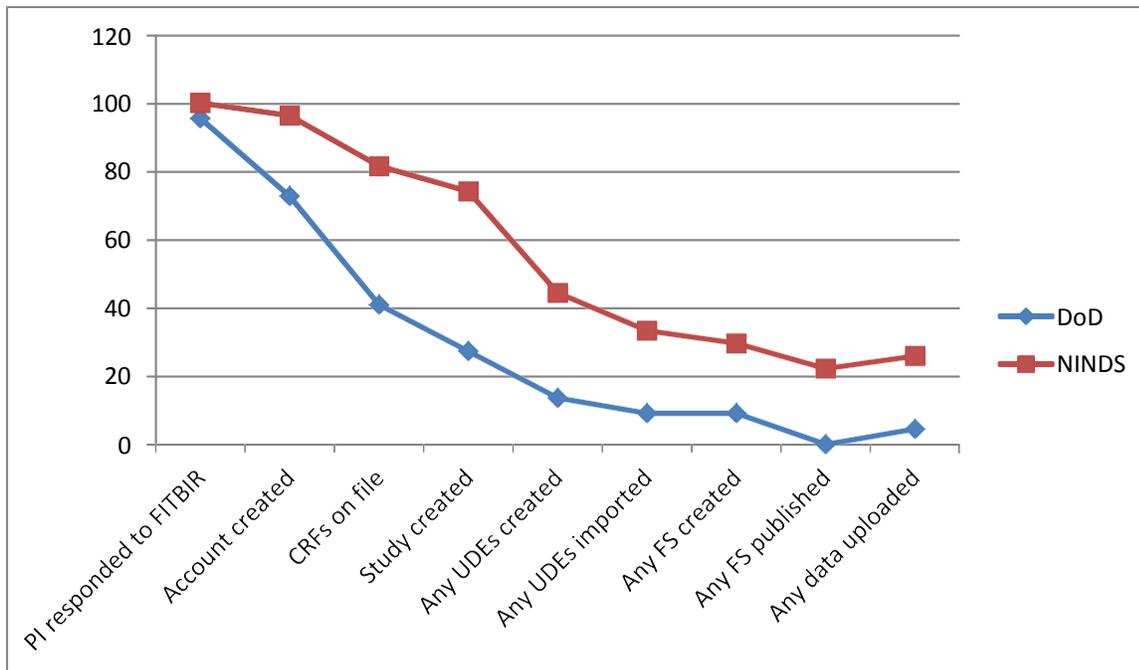
**Summary of 2014 Data Submissions to FITBIR**

In FY 2014, over 2300 subjects were added to the FITBIR database which equates to over 47K records in the database. The high percentage of pseudo GUIDs is due to the fact that the majority of the data submitted to FITBIR thus far was from legacy studies. Since these studies were unaware of the PII items needed to generate a GUID at the time that study was operational, GUIDs could not be created and pseudo GUIDs were generated.

**Subjects Submitted to FITBIR**  
**Total: 2,314**



**Percentage of FITBIR studies reaching each checkpoint/milestone**



There is an almost 100% compliance rate of PIs responding to FITBIR Ops after being contacted. Since NINDS restricts 75% of the PI’s funding until the PI has met certain criteria (attended an introductory call, created a FITBIR account and study) the number of NINDS accounts and studies created are overall higher than for the DOD. Currently there are 29 studies have been created by grantees in the FITBIR

System. From NINDS, 19/22 grantees have created studies while 7/23 DOD grantees have created studies in FITBIR. One other grantee, not funded by DOD or NIH, has created a FITBIR study.

It is evident that overall the percentage of studies (both DOD and NINDS) reaching milestones related to work in the Data Dictionary is quite low. NINDS is showing a higher percentage of PIs with data submitted due to the fact that their legacy PIs are funded unlike the DOD legacy PIs awaiting funding.

To give an overall understanding of the progress made by each study (by PI), a basic heat map was created where green denotes complete (or almost) success, whereas red denotes no success.

FITBIR Annual Report September 16, 2014

PI Name	PI contacted FITBIR	Administrative work	Dictionary work	Data Uploaded
<b>DoD</b>				
CARE - Michael McCreary (DOD/NCAA)/ Grand Alliance TBI Study	Green	Yellow	Red	Red
CENC	Green	Yellow	Red	Red
Harrison Felix, Cynthia (Legacy data)	Green	Yellow	Red	Red
Miller, Emmy (Legacy data)	Green	Yellow	Red	Red
Robertson, Claudia (Legacy data)	Green	Yellow	Red	Red
Alberts, Jay	Green	Yellow	Red	Red
Bernick, Charles	Green	Yellow	Red	Red
Debad, Jeff	Green	Yellow	Red	Red
Espinoza, Tamara	Green	Yellow	Red	Red
Grant, Patricia	Green	Yellow	Red	Red
Heller, Michael	Green	Yellow	Red	Red
Hess, Robert and Reza Farivar-Mohseni	Green	Yellow	Red	Red
Kiderman, Alex	Green	Yellow	Red	Red
Killgore, William	Green	Yellow	Red	Red
Lathan, Corinna and Charlotte Safos	Green	Yellow	Red	Red
Okonkwo, David	Green	Yellow	Red	Red
Pape, Theresa	Green	Yellow	Red	Red
Radomski, Mary	Green	Yellow	Red	Red
Riedy, Gerard - NICOE imaging	Green	Yellow	Red	Red
Taub, Edward	Green	Yellow	Red	Red
Vakoc, Benjamin	Green	Yellow	Red	Red
Wright, W. Geoffrey	Green	Yellow	Red	Red

