

**Colorado Brain Injury Program
Report to the Joint Budget Committee and
Health and Human Services Committees
July 1, 2014 – June 30, 2015**

Executive Summary of the Legislative Report:

The Colorado Brain Injury Program (CBIP) was created by Title 26, Article 1, Part 3 of the Colorado Revised Statutes, to improve the lives of Colorado residents who have survived traumatic brain injuries (TBI). This statute created the Colorado TBI Trust Fund (Trust Fund) to finance program activities, and the Trust Fund Board to advise the Program on operations of the Trust Fund. The board is administered within the Colorado Department of Human Services (CDHS). Three board members are designated in statute and 10 members are appointed by the Governor with the consent of the Senate. The Board has established three ongoing committees to assist staff in policy-setting of program goals and strategic planning for the Trust Fund: Program Evaluation and Research, Revenue, and Vision and Outreach.

Revenue/Expenditures:

During the reporting period of July 2014– June 2015, the Trust Fund received \$2,200,499. The Trust Fund expended \$1,965,757. CBIP has a spending authority of \$3,321,588. CBIP received \$77 below last year's total revenue of \$2,200,576. Unexpended revenue goes into a reserve fund. It is important to maintain a reserve fund to help cover expenses when revenue is less than anticipated. The current reserve fund is \$1,346,233.

Funds are divided across program areas with the following percentages: 55% for services, 25% for research, and 5% for education. This leaves 15% of funds flexible so that the Program Director and Board of Directors can determine which program area requires an increase in percent of funds each year. In FY 2015, funds were distributed according to a statutory formula. Five percent of the funding increase for 2015 went toward education, 60% to research and 35% to services.

Services:

During FY 2015, 242 adults applied for services with 224 new adult participants being referred for case management services during the fiscal year. A total of 1,084 adults received case management services. A total of 90 children were referred with 89 children/youth served during FY 2014-15.

Research:

During the period from July 2014 – June 2015, two research grants were completed, one remains active. Expenditure on the three research grants totaled \$519,884 for FY 2014-15. The program issued a request for proposals during this past fiscal year. Eighteen researchers submitted a letter of intent, 16 were invited to submit a full application. One research declined to submit a full application therefore 15 grants were reviewed and four grants were awarded.

Education:

During FY 2013-14 the program issued a request for proposals that resulted in 16 applications with 11 awards being made. Funded grants totaled \$53,025. In addition the program continues to partner with the State Unit on Aging to partner with county agencies to provide a Matter of Balance, a fall prevention curriculum for older adults, across the State of Colorado. Finally the program partners with Offices, Divisions and Program within CDHS and other state agencies to provide training on identification of brain injury and guidance for supporting individuals with brain injury in their system to help them achieve greater outcomes.

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Program Overview

The CBIP was created by Title 26, Article 1, Part 3 of the Colorado Revised Statutes, to improve the lives of Colorado residents who have survived traumatic brain injuries (TBI). This statute created the Colorado TBI Trust Fund (Trust Fund) to finance program activities, and the Trust Fund Board to advise the Program on operations of the Trust Fund. The board is administered within the Colorado Department of Human Services (CDHS). Three board members are designated in statute and 10 members are appointed by the Governor with the consent of the Senate. Please see below for a list of board members. The Board has established three ongoing committees to assist staff in policy-setting of program goals and strategic planning for the Trust Fund: Program Evaluation and Research, Revenue, and Vision and Outreach.

Trust Fund Board of Directors

Name	Employment/Affiliation
Deborah Boyle	Douglas County Sherriff's Office
Susan Charlifue, PhD	Craig Hospital
Jeffery Cuthbert, PhD	Craig Hospital
Indira Gujral	Colorado Department of Public Health and Environment
Sena Harjo	Clayton Early Learning Center
Catharine Johnston-Brooks, PhD	Denver Veterans Affairs Medical Center
Danny Mistry, MD	Western Orthopedics & Sports Medicine, P.C.
Helen Morgan	Denver District Court
Jennie Munthali	Colorado Department of Public Health and Environment
Dannis Schanel	Brain Injury Alliance of Colorado
Wendy Turman	Association of Schools and Programs of Public Health
Laetitia Thompson, PhD	University of Colorado School of Medicine
Leo Jaramillo	Colorado Department of Human Services

CBIP Operations

Program Administration

CDHS administers CBIP which is housed within the Division of Vocational Rehabilitation (DVR). CBIP staff work closely with the Trust Fund Board to perform the following functions for the program: financial management, policy development, program development and implementation, contract management, program monitoring, administrative support, website maintenance, public assistance and information, reporting, marketing and public relations.

