

Traumatic Brain Injury Research and Treatment in Indiana

Every year 2.5 million Americans are hospitalized for a traumatic brain injury (TBI), according to the Centers for Disease Control and Prevention (CDC). TBI contributes to about 30 percent of all injury deaths in the United States.ⁱ According the Indiana State Department of Health, the estimated burden of TBI was estimated to be approximately 36,000 Hoosiers each year in Indiana. In 2016, there were 18.6/100,000 deaths, for a total of 1,239 deaths that year. There were 6,726 inpatient admissions at a rate of 101.4/100,000 Indiana residents and the incidence of ED visits in 2016 was found to be 357/100,000 for a total of 24,778 not including outpatient visits.

Partnerships between Indiana State government and the Rehabilitation Hospital of Indiana (RHI) are proving that the above data is only part of a much larger picture. Our work has revealed brain injury's unrecognized impact on children, veterans and those in the criminal justice system. This very same work has resulted in new therapies and services that successfully address some of the significant problems resulting from brain injury.

Veterans are impacted by TBI at even higher rates than the general population. The total number of veterans who have experienced TBI is not known, in part because TBI is difficult to identify, and in part because some veterans have not accessed VA health care services.ⁱⁱ A 2013 Congressional Research Service report noted that the Veterans Administration identifies 201,435 veterans from all eras enrolled with VA for healthcare who have a diagnosis associated with TBI and 56,695 Gulf War era veterans enrolled with VA for healthcare as having been evaluated or treated for a condition possibly related to TBI.ⁱⁱⁱ As of September 2017, Indiana, home to the nation's fourth largest National Guard, had 225,125 veterans under the age of 65^{iv}, including nearly 53,000 veterans who served in the Gulf War.^v

TBI Overview

Moderate and severe TBI can result in long-term medical, physical, cognitive, emotional, and behavioral changes that can impact a person's ability to function day-to-day.^{vi} This can include impaired thinking or memory, movement, sensation (e.g., vision or hearing), or emotional functioning (e.g., personality changes, depression).^{vii} These issues not only affect individuals but can have lasting effects on families and communities and can continue for years. Further, TBI significantly increases risk of psychiatric disorders, diabetes, heart attack, and stroke.^{viii} These associated risks are due in part to gaps in the health care system that leave those with TBI in the care of doctors who are often unaware of their patients' TBI history, limiting their ability to effectively treat the effects of the TBI.

Further, approximately 70 percent of people with TBI are discharged from the hospital on at least one opioid and they **are 11 times more likely to overdose** on opioids. TBI is also a significant risk factor for interaction with the criminal justice system according to the CDC.^{ix} Initial screening by the Rehabilitation Hospital of Indiana (RHI) validates this finding. Screening showed that nearly 60 percent of participants in the Marion County problem solving courts that serve Indianapolis have a history of TBI. Research has also shown that

children who have TBI are **18.7 times more likely** to have concomitant criminality and be involved in psychiatric care by the age of 18.^x TBI, substance abuse, and criminality are co-occurring conditions, but the TBI is typically unrecognized, compromising outcome. Research has shown that 65 percent of those in substance abuse treatment have a lifetime exposure of 65 percent to any TBI, of which 17 percent are moderate to severe,^{xi} and 68 percent of psychiatric inpatients were found to have lifetime exposure to TBI, 20 percent of which were moderate to severe.^{xii} In a study of 295 dually diagnosed individuals with substance abuse disorder and severe mental illness, 80 percent had at least one TBI, 61 percent with at least one TBI with loss of consciousness, and 24 percent with at least one moderate to severe TBI.^{xiii} Last, RHI researchers recently found that of **64 adolescents placed in a residential facility, 50 percent screened positive for lifetime exposure to TBI**, and of these 32 adolescents, 18 percent were found to have moderate to severe TBI, and as a consequence, likely chronic cognitive and neurobehavioral disability associated with their injury. Further, **the history of TBI was known in none of these adolescents by the treatment team in this facility.**

RHI is one of 16 federally-recognized Model Systems sites that contribute data to the National Institute on Disability and Rehabilitation Research TBI database to study TBI as a chronic lifelong condition. Model systems sites follow people for life after brain injury. Model Systems data has demonstrated brain injury's lifelong presence, proven the disabilities resulting from brain injury can vary widely, and shown that the level of disability from TBI continually changes both positively and negatively over time.^{xiv} Based on these findings, the CDC has determined that "the public health burden of TBI suggests important implications for future policies to address proactive, lifelong disease management."^{xv}