NINDS	PI contacted FITBIR	Administrative work	Dictionary work	Data Uploaded
ADAPT - Michael Bell & Stephen Wisniewski	Green	Yellow	Red	Red
Manley - TRACK - TBI Pilot	Green	Yellow	Red	Red
ProTECT - David Wright	Green	Yellow	Red	Red
Gullapalli, Rao (Legacy data)	Green	Yellow	Red	Red
Pan, Helen (Legacy data)	Green	Yellow	Red	Red
Rivara, Fred (Legacy data)	Green	Yellow	Red	Red
Bayly, Philip	Green	Yellow	Red	Red
Broglio, Steven	Green	Yellow	Red	Red
Cox, Charles (upload 2016)	Green	Yellow	Red	Red
Gordon, Wayne (one year extension)	Green	Yellow	Red	Red
Heldt, Thomas	Green	Yellow	Red	Red
Levin, Harvey	Green	Yellow	Red	Red
Lipton, Michael Lawrence	Green	Yellow	Red	Red
Lui, Yvonne W	Green	Yellow	Red	Red
Maldjian, Joseph	Green	Yellow	Red	Red
Manley, Geoffrey - prospective	Green	Yellow	Red	Red
McKee, Ann	Green	Yellow	Red	Red
Mckenzie (Trifiletti), Lara	Green	Yellow	Red	Red
Medaglia, John	Green	Yellow	Red	Red
Ojemann, Jeffrey	Green	Yellow	Red	Red
Port, Nicholas	Green	Yellow	Red	Red
Rabinowitz, Amanda R	Green	Yellow	Red	Red
Sours, Chandler	Green	Yellow	Red	Red
Suskauer, Stacy	Green	Yellow	Red	Red
Temkin, Nancy	Green	Yellow	Red	Red
Thompson, Hillarie	Green	Yellow	Red	Red
Tommerdahl, Mark A	Green	Yellow	Red	Red

Category	Description of Category	Color Code Definition
PI contacted FITBIR	Reached back to FITBIR Ops	Green=yes; Red=no
Administrative Tasks	Account created, CRFs on file, study created.	Green = two or three tasks completed of the three Yellow = one completed task of the three; Red = none completed
Dictionary Work	UDEs created, UDEs imported, FS created.	Green = two or three tasks completed of the three Yellow = one completed task of the three; Red = none completed
Data Uploaded		Green=yes; Red=no

**Outreach Activities**

In FY 2014, outreach activities continued to include demonstrations, webinars, and presentations. The primary focus of the Operations team is to serve the end users. One way the team is accomplishing this is by hosting a weekly webinar series followed by open call in hours. The webinar series touches upon all the components of the informatics system to include real time demonstrations of how to use the tools.

Below are details about the weekly webinar topics:

**Table 7. Weekly FITBIR Ops Webinar Topics**

Deep Dive Topic	Description
<b>Introduction to FITBIR</b>	Users are provided an overview of the BRICS system/tools, IRB considerations for protocols and consent forms, FITBIR submission and data sharing schedule, GUID (What? How? Explain Pseudo GUID vs. GUID, How to use the GUID tool for single GUID creation and/or multiple GUID creation; IRB issues), CDE overview, FITBIR account creation.
<b>Data Dictionary – Data Elements</b>	Users are provided with an overview of the Data Dictionary, emphasizing data elements - how to search data elements (CDE+UDE), what do we mean by “crossmapping”?, how to create a unique data element (UDE)
<b>Data Dictionary – Form Structures</b>	Users are provided with an overview of the Data Dictionary, emphasizing form structures - form structure overview, how to create a form structure, use of shared drafts
<b>Imaging Submission</b>	Users are provided with an overview of the Medical Image Processing, Analysis, and Visualization (MIPAV) tool, how form structures and data elements in FITBIR are used in MIPAV, end to end demo of uploading an imaging file to FITBIR, opportunity for us to hear what the future imaging needs are of FITBIR end users.
<b>Validation and Upload of Data</b>	Data validation (after form structures are created and published) and data upload- how to use Validation and Upload Tools
<b>Query Tool &amp; Data Download</b>	Data visualization in FITBIR, faceted searching, “Join on GUID”, downloading data from Query Tool and/or Study in Data Repository

The number of end users joining a given session has been as large as 20 participants. The feedback has been very positive from FITBIR users and the content has been revamped and tailored to meet the

feedback received on the calls. The open call in hours following the webinar topic also provide another opportunity for users to ask individual questions while allowing others to also participate and collaborate. The webinar and open call in hours will continue in FY 2015.

**Preclinical CDE Development**

In FY 2014, the working group established in FY 2013 to start building definitions for preclinical TBI CDEs for future incorporation into FITBIR continued its efforts. The goal was to promote bi-directional translational research and facilitate meta-analysis of preclinical research. There was a working group meeting held at the National Neurotrauma Society symposium (July 1, 2014) to discuss the preclinical CDEs and next steps for publication.