Program Services Overview:

Intake, eligibility and outreach:

CBIP contracts with the Brain Injury Alliance of Colorado (BIAC) to conduct intake and determine eligibility of clients for both the youth and adult services. In addition, BIAC is responsible for conducting outreach and education to the state regarding all Trust Fund support programs and training regarding brain injury to interested parties. This contract is awarded

through a five year competitive bid process. BIAC provides services beyond what the Trust Fund supports. This helps to enhance the services the clients of both CBIP Adult Services and the Youth Brain Injury Connections (YBIC) receive without increasing cost to the Trust Fund. These supports include support groups, recreational opportunities, information and referral to name a few. Additionally, BIAC has begun a formalized partnership with seven hospitals called the Pathways Program. Through Pathways hospitals are receiving consent from individuals being discharged from the hospital with a diagnosis of brain injury to send a referral directly to BIAC. Once the referral has been received, BIAC initiates contact with the individual. This is done at a variety of intervals. The goal is provide resource support to these individuals as it is required. This program is important for two key reasons; 1) research shows that individuals discharged with brain injury often do not perceive that they will require support until six months or one year post injury and by that time they often do not remember the resources they were informed of at the hospital; 2) often individuals lack the ability, either because they are overwhelmed or simply because they cannot remember, to initiate contact with support. In the Pathways model, BIAC is reaching out to the client, taking that burden off of the individual. Pathways is also critical to early referral to CBIP.

Youth Brain Injury Connections:

CBIP maintains an inter-agency agreement with the Colorado Department of Education (CDE). CDE is responsible for providing capacity building support for Colorado school districts and for community providers working with children/youth with brain injury. Additionally, CDE provides training support to families of children/youth with brain injury. There are now 1.5 FTE dedicated to brain injury at CDE. Funding for these positions represents a true inter-agency partnership. Money from the Trust Fund supports 1.0 FTE Brain Injury Health Consultant and operational costs associated with this FTE. This individual sits within the Health and Wellness Unit at CDE. In addition, the Exceptional Student Services Unit supports a 1.0 FTE with half of this person's focus being brain injury and half focused on fetal alcohol spectrum disorder. During FY 2014-15, important changes were made to the children/youth program. Previously CBIP provided support to CDE for a .5 FTE Statewide Brain Injury Liaison. The liaison position provides direct support to students with brain injury, their families and consultation support to school districts. Due to the direct support nature of this position, CDE felt it was out of scope with their mission which is to provide support to districts, not individual families. Therefore, this position has now shifted to BIAC.

YBIC provides case management support in addition to education consultation. This function has been supported through a partnership with the Health Care Program for Children with Special Needs offices, located in local county public health agencies. The Program leverages existing infrastructure to provide case management for children/youth with a brain injury at no cost to the Trust Fund. These services are funded by Title V funds from the Social Security Act. CBIP provides support to care coordinators through training regarding brain injury and technical assistance support regarding serving these children/youth. Additionally, CBIP continues to partner with the Colorado Department of Public Health and Environment (CDPHE) to maintain the case management infrastructure and to collect data related to children served through case management.

Adult Brain Injury Program:

The aim of the Adult Brain Injury Program is to increase self-sufficiency and to create a safety net for those who require on-going support. This approach to case management provides program participants with the supports necessary to more fully re-integrate into their communities. CBIP contracts with Rocky Mountain Human Services (RMHS) to provide the adult services. This contract is awarded on a five year, competitive request for proposals.

RMHS has held this contract for the past seven years. RMHS provides individualized case management supports for clients in the program. This includes conducting an assessment to determine level of care required, conducting an intake to determine the client's needs/strengths and goals, writing a support plan to address identified needs and addressing the clients goals. In addition, RMHS provides classes/workshops for individuals with brain injury and their support systems regarding brain injury and living with a brain injury.

Revenue and Expenditures

Through the TBI Trust Fund, CBIP receives revenue from surcharges assessed for convictions of driving under the influence of drugs or alcohol (DUI) or driving while ability is impaired (DWAI), speeding, and youth under 18 years of age riding a motorcycle or motorized bicycle without a helmet. The surcharges are \$20.00 for DUI/DWAI convictions, and \$15.00 for speeding and helmet convictions.

Funds are divided across program areas with the following percentages: 55% for services, 25% for research, and 5% for education. This leaves 15% of funds flexible so that the Program Director and Board of Directors can determine which program area requires an increase in percent of funds each year.

During July 2014–June 2015 period, the Trust Fund received \$2,200,499, and expended \$1,965,757. CBIP has a spending authority of \$3,311,937. The Program received \$77 below last year's total revenue of \$2,200,576. Unexpended revenue goes into a reserve fund. It is important to maintain a reserve fund to help cover expenses when our revenue is less than anticipated. The current reserve fund is \$1,346,233.

Due to the need to ensure fund solvency, program staff and the Board have begun to explore additional funding to help support program activities. It is outlined in statute that, in addition to surcharges, the Program can accept gifts, grants and donations. During fiscal year 2013-14, the Program submitted two grant proposals. Each grant was awarded funding starting in fiscal year 2014-15.

CBIP received a grant from the CDHS, Office of Behavioral Health (OBH), to begin in July 2014. This is a two and a half-year grant. In each of the first two years, the Program will receive \$90,850. The third year is six months and will be funded at \$45,425. This grant represents a partnership between CBIP; Denver Juvenile Probation; Denver County Jail Transition Unit; the University of Denver (DU); and the University of Colorado (CU) Anschutz Medical School.

The primary objectives of this grant are to screen for a life time history of brain injury, assess for on-going impairment, provide psycho-social education for justice-involved individuals identified with brain injury as well as provide resources for support related to their brain injury.

Additionally, CBIP received a US Department of Health and Human Services, Health Resources and Services Administration (HRSA), TBI Implementation four-year grant award. This grant began June 2014 and will end May 31, 2018. Project funding will be \$250,000 each year of the grant. This grant has a similar focus as the grant from OBH, however is much larger in scope. The HRSA grant focuses on the following target populations: inmates from Boulder, Denver (RISE unit) and Larimer County Jails; individuals involved in the Denver District Problem Solving Courts; Denver Juvenile Probation; and youth incarcerated within six target Division of Youth Corrections sites across the state.

There are four primary initiatives of this grant: screening, identification and assessment of brain injury; education and capacity building for corrections and mental health staff and psycho-education for those identified; information and referral for justice-involved individuals; and case management support for these individuals.

To implement the goals and objectives of this project, CBIP is partnering with: BIAC; RMHS; CDE; DU; CU; and a contract evaluator.

These grants enable the program to address the needs of a population that has been traditionally underserved. These services can decrease incarceration for those who have not yet been sentenced, and decrease recidivism for those who have been incarcerated. Through these grants the Program is projected to save the TBI Trust fund \$31,055 in the first two years, \$22,143 in year three, and \$13,228 in year four in personnel cost and increased staffing at BIAC and RMHS by approximately 2.5 FTE.

Services

All individuals receiving assistance from CBIP receive case management services. Case management is designed to provide clients with skills they can use throughout their lifetime and to connect clients with resources in their communities following their participation in the program. Additionally, the Adult Brain Injury Program provides community TBI assist hours (meant to help clients with brief case management needs) and classes and workshops for survivors and families in an effort to improve life and advocacy skills. Youth accessing YBIC are provided with education consultation support in addition to case management. The goal is to develop a comprehensive safety net to support families as they navigate complex medical, community and educational systems.

Services Provided During the Reporting Period of July 1, 2014 – June 30, 2015

Colorado Adult Brain Injury Program, Clients Served:

CBIP contracts with BIAC to conduct intake and eligibility and outreach for the program. Once approved for services, the individual is referred to RMHS for case management. During FY 2015, 242 adults applied for services with 224 new adult participants being referred for case management services during the fiscal year. RMHS is contracted to provide case management, community TBI assist support and classes and workshops. One thousand eighty four adults received case management services. There is no longer a waitlist for accessing support; however, there is a waitlist for individualized case management. Individuals waited an average of 120 days to be assigned an individualized Brain Injury Support Specialist (BISS) for intensive case management. Individuals on the waitlist have access to information and resource from a BISS, community TBI assist support, and classes and workshops.