**Preclinical TBI Research Common Data Elements Workgroup**

**Table 8. Preclinical Workgroup**

Douglas Smith, Chair	University of Pennsylvania
C. Edward Dixon	University of Pittsburgh
Christine Duhaime	Harvard University
David Hovda	UCLA
Michelle LaPlaca	Georgia Institute of Technology
Linda Noble	UCSF
Frank Tortella	Walter Reed Army Institute of Research
Stephen Ahlers, Ad Hoc	Walter Reed Army Institute of Research
Ramona Hicks, Federal Liaison	NIH/NINDS

Preclinical TBI research studies that use animal models could also benefit from the use of CDEs and access to raw data. FITBIR has facilitated steps toward standardizing preclinical TBI research by providing a template for creating CDEs. Recommendations developed by a scientific team of experts were made available through the NINDS TBI Research listserv with a request for feedback by Sept. 15, 2015. Next steps are to: 1) finalize the CDEs and upload them into FITBIR; 2) publish a paper describing the opportunities and challenges of standardizing and sharing preclinical research data, as well as the process involved in creating the CDEs; and 3) develop electronic data collection forms using the ProFoRMS tool to facilitate their use. See Appendix C.

**Data Element Work with NINDS CDE project**

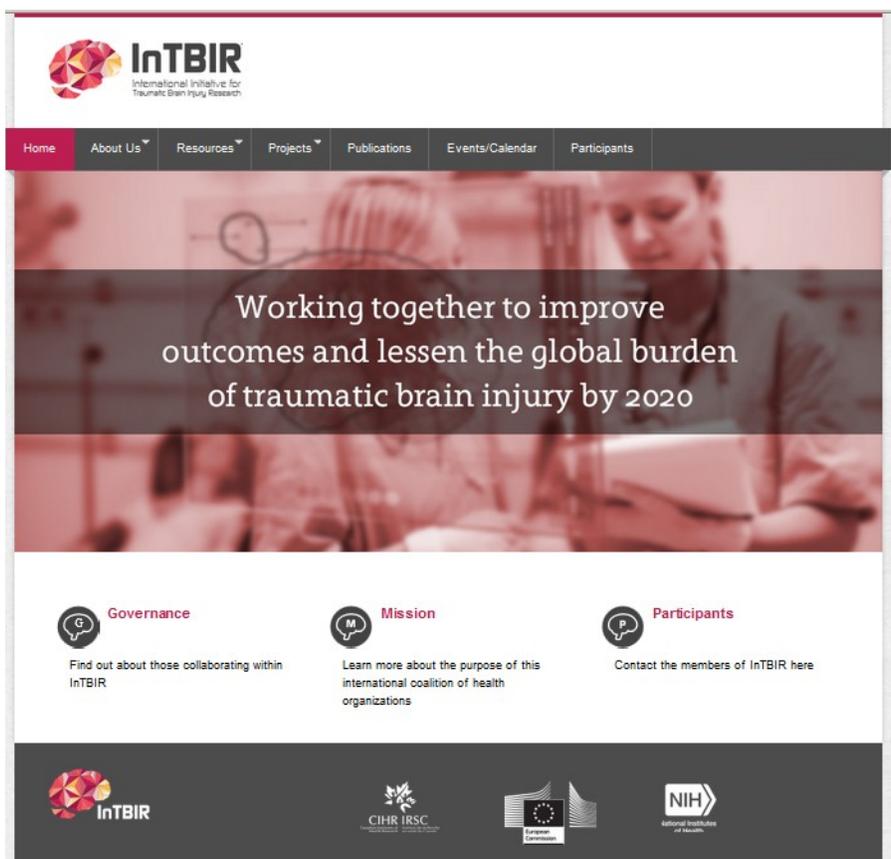
The FITBIR Operations team along with FITBIR Co-Director, Dr. Matt McAuliffe, worked very closely with the NINDS Common Data Element (CDE) project throughout FY 2014. For almost 6 months, FITBIR met weekly with the NINDS CDE project, then biweekly and eventually monthly. A change control board (CCB) was created to discuss and track all changes made to CDEs. FITBIR was also involved in discussions with the International TBI CDE working groups. Large scale changes were made to data elements with permissible values of ‘Other, specify’ and to consolidate data definitions into the ‘General’ disease category when a CDE existed in two or more disease categories. All of the CDE updates were incorporated into the FITBIR Data Dictionary.

## International Traumatic Brain Injury Research (InTBIR)

The European Commission (EC), the NIH, and the Canadian Institutes of Health Research expressed interest in developing a framework for an international initiative for TBI Research (InTBIR) back in 2011. InTBIR was set up to advance clinical traumatic brain injury (TBI) research, treatment and care. In FY2014, FITBIR and InTBIR worked together to discuss policy and technology issues as the InTBIR initiative advanced. Teleconferences, webinars, and in person meetings were held. FITBIR was invited to sit on a panel during the 3rd Annual InTBIR Meeting to discuss Resources for Sharing and Analyzing Data (30 minute moderated panel discussion followed by 30 minute open discussion). The goal is to provide examples of progress and issues in developing and federating InTBIR research databases so that by 2020 we have high quality, standardized data on more than 10,000 children and adults with TBI as well as advanced analytical tools available to all of the projects.

Also, FITBIR staff assisted InTBIR with branding and launching their public website in 2014.

(<http://intbir.nih.gov/>)



## **Plans for FY 2015**

### **Data Submission**

Submission of legacy data to FITBIR will continue to be a priority this upcoming year. The richness of these data sets coupled with ability to share the data soon after these are deposited into the repository will allow the greater TBI community to mine and analyze data from FITBIR for the first time.