Colorado Youth Brain Injury Connections

The Program contracts with BIAC to manage the referral process for youth being referred to YBIC. When the referral is received, BIAC sends this referral to the Local Public Health Agency, Health Care Program for Children with Special Needs (HCP) for case management support. Additionally, the Brain Injury Education Liaison at BIAC will work with the individual, family and school personnel to provide consultation regarding supports within the education setting. A total of 90 children/youth were referred to the program with 89 children/youth accessing services during FY 2014-15.

Evaluation:

CBIP Director, the Board of Directors, Program Evaluation and Research work groups, with support of the CDPHE Epidemiology and Program Evaluation Unit, has designed a comprehensive evaluation plan for the adult program. The Program Director and Board of Directors will be adapting this evaluation metrics to meet the needs of the Youth program. It is anticipated this will be completed in FY 2015-2016.

Outreach:

The CBIP contracts with BIAC to conduct outreach and education regarding the Program. The following represent the variety and numerous outreach activities that occurred during FY 2015.

Hospitals

Formal contracts with hospitals were expanded from one in the previous fiscal year to seven facilities (Penrose, St. Francis, St. Thomas More, St. Mary Corwin, St. Anthony, HealthSouth Littleton, and HealthSouth Colorado Springs). On July 1st of 2015, that number will increase to 11 (the additional four will be: Summit Medical Center, Avista Adventist, Longmont, and St. Anthony North). Patients with brain injuries release their information to BIAC upon discharge from these facilities. BIAC contacts patient to discuss programs, including the Trust Fund. Additional outreach took place at the following hospitals: Craig Hospital, Boulder Community Hospital, Swedish, Children's Hospital Colorado, University Hospital, Sterling Medical Center, Telluride Medical Center, Denver Health, St. Mary's in Grand Junction, Yampa Valley Medical Center, Valley View Hospital, Littleton Adventist, Spalding, and Platte Valley Medical Center. Typically BIAC meets with case managers, social workers, and discharge planners at these facilities.

Outreach at Brain Injury Conferences/Events

Grand Junction, Steamboat Springs, Denver, Colorado Springs, Gunnison, Boulder, Vail - Craig Hospital Brain Injury Summit. Often this includes a booth of information about resources, but sometimes there is a formal presentation incorporated into the conference/event.

Other Conferences

Behavioral Healthcare Council Annual Conference, Translational Neuroscience and Educator's Conference, Adolescent Health Conference, Collaborative Justice Conference, Community and School Pediatric Health Conference, Colorado School Nurse Conference, Colorado Neurological Institute Conference, Family Leadership Training Institute Annual Summit, Pediatric Acute Injury & Illness Conference, Pediatric Trauma Conference, PEAK Parent Center Conference, School Social Work Conference, Youth Athlete Symposium, and the Denver Judicial Conference.

Press Releases and E-Newsletter Blasts

Fort Morgan Times, Brush News Tribune, CDE Scoop, COVA Newsletter, BIAC "Breaking News" E-Newsletter

Outreach/Education/Training

Red Rocks Community College, National Commission on Correctional Health, Safehouse Progressive Alliance for Nonviolence, The Gathering Place, Family Resource Center, Work Options for Women, Skyview Academy, Morgan Community College, Pueblo Community College, Sewell Early Childhood Centers/Head Start, Center for Neurorehabilitation Services, Community & VA Mental Health Providers, Jefferson County School District – Nurses, Statewide Directors of Special Education, Operation TBI Freedom, CO Psychological Association, Colorado Coalition Against Domestic Violence, Metro State University - Access