A study to explore the feasibility of federating FITBIR with the NIDRR TBI Models System database is in negotiation with the DOD. A grant to support the federation of FITBIR with several other DOD databases, such as the DVBIC and NICOE databases, is also under consideration for funding by the DOD. Linking these databases would provide an unparalleled opportunity to accelerate knowledge about TBI in military service members, veterans and civilians.

FITBIR Operations will continue to work side-by-side with FITBIR grantees to assist them in preparing to upload their data to FITBIR.

There is discussion to target a new FITBIR grantee with a smaller study to pilot using ProFORMS for their data collection.

### **Coordination with Grants Management**

To provide additional programmatic support to FITBIR, an Integration Team is under development. The concept builds upon the success of NDAR and PDPB, where an Integration Team meets monthly to discuss ways to integrate FITBIR activities with the Extramural Funding Agencies and Grantees and to solve problems.

### **System Enhancements**

In FY 2015, the modular components of BRICS will be enhanced to more fully meet the long-term requirements of the FITBIR informatics system. Publicly available summary data generated from legacy data input into the system will be developed. Enhanced Query enhancements will allow investigators to be able to query across three or more forms. In response to the call from FITBIR users, in FY 2015 the system will include an extra CDE attribute called "Permissible Value (PV) output code" so an alphanumeric PV can be mapped to a code when data are outputted from the query tool. Please note that this code will not be used for the submission of the data into the database since it is not possible to build a system to support every PI's unique coding system. As always, following an Agile approach, system changes and enhancements will occur throughout FY 2015.

## IV. Budget

Throughout FY2014 cost-effective software technologies, favoring free and open-source software solutions were utilized whenever possible.

Module 1, the design and implementation of the FITBIR Informatics System, from the Memorandum of Agreement states the following:

- Module 1: Design and implementation of the Federal Interagency Traumatic Brain Injury Research (FITBIR) Database. The project is modeled after the National Database for Autism Research (NDAR) project. NDAR, developed and deployed by Biomedical Imaging Research and Services Section of NIH/CIT, is a secure collaborative biomedical informatics system sponsored by the following NIH institutes, NIMH, NICHD, NIEHS, NINDS, and NIDCD. Reusing technology developed for NDAR will provide significant cost savings (approximately 35- 50%) and deployment time. Primary functionality and tools of NDAR which can be reused for this project include anonymous subject ID generation, web-based data entry, data validation, data sharing, image analysis, bioinformatics tools, data analysis, and operations. NIH/CIT is uniquely capable of building a central, federated database that can serve as a data repository and also can link existing databases.

Approved Module 1 expenses included equipment, software, contract staff, co-location space, and project related travel. As a result of tight financial controls and strong management oversight, total budget (\$10.1M) allocated for four years has been committed and will be expended by March 2015.

### Future Funding for FITBIR

The current FITBIR MOA expires on 31 March 2015. To secure funding starting in 2015, it was imperative to get FITBIR as a line item in a Program Objective Memorandum (POM). The final product of the programming process within the Department of Defense, the POM, displays the resource allocation decisions of the Military Departments in response to and in accordance with Defense Guidance. CAPT Biggerstaff presented the FITBIR budget to his superiors at OASD(HA) in June 2013 and was able to secure future funding for FITBIR. Only the proposed Operations & Maintenance (O&M) lines were funded. The sustainment will be funded at \$2.8M/yr. starting in FY2015 for 5 years. The Research and Development (R&D) items proposed were passed for funding at this time.

NIH has committed \$2.0M in bridge funding in FY2015 to assist FITBIR while awaiting funding (\$2.8M/yr.) from the DOD. In the event that the DOD funding is available on time, the NIH funding will be used to accelerate data element and form structure development and system enhancements.

## **V. Summary**

Over the past year, FITBIR, a secure bioinformatics platform, has grown facilitating standardization of data fields, data sharing and scientific collaboration for TBI research. FITBIR now has over 2300 unique subjects with over 27K records to include clinical assessment and imaging data. The standard software development lifecycle process (requirements, design, development, testing) will continue in FY 2015 with three main development themes. These themes will include Operational and Maintenance Support (O&M), additional FITBIR enhancements, and possible federation to other sites (including both biospecimen repositories and data repositories).

# **Appendix A**

FITBIR Governance Document

**Governance Document**

**Federal Interagency Traumatic Brain Injury Research (FITBIR) Informatics System**

**Summary and Purpose of the Agreement**

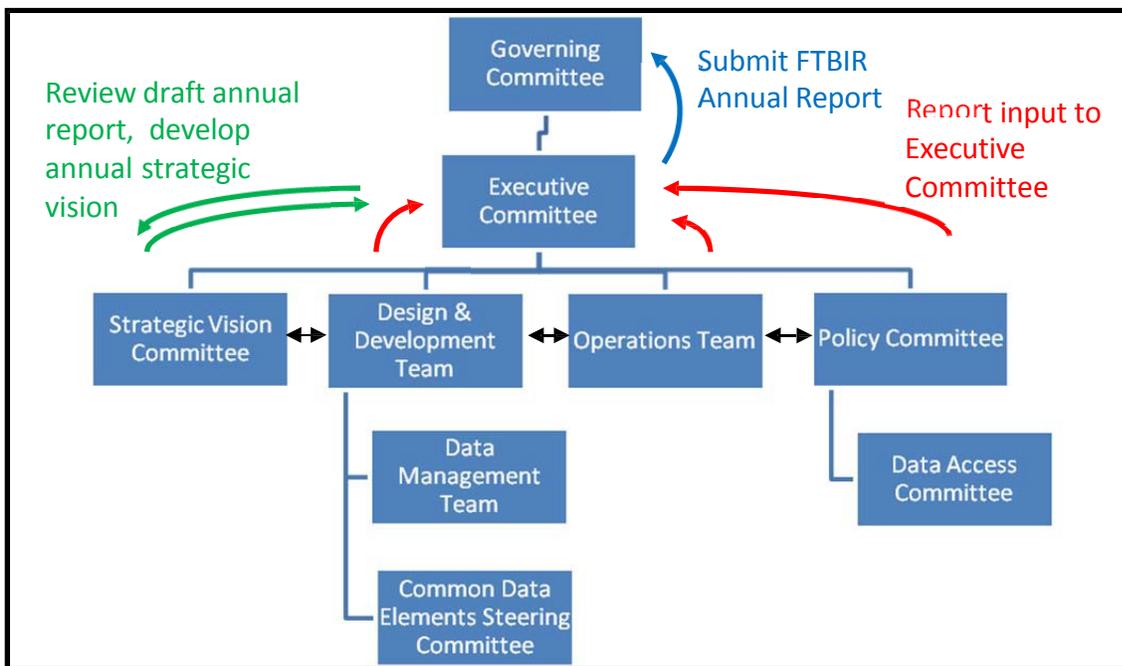
The Federal Interagency Traumatic Brain Injury Research (FITBIR) Informatics System is a collaborative effort by participating National Institutes of Health (NIH) Institutes and Centers (ICs) and US Army Medical Research and Material Command (USAMRMC) to develop a data repository and bioinformatics platform for traumatic brain injury (TBI) research. The funding for the FITBIR Informatics System has been provided by USAMRMC with the NIH providing contributions in staff and technical resources. Conceived in 2011, FITBIR began to accept data in 2012. Data will be made available to the TBI research community in accordance with FITBIR’s Data Sharing Policy. This document formalizes the organizational framework whereby participating research agencies agree to work together.

**Authority**

The signatories of this document have been designated as the lead authorities for conducting the business of the FITBIR Informatics System in a joint Memorandum of Understanding among the USAMRMC, the Division of Computational Bioscience of the Center for Information Technology (CIT) and the National Institute of Neurological Disorders and Stroke (NINDS) at the NIH regarding development and maintenance of the FITBIR Informatics System (April 20, 2011).

**Organizational Structure**

Clear lines of authority are required to ensure that decision making is both efficient and representative of FITBIR’s stakeholders.



For each group or committee listed above, the membership, responsibility, operating protocols, and decision making authority are described.

### **Governing Committee**

- Membership:** The FITBIR Governing Committee is comprised of the representatives from the NIH and the USAMRMC as voting members. Additional members may be added in the future.
- Responsibilities:** The Governing Committee makes all decisions related to overall strategic vision, operating procedures, and will regularly assess FITBIR activities.
- Operating Protocols:** Voting members are entitled to one vote on the Governing Committee. Each voting member may designate a delegate to act in his/her stead. The Governing Committee meets as many times as deemed necessary, but at least two times per year.
- Decision-making:** Decisions are based on a two-thirds majority vote of voting members.
- Current Members:** Dr. Dallas Hack (Co-Chair), USAMRMC  
Dr. Walter Koroshetz (Co-Chair), NIH/NINDS  
Dr. Sean Biggerstaff, OASD/HA  
Dr. Benes Trus, NIH/CIT

### **Executive Committee**

- Membership:** The Executive Committee consists of three Co-Directors appointed by the Governing Committee.
- Responsibilities:** The Executive Committee manages and coordinates work on the overall strategic vision, design, policies and operations of FITBIR. NIH/CIT is responsible for the day-to-day program management. Co-Directors oversee and manage the following subprojects:
- Design & Development Team - NIH/CIT
  - Operations Team – NIH/CIT
  - Policy Committee – NINDS & USAMRMC
  - Strategic Vision Committee – NINDS & USAMRMC

The Co-Directors also serve as federal liaisons on many of the subcommittees. The Executive Committee prepares a FITBIR Annual Report to the Governing Committee.

**Operating Protocols:** The Executive Committee meets bi-weekly to discuss and monitor the development and implementation of FITBIR. The Executive Committee reports to the Governing Committee biannually, with additional meetings as needed, and follows its guidance.

**Decision-making:** Decision making is reached by consensus.

**Current Members:** Dr. Frank Lebeda, USAMRMC  
Dr. Ramona Hicks, NIH/NINDS  
Dr. Matthew McAuliffe, NIH/CIT

### **Strategic Vision Committee**

**Membership:** The Strategic Vision Committee is led by NIH/NINDS and USAMRMC. It is comprised of a minimum of five stakeholders appointed by the FITBIR Executive Committee, including Federal government employees, distinguished scientific experts from academia, industry, and private and non-profit foundations. Members serve for a two year term.