Center, Arapahoe Community College, Wellness Council - Arapahoe County Inter Agency Networking Group, Jefferson County Retired School Employees Association, Parker Police Crisis Intervention Team, Red Rocks Community College, Front Range Community College, Parent to Parent of Colorado, Mental Health Partners - Emergency Psychiatric Team, Colorado Society of School Psychologists, Colorado Association of School Nurses, Mile High Behavioral Healthcare, Touchstone Health Partners, Crisis Intervention Training Annual Conference, Center of Hope, Rocky Mountain Crisis Partners, Safe Shelter of St. Vrain, 19th Judicial Probation Department, Public Defenders Office, Colorado Coalition for the Homeless, Spring Creek Healthcare Center (Skilled Nursing Facility), Fort Collins Rescue Mission, Courage to Risk Conference (for Special Educators), Poudre & Thompson School Districts, ARC of Larimer County, Mesa Vista (Skilled Nursing Facility), Pinnacol Insurance, School Mental Health Advisory Council, Center for Technical Assistance and Training (CTAT) Survivor Series, Consultants for Children, Colorado Organization for Victim's Assistance (COVA), Jefferson County Mental Health - Criminal Justice Mental Health Case Management Program, 20th Judicial District Probation, InnovAge, Valley Hope - Substance Abuse Services, Catholic Charities, Pediatric Partners, Roaring Fork School District Admin, Glenwood Springs Library, Havern School, Evergreen Rotary, Centennial Peaks Hospital (Substance Abuse Facility), ARC Larimer County, Harmony Foundation - Residential Treatment Center, South Valley Physical Therapy, CDE-Educational Facilities (statewide), CO Convening on Children Youth and Families, CeDAR: Center for Dependency, Addiction and Rehabilitation, Long-Term Flood Recovery Group of Boulder, ARC: Chapter Executives, Colorado Chiropractor's Association, Senior Helpers, Aurora Mental Health Center, Bayaud Enterprises, CDPHE Health Care Program for Children with Special Needs (HCP), SCL Home Health, Mental Health America of Colorado

Testimonials

“This presentation was very beneficial for all our staff, especially to those advocates and counselors that work directly with clients in daily basis. In the field of domestic violence there are many clients that have to deal with brain injuries caused by their abusive partners or due to accidents not related to the abuse. Your presentation gave us tools to better help these clients and provided information about resources and accessibility.”

Nancy Chavez-Porter

Training and Community Education Director

Safehouse Progressive Alliance for Nonviolence

“This training was immensely beneficial to several of our Disaster Case Managers with the Long Term Flood Recovery Group of Boulder County as they deal with clients who were affected by the Colorado floods of 2013. Our clients are dealing with a number of factors and a traumatic brain injury makes following their recovery plans even more of a challenge. We found that following the BIAC presentation that many of us were able to deal more effectively with these clients. This presentation also sensitized us by defining the brain injury conditions and its variances to behavioral impacts. The BIA Colorado provides an excellent partnership of one-stop shop resources for youth, adults and providers.

Our agency appreciates that these services are free and the each client, once they are accepted, are provided an individual case manager. We would encourage continued funding of this valuable program.”

Maggie Roe

Disaster Case Manager/Supervisor

Long-Term Flood Recovery Group of Boulder County

Research

CBIP awards grants to support research in Colorado related to the treatment and understanding of traumatic brain injuries. The Research Program has established the following three research priorities: basic science, clinical science and health services and outcome research. Research is funded at two levels: Type I (up to \$50,000/year for two years) and Type II (up to \$150,000/year for two years).

During the period of July 2014 – June 2015, two research grants were completed, one remains active. Expenditure on the three research grants totaled \$519,884 for FY 2014-15. The research grants funded are summarized below.

Title: *“The Role of Natural Antibodies in Pathophysiology of TBI”*

Principal Investigator: Philip F. Stahel, MD

Institution: Denver Health Medical Center, University of Colorado School of Medicine

Award: \$1,024,753

Status: Five year project ended FY 2014-15.

Description: The initial goal of the proposed study is to evaluate the role of natural antibodies on the secondary neuroinflammatory response following TBI. As natural antibodies are a relatively new area of inflammation research, researchers are just beginning to understand their intricate and complex mechanisms of interaction with neoantigens exposed after trauma. An intimate and more sophisticated understanding of natural antibodies and their roles in the neuroinflammatory response after head injury is a prerequisite for a future successful “bench-to bedside” translation of basic research into therapeutic modalities.