**Responsibilities:** The Strategic Vision Committee has responsibility for advising the Executive Committee for the following:

- Strategies for maximizing the impact of the FITBIR Informatics System to address critical questions in TBI diagnosis and treatment.
- Identification and prioritization of research questions and hypotheses to be supported by the FITBIR Informatics System.
- Identification and leveraging of other related resources, tools, and projects.
- Recommendations to the Executive Committee following review of the draft FITBIR Annual Report for vision setting.

**Operating Protocols:** The Strategic Vision Committee will meet shortly after the signing of the Governance MOU, in order to provide initial input to the Governing Committee and Executive Committee. After that, the Strategic Vision Committee will meet yearly, unless indicated otherwise. Policy Committee members are invited to the FITBIR Governing Committee meetings.

**Decision-making:** Recommendations are based on a majority vote and forwarded to the Governing Committee and Executive Committee for approval.

**Current Members:** Dr. Frank Lebeda, USAMRMC (Co-Coordinator)  
Dr. Ramona Hicks, NIH/NINDS (Co-Coordinator)

## Committee Members:

- Dr. Thomas DeGraba, NICOE
- Dr. Ramon Diaz-Arrastia, USUHS
- Dr. Robert Harbaugh, Penn State
- Dr. Geoffrey Manley, UCSF
- Dr. Rema Raman, UCSD

## Federal Liaisons:

- Dr. Matthew McAuliffe, NIH/CIT
- Dr. Greg Farber, NIH/NIMH
- Dr. Michael Schoenbaum, NIH/NIMH
- Dr. Vinay Pai, NIH/NIBIB

**Design and Development Team**

Membership:	The Design and Development Team is led by the NIH Center for Information Technology (CIT) and supported by contractors. Members are nominated by the CIT and confirmed by the FITBIR Executive Committee.
Responsibilities:	The Design and Development Team is responsible for the systems development implementation and technical support of FITBIR.
Operating Protocols:	The Design and Development Team develops and supports FITBIR, taking direction from the Executive Committee, with additional input from other teams and committees.
Decision-making:	The Design and Development Team makes detailed decisions required for the development of FITBIR.
Current Organization:	Dr. Matthew McAuliffe, NIH/CIT (Chair) Members: Contractors will be hired by NIH/CIT.

**Data Management Team**

Membership:	The Data Management Team is appointed by the Executive Committee and comprised of data base managers from academia, industry, government, and private and non-profit foundations that have expert experience managing databases for TBI research.
Responsibilities:	The Data Management Team will ensure that FITBIR meets the needs of its stakeholder community for uploading and accessing data. In addition, the team will provide input on general design considerations, data collection forms, and operating procedures for FITBIR.

- Operating Protocols:** The Data Management Team will meet shortly after the signing of the Governance MOU, in order to provide initial input into the Design and Development Team. After that, the Data Management Team will meet yearly, with additional meetings as needed. The Data Management Team will prepare an annual report of its activities for submission to the Executive Committee for the FITBR Annual Report.
- Decision-making:** Recommendations are reported to the Operations Team.
- Current Members:** Dr. Matthew McAuliffe, NIH/CIT (Chair)  
Members will be appointed by the Executive Committee.

### **Common Data Elements Steering Committee**

- Membership:** The TBI Common Data Elements (CDEs) Steering Committee is comprised of scientific experts from academia, industry, government, and private and non-profit foundations. The Steering Committee is coordinated and led by NINDS and supported by contractors. Members are appointed by a Federal Oversight Committee for TBI CDEs, which is coordinated by NINDS.
- Responsibilities:** The TBI CDE Steering Committee provides oversight and guidance for managing and updating the data elements for FITBIR. This includes designating data elements as “core”, “basic” or “supplemental” and providing definitions and protocols for data collection.
- Operating Protocols:** The TBI CDE Steering Committee will meet at least once a year in person, and if necessary, more often via conference calls. The Steering Committee may establish working groups and subcommittees to review the CDEs that are in the FITBIR Informatics System.
- Decision-making:** The Steering Committee reviews input from investigators, user groups, and feedback collected from the website every 6 months. There will need to be a quorum at each meeting for voting purposes for maintaining and/or updating the TBI-specific data elements. The Steering Committee reports to the Design and Development Team.
- Current Members:** Ms. Joanne Odenkirchen, NIH/NINDS (Coordinator)
- Dr. Cynthia Harrison-Felix, Craig Hospital  
 Dr. Joseph Giacino, Spaulding Rehabilitation Center  
 Dr. Jamie Hutchison, The Hospital for Sick Children Toronto  
 Dr. Andrew Maas, University Hospital Antwerp  
 Dr. Geoffrey Manley, UCSF  
 Dr. Gerard Riedy, Walter Reed Army Medical Center  
 Dr. Alex Valadka, Seton Brain & Spine Institute  
 Dr. Elisabeth Wilde, Baylor College of Medicine

## **Operations Team**

- Membership:** The Operations Team is led by NIH/CIT and supported by employees and contractors. Members are nominated by the CIT and confirmed by the FITBIR Executive Committee.
- Responsibilities:** The Operations Team is responsible for the secure and correct functioning of the FITBIR Informatics System, a protected resource for TBI research data. Operational procedures will be established to ensure that the data contained in FITBIR are efficiently made available to qualified researchers according to the protections defined in FITBIR and other Federal policies. The operations team will assist the investigators and user groups with implementing standard operating procedures for:
- Account Requests
  - Data Submission Requests
  - Web-based Data Entry Tools and Forms
  - Data Access Requests
  - Quality Assurance and Quality Control
  - Establishment of a Federated Data Source
  - Common Data Elements and Definitions
  - GUID Generation Permission Request
  - Request for Time Extension for Sharing
  - Deviations to Data Sharing Terms
  - Administrative Access to FITBIR.
- Operating Protocols:** The Operations Team takes direction from the Executive Committee, along with input from other teams and committees. The Operations Team prepares an annual report of its activities for submission to the Executive Committee for the FITBIR Annual Report.
- Decision-making:** The Operations Team makes detailed decisions required for the operation of FITBIR that are approved by the Executive Committee.
- Current Members:** Dr. Matthew McAuliffe, NIH/CIT (Chair)  
Members: Contractors will be hired by NIH/CIT.