This project is ultimately aimed at a long-term “bench-to bedside” transfer of insights from experimental models into new therapeutic modalities for reducing the extent of secondary brain damage and attenuating the overall mortality and long-term neurological morbidity in patients suffering from TBI. Excessive local complement activation in the CNS may be triggered by natural antibody-neoantigen interactions. Thus, experimental pharmacological blockade using novel CR2-chimeric molecules may represent a “cutting-edge” approach to inhibit complement-mediated local brain tissue damage resulting from natural antibody-induced activation of the 18 complement cascade. This therapeutic approach may limit the inflammatory downstream events prompted by natural antibodies with amelioration of secondary brain injury. Should this approach be successful, pharmacological blockade of natural antibodies or utilization of CR2-chimeric molecules may represent a therapeutic option to be tested in clinical trials in the longterm.

Title: *“Developing Novel FLAP Inhibitors for Use in TBI”*

Principal Investigator: Kim A. Heidenreich, PhD

Institution: Department of Pharmacology, UC Denver, Anschutz Medical Center

Award: \$ 375,000

Status: Three year project ended FY14-2015

Description: About 1.7 million American civilians each year suffer a TBI from motor vehicle accidents, falls, and sports injuries. The military estimates that as of 2008 more than 320,000 soldiers have returned from Iraq and Afghanistan with TBI largely from increased exposure to blasts. Neurological damage resulting from a TBI does not all occur immediately at the moment of impact (primary injury) but evolves afterwards (secondary injury). Secondary brain injury is the leading cause of hospital deaths after TBI. Most secondary brain injury is caused by brain swelling and if unchecked swelling can lead to increased intracranial pressure, cerebral herniation, enhanced morbidity, and possibly death. Using an experimental model of TBI, the PI

and collaborators have shown that pharmacological administration of MK-886, a FLAP inhibitor previously developed for asthma, before or immediately after TBI blocks the production of lipid mediators that cause brain swelling after TBI. The early blockade of swelling by MK-886 is associated with less cell death and subsequent neurological impairment. The aims of the current proposal are to develop FLAP inhibitors that can be evaluated in human studies to treat TBI in both prophylactic and acute settings.

Title: *“Identifying TBI in school children: A Case Study of the Educational Identification of TBI Process in Colorado”*

Principal Investigator: Pat Sample, PhD

Institution: Colorado State University, Occupational Therapy Department

Award: \$281,250

Status: This grant will end FY 2015-16.

This exploratory study is investigating the earliest stages of a newly-broadened, school-based student TBI identification process in Colorado (ED-ID), which has been developed with the express purpose of increasing the level of support for students with a possible TBI that has not previously been medically diagnosed. The outcomes for newly-identified students, combined with the lessons learned by the Colorado Department of Education, and Colorado schools, will mark an opportunity for Colorado to change teaching and learning processes to benefit previously un- or misidentified students. Well-tuned educational identification of TBI in students will facilitate focused and appropriate supports for their TBI-related school problems. The project will weave together information from the State, district, school, and even individual student/family levels, related to the change in the TBI identification process. The more we can understand the efficacy of TBI identification protocols in Colorado schools, and the more we learn about new methods to identify students with TBI who need unique supports to succeed in school, the more we can improve outcomes for those students.

CBIP released a competitive request for proposals (RFP) in FY 2014-15. Eighteen researchers submitted a letter of intent, 16 were invited to submit a full application. One research declined to submit a full application therefore 15 grants were reviewed and four grants were awarded. The following applicants were awarded:

Title: *“Outpatient Follow-up after ED Evaluation of Concussion in Children: Barriers, Facilitators and Benefits”*

Principal Investigator: Dr. Joseph A. Grubenhoff

Institution: University of Colorado School of Medicine

Award: \$119,595

Status: Type I project will begin July 1, 2015 and end June 30, 2017

Description: Concussions are a frequent reason children visit emergency departments (ED). Although most children recover within a few weeks, up to 15% develop persistent symptoms which may interfere with academic and athletic activities. Experts agree that children should receive ongoing medical care until they have fully recovered from a concussion. A primary goal of follow-up care is to help children successfully return to the classroom and safely return to athletic activities. However, studies of children with concussion initially evaluated in the ED show that a large proportion of children do not attend recommended follow-up. Reasons for this have not been identified. Furthermore, it is unknown just how effective attending follow-up may be, either in increasing the chances that children will get needed help from schools, or as they return to the classroom or in decreasing the likelihood that children will return to athletic activities before it is safe for them to do so. Our study addresses two related questions: (1) What factors promote or prevent attending a follow-up visit after ED evaluation for a

concussion? (2) Does attending follow-up increase the chance that children will get academic support and decrease the chance they will return to sports before it is safe to do so. Answering these two related questions will provide scientific support for recommendations that will help improve children's school performance and will help them safely return to sports. As public concern about the long-term effect of concussions grows, it is vitally important to provide care with proven benefit and ensure that all children receive that care. In addition to providing scientific support for consensus recommendations, we will gather information that will drive a future study to determine how best to improve follow-up for these children if it is shown to be beneficial.

Title: *"Fast MRI for Young Children with TBI"*

Principal Investigator: Dr. Daniel Lindberg

Institution: University of Colorado

Award: \$375,000

Status: Type II project will begin July 1, 2015 and end June 30, 2017

Description: Traumatic Brain Injury (TBI) in children causes more than 2,000 deaths, 35,000 hospitalizations and 470,000 emergency department visits in the US each year, making it a leading cause of pediatric disability and death.[1] Currently 20-66% of these children undergo CT, exposing them to harmful radiation, and increasing their lifetime cancer risk.[2] Magnetic Resonance (MR) is an imaging technique that uses no radiation, but currently, traditional MR in children has required sedation – which has its own costs and risks, including cognitive delay.[3] These risks have gained widespread attention, resulting in a well-validated decision rule to decrease rates of avoidable imaging.[4] However, even if the rule were used perfectly, imaging would still be required for tens of thousands of children annually. The youngest children also face the additional risk of abusive head trauma (AHT), a particularly deadly type of TBI that is easy to miss because caregivers rarely provide an accurate history and because clinical examination findings are subtle or non-specific. Currently, AHT is missed in 31% of cases.[5] Our own preliminary data suggests that one reason for this is that imaging is omitted for some high-risk patients, perhaps in part because of the fear of ionizing radiation associated with CT. In summary, clinicians who consider imaging for TBI in young children must choose between the risks of radiation, sedation, or missed TBI, all of which have exponentially increased risk for children <3 years old.

Title: *"Optimized Sleep after Brain Injury: a pilot study"*

Principal Investigator: Dr. Michael Makley

Institution: Craig Hospital

Award: \$300,000

Status: Type II project will begin January 1, 2016 and end June 30, 2017

Description: The proposed study will begin to address the gap in knowledge about the nature, incidence and effect of sleep disturbances on recovery from moderate-to-severe TBI during the early rehabilitation period. It will also pilot a sleep hygiene protocol to improve sleep for individuals in the early rehabilitation phase after TBI. It will employ 24-hour per day sleep observations and actigraphy to characterize the incidence and type of sleep disturbances in the early rehabilitation phase of TBI. In addition, the study will serially test participants multiple times a week with the Orientation Log (OLOG) and the Confusion Assessment Protocol (CAP) to closely monitor changes in alertness, orientation, attention, memory functions and behavior as they emerge from PTA. The sleep observations and actigraph information can then be compared to the cognitive measures of PTA to examine the relationship of sleep quantity and quality on cognitive functions during recovery from PTA. The randomized controlled trial (RCT) pilot component of the study will be the first therapeutic attempt to normalize sleep cycles and

sleep quality in individuals with TBI who are in PTA and have sleep disruptions during early rehabilitation. Twenty individuals with TBI who are in PTA, who have low sleep efficiency on actigraphy during the initial night time screening will be randomized into a comprehensive sleep hygiene protocol (SHP = 10) or a standard of care (SOC = 10) protocol. Both groups will have access to all rehabilitation facilities, therapies, services and programs. The difference between the groups is the systematic attempt to improve sleep in the SHP by four principle components: 1) improved night sleep environment, 2) increased daytime activation, 3) enhanced circadian stimuli and 4) adjusted sleep time to match pre-TBI preferences. In the SOC group, there will be no systematic efforts to influence circadian rhythms, daytime activation or nighttime sleep environment. Participant's sleep in both groups will be monitored with 24-hour actigraphy and hourly staff ratings on the Makley Sleep Scale (MSS). Behavioral attendants will rate participant's behavior hourly. Nursing staff will rate agitation on the Agitated Behavior Scale. Cognitive functioning will be monitored with the Orientation Log (OLOG) and Confusion Assessment Protocol (CAP) three times per week until one week after emergence from PTA. A third group of ten individuals with TBI who are in PTA, but who have normal sleep efficiency on actigraphy during the initial nighttime screening will undergo the same monitoring as the low sleep efficiency SOC group. The sleep, cognitive testing and behavioral information for the three groups will enable examination of the relationship of sleep to PTA and the potential benefit of the SHP on normalizing sleep and enhancing cognitive recovery, including resolution of PTA.