## **Policy Committee**

- Membership:** The Policy Committee is composed of Federal employees or contractors appointed by the Executive Committee. Predominantly, this includes program directors and policy staff from Federal granting agencies.

**Responsibilities:** The Policy Committee is responsible for creating policies and guidelines that support the strategic vision and align with scientific and technological capabilities and operational procedures for:

- Data Sharing
- Data Access
- Collaborations
- Adjudications
- Publications.

The Policy Committee will ensure that policies related to FITBIR consider and reflect the needs of all stakeholders to the greatest extent possible. Specialized working groups, most notably the Data Access and Quality Committee (DAQC), will be formed to assist with implementation of the policies. The Policy Committee also contributes to overall strategic vision and scope.

**Operating Protocols:** The Policy Committee will meet as necessary, but at least every 6 months. Policy Committee members are invited to the FITBIR Governing Committee meetings.

**Decision-making:** Policy recommendations will be based on a majority vote and forwarded to the Governing Committee for approval.

**Current Members:** Dr. Deborah Hirtz, NIH/NINDS (Chair)  
 Dr. Debra Bergstrom, NIH/NINDS  
 Dr. Savita Nigam, USAMRMC Ms.  
 Alison Garcia, NIH/CIT  
 Dr. Frank Lebeda, USAMRMC  
 Dr. Ramona Hicks, NIH/NINDS  
 Dr. Stuart Hoffman, VA  
 Dr. Mary Ellen Michel, NIH/NICHD/NCMRR  
 Dr. A. Cate Miller, NIDRR  
 Dr. Wanda Salzer, DCoE  
 Dr. Karen Schwab, DVBIC  
 Dr. Anne Sperling, NIH/NIMH

### **Data Access and Quality Committee (DAQC)**

**Membership:** The FITBIR Data Access and Quality Committee (DAQC), a sub-committee of the Policy Committee, will consist of a minimum of 3 Federal government employees or contractors with expertise in science, policy or bioinformatics, and will be appointed by the Policy Committee.

**Responsibilities:** The DAQC reviews and provides feedback about whether to 1) accept FITBIR data submissions; and 2) grant access to FITBIR data. Such reviews include, for

example, examining submission and access documentation for consistency with expectations outlined in the FITBIR Data Access Policy. The DAQC prepares an annual report of its activities for submission to the Executive Committee for the FITBIR Annual Report.

Operating Protocols: The DAQC will review data access requests and data submissions at least twice monthly either online or in person.

Decision-making: Decisions are based on a majority vote. Decisions that are appealed will be forwarded to the Policy Committee for its review and final decision-making.

Current Members: Dr. Debra Bergstrom, NIH/NINDS (Chair)  
Dr. Savita Nigam, USAMRMC  
Ms. Alison Garcia, NIH/CIT

### **Approvals**

This Memorandum of Understanding and Agreement will be reviewed on an annual basis and amended as necessary.

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COL Dallas C. Hack, MD	Date
US Army Medical Research and Material Command	

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CAPT Sean Biggerstaff, PhD	Date
Office of the Assistant Secretary of Defense For Health Affairs	

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Walter Koroshetz, MD	Date
National Institutes of Health Deputy Director, NINDS	

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Benes L. Trus, PhD	Date
National Institutes of Health Acting Scientific Director, CIT	

# **Appendix B**

## FITBIR Communications and Outreach

**I. Presentations**

Conference Presentations (Speaker/Poster/Exhibitor)

3/3-3/4/14 National Capital Area TBI Research Symposium: Bethesda, MD (exhibitor)

3/12/14 Brain Injury Awareness Day on Capitol Hill (exhibitor)

4/16-4/17/14 4th Annual Traumatic Brain Injury Conference Arlington, VA (exhibitor)

6/28-6/29/14 3rd International Traumatic Brain Injury Research (InTBIR) Meeting  
San Francisco, CA (speaker)

6/29-7/2/14 Annual National Neurotrauma Society meeting San Francisco, CA (exhibitor)

7/17/14 Committee on Institutional Cooperation's- Traumatic Brain Injury Summit  
Program Philadelphia, PA (speaker)

**II. Individual demonstrations**

Continuous throughout the year

**III. Congressional Briefings**

None

**IV. Webinars**

Weekly- every Thursday from 2-4 pm

Ad hoc with FITBIR users as requested

**V. Notices**

Release Date: March 27, 2014

NIH Notice NOT-NS-14-022

<http://grants.nih.gov/grants/guide/notice-files/NOT-NS-14-022.html>

**VI. Journals**

<http://online.liebertpub.com/doi/abs/10.1089/neu.2013.2970>

Transforming Research and Clinical Knowledge in Traumatic Brain Injury Pilot: Multicenter  
Implementation of the Common Data Elements for Traumatic Brain Injury