Title: *"Prevalence to Poor Outcome after TBI in Colorado"*

Principal Investigator: Gale Whiteneck, Ph.D

Institution: Craig Hospital

Award: \$42,057

Status: Type I project will begin July 1, 2015 and end June 30, 2016

Description: Traumatic Brain Injury (TBI) has been well documented by the Centers for Disease Control and Prevention (CDC) as a major long-term public health concern; estimating 3.2 million people with disability after TBI are living in the US. But this estimate has been based primarily on follow-up studies of people hospitalized with TBI. Recent research funded by the CDC through the Colorado Injury Control Research Center, suggests that the number may be closer to 10 million people living with disability after TBI, when people with TBI who were not hospitalized are also considered. The study estimated that 900,000 adult Coloradans have experienced loss of consciousness (LOC) from a TBI, and that another 700,000 have had a TBI without LOC in their lifetime. Of these people with a history of TBI, over 500,000 also reported activity limitations and over 300,000 reported low satisfaction with life. This research was conducted by Craig Hospital using a statewide, population-based survey of Coloradans age 18 and over. The data from this representative sample of 2,701 Coloradans provides a unique opportunity to develop accurate estimates of the number of adults in Colorado living with 10 specific negative outcomes and 11 post-concussive symptoms after TBI. Secondary analysis of this dataset will provide useful estimates of the number of people living with health and function, employment and social integration, and life satisfaction problems after TBI in Colorado. These estimates will be calculated by TBI severity and etiology, age group, gender, race/ethnicity, education, marital status, household composition, urban vs rural counties, and the 14 Colorado Planning and Management Regions. This small proposed Type I project will be led by the same Principal Investigator who led the original research, collecting the data to be further analyzed in this study. It will be completed in half **the time, using only a third the funds typically allocated for Type I applications.**

Education

The Brain Injury Education Program provides education across Colorado about TBI with the goal to prevent brain injury and increase access to appropriate and effective services and supports for those with a brain injury. Historically, the program awards competitive Education Grants with a maximum award amount of \$10,000.

During the FY 2014-2015 Education Grant cycle, 16 applications were received with 11 grants awarded. The total amount awarded was \$53,025. Grants were awarded to the following entities:

1. BIAC – statewide initiative – \$6,750
2. Community Enterprise – Thornton, Westminster, Welby, Commerce City - \$2,000
3. Boulder Valley School District – Boulder County - \$2,500
4. Northeast County Health Department – Northeast Region - \$9,956
5. Tri-county Health Department – Adams, Douglas, Arapahoe Counties - \$6,719
6. Denver Research Institute – statewide initiative - \$7,000
7. Poudre School District – Fort Collins - \$1,290
8. Colorado State University – Larimer County - \$10,000
9. Rocky Mountain Health Plans Foundation – Western Slope - \$5,000
10. Academy School District 20 – Colorado Springs/Monument - \$1,310
11. BIAC – Boulder Brain Storm - \$500

In addition to education grants, the program meets the education requirement through providing training and consultation to offices, divisions, and programs within CDHS as well as across other state agencies. Specifically, the program has been involved with training initiatives with: the Office of Behavioral Health; Jail Based Behavioral Supports program, supported a grant initiative related to homelessness, working with OBH on veterans initiatives such as supporting veterans who are justice involved, and partnering with the crisis centers program to ensure a requirement that all crisis center staff have training related to brain injury. In addition to CDHS, the program is working closely the Department of Judicial to conduct training on brain injury both through the HRSA grant but also in general partnership with the training division. The program also continues to work with the Department of Education and the Department of Public Health and Environment to provide education to school districts and county care coordinators. Finally, the program has partnered with the Department of Health Care Policy and Finance to develop a plan to provide education to Behavioral Health Organizations and community mental health providers on the co-occurrence of brain injury and behavioral health concerns.