John K. Yue, Mary J. Vassar, Hester F. Lingsma, Shelly R. Cooper, David O. Okonkwo, Alex B.  
Valadka, Wayne A. Gordon, Andrew I. R. Maas, Pratik Mukherjee, Esther L. Yuh, Ava M. Puccio,  
David M. Schnyer, Geoffrey T. Manley and TRACK-TBI Investigators including:, Scott S. Casey,  
Maxwell Cheong, Kristen Dams-O'Connor, Allison J. Hricik, Emily E. Knight, Edwin S. Kulubya,

David K. Menon, Diane J. Morabito, Jennifer L. Pacheco, and Tuhin K. Sinha. *Journal of Neurotrauma*. November 15, 2013, 30(22): 1831-1844. doi:10.1089/neu.2013.2970.

# **Appendix C**

## PreClinical CDEs

<u><b>Animal Characteristics</b></u>	<u><b>Animal History</b></u>	<u><b>Assessments and Outcomes</b></u>
Species	Pre-injury subject housing	Outcome timing
Birthdate	Pre-injury conditions	Assessment date and time
Age	Pre-injury surgical procedures	Acute neurological assessment
Age group	Injury group	Apnea indicator
Sex	Injury date and time	Apnea duration
Animal vendor	Anesthetic type	Righting response time
Strain/genetic modifications	Anesthetic route	Toe pinch response
Weight measurement	Duration of anesthesia	Acute physiological assessments
	Analgesia type	Brain imaging type
	Injury severity	Chronic physiol. assessments
<u><b>Injury Model Characteristics</b></u>	Number of injury exposures	Memory/retention tests
External cause modeled	Interval between injuries	Learning/acquisition tests
Injury model	Post-injury surgical procedures	Sensory/motor tests
Device manufacturer	Post-injury conditions	Anxiety tests
Device manufacturer other text	Post-injury subject housing	Social interaction tests
Animal stabilization method	Treatment group	Change in body weight
Cortical region that is impacted	Treatment onset	Histopathology
Impact location	Drug treatment route	
Impact location coordinates	Treatment or therapy type	
	Treatment control	
	Treatment dose	
	Survival time Euthanasia date and time Type of euthanasia	
Invasive surgery	Impactor tip shape	Impactor dwell time
Craniotomy size	Impactor tip rigidity	Impactor velocity
Impactor angle	Impactor depth setting	Surface material
Impactor angle measurement		
Craniotomy size	Connector tube material	Cap characteristics
Connector angle	Diameter of port at end of device	Peak pressure pulse
Connector tube	Cement	Duration of pressure wave
Connector tube length	Transducer manufacturer	
Invasive surgery	Height of drop	Impactor retraction
Surface material	Guidance of weight drop	WD-specific pre-injury surgical procedures
Craniotomy size	Weight drop characteristics	WD-specific post-injury surgical procedures
Impactor/projectile mass	Impactor velocity	
Impactor/projectile material	Contact surface	
Impactor tip shape	Size of contact surface	
Impactor tip rigidity	Impactor dwell time	
Blast induced delivery device	Distance between animal and tube	Reflective surfaces
Type of pressure wave	Animal orientation to blast wave	Primary blast effects
Detonation type	Peak overpressure	Secondary blast effects type
Quantity of detonation material	Rise time of overpressure	Secondary blast effects specifications
Driver gas		

Pressure wave medium	Duration of overpressure wave	Tertiary blast effects
Distance from detonation	Impulse	Tertiary blast effects specifications
Blast tube diameter	Reflective wave overpressure	Quaternary blast effects
Blast tube length	Blast wind pressure	Systemic injury
Shock tube driven section length	Pressure sensor orientation	Extracranial injuries
Membrane thickness	Pressure sensor type	BIN-specific pre-injury surgical procedures
Membrane burst method	Pressure sensor sampling frequency	BIN-specific post-injury surgical procedures
Membrane burst pressure	Incident pressure time history	
Tube end configuration	Body exposure	
Placement relative to shock tube	Protective shielding location	
	Protective shielding type	
Craniotomy size	Impactor tip/projectile shape	Cap characteristics
PBBI probe	Impactor tip rigidity	Peak pressure pulse
PBBI orientation	Impactor depth setting	Duration of pressure wave
Diameter of inflated balloon	Connector tube length	PBBI-specific pre-injury surgical procedures
Balloon inflation volume	Connector tube material	PBBI-specific post-injury surgical procedures
Life span of the balloon	Diameter of port at end of device	
Brain cavity volume	Cement	
Projectile driver mechanism	Impactor /projectile mass	Contact pressure
Impactor/projectile material	Impactor tip/projectile shape	PCI-specific pre-injury surgical procedures
Impact distance	Peak pressure sensor film	PCI-specific post-injury surgical procedures
Projectile velocity	Contact surface	
Helmet	Size of contact surface	
Cause of hemorrhage	Injection material	ICH-specific pre-injury surgical procedures
Intended location: Compartment	Volume of hemorrhage	ICH-specific post-injury surgical procedures
Intended location: Side	Duration of injection	
Actual location: Compartment	Peak intracranial pressure	
Actual location: Side		
Intracranial pressure elevation-specific surgical procedures	Duration of increased pressure maneuver	Peak intracranial pressure