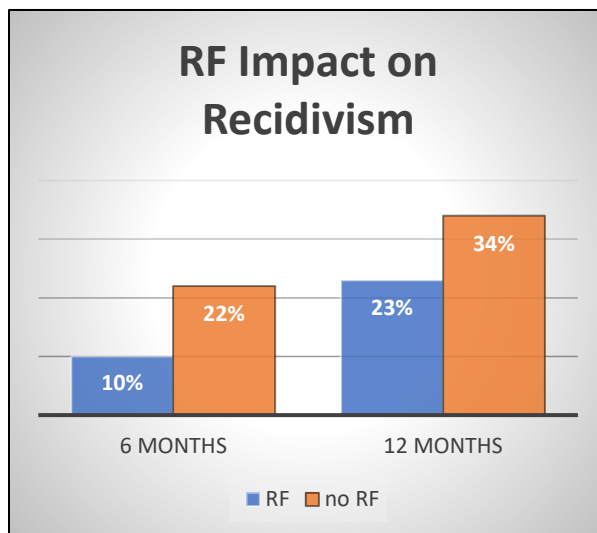
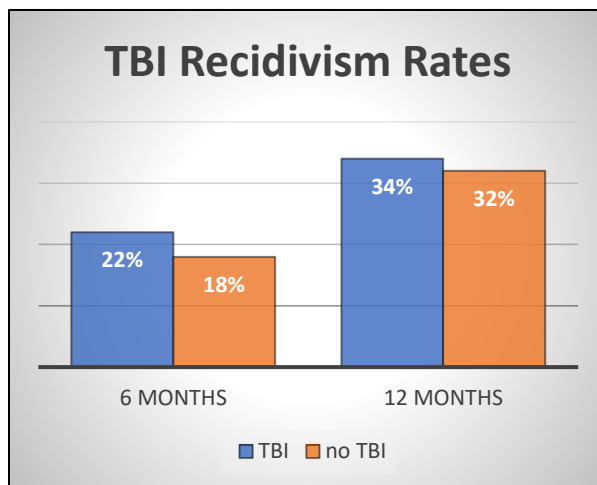
RHI Research

Groundbreaking work in Indiana over the past few years has proven that the consequences of brain injury can be mitigated. RHI partnered with Indiana Vocational Rehabilitation (VR) in 2009 through two federal Health Resources and Services Administration grants to develop and provide Resource Facilitation (RF), which connects those with TBI to both TBI-specific and instrumental resources to enable participants to return to work and school. These studies demonstrated that RF dramatically improved the previous 18 percent return to work rate to a minimum of 64 percent.^{xvi,xvii,xviii} RHI completed the first randomized controlled trial of RF in 2010 and translated that into a statewide clinical service by 2015 through its Research, Training, and Outcomes Center for Brain Injury. RF became a statewide service in 2014 and has reached **return to work outcomes of 70 percent**. Further, people who received RF used significantly fewer social services and their desire for services also significantly declined at the end of RF and they were also found to have significantly decreased level of disability. It is also worth noting that the average RF client is roughly 10 years post-injury.

Researchers at the Center for Business and Economic Research, Miller College of Business at Ball State University recently completed an economic impact study of RF in Indiana. They demonstrated that if Indiana provided RF to those with moderate to severe TBI, the annual aggregate lifetime savings generated as a result of RF for Indiana would be \$249.1 million a year for wages and benefits, \$30.97 million a year in additional Indiana state taxes paid, \$80.1 million a year for savings to SSDI/private disability, and \$6.6 million a year for SNAP, resulting in a **total of \$366.77 million in savings a year**. Their study did not however capture the savings associated with reduced need for services.

Since 2014, RHI has been identifying and treating people with undiagnosed brain injuries in the Indiana Department of Correction (DOC). Researchers in the RHI Brain Injury Rehabilitation Research, Training, and Outcomes Center (RTOC) found that 95 percent of veterans in Marion County’s Veterans Court screened positive for TBI. Sixty-eight percent of veterans in Indiana Veterans Units at Edinburgh and Putnamville Correctional Facilities screened positive for moderate to severe TBI. In contrast, 8.5 percent of people in the overall population have a lifetime exposure to TBI.

RHI and the Indiana DOC were awarded a new HRSA grant in 2014 to apply RF to offenders leaving the DOC. The intent of this grant, which concluded in May 2018, was to determine if RF would reduce recidivism rates for offenders with TBI. Results of the pilot study of 195 offenders showed that ex-offenders with moderate to severe TBI are **almost twice as likely to return to prison** as those without a TBI within the first six months after release. This study also demonstrated that those with TBI who participated in RF are significantly less likely to be re-arrested at both six months and 12 months after release.^{xix} At six months, 10 percent of those in the RF treatment group were re-arrested, compared with 22 percent of those who did not receive treatment through resource facilitation. In fact, offenders with TBI not receiving the RF intervention demonstrated a recidivism risk **nearly two and a half times higher** than those who were treated. These findings demonstrated that RF can cut the risk of recidivism for brain injury survivors by nearly 60 percent. The trend continued at the 12-month time point with 23 percent of the RF treatment group returning to the department of corrections and 34 percent of the comparison group returning at 12 months.



Indiana as a National Leader

Over the last decade, Indiana has become a leader in brain injury services. Partnerships between Indiana’s Vocational Rehabilitation, the Department of Correction, the Indiana State Department of Health, and RHI have proven that the disabilities related to brain injury can be mitigated far more successfully than was previously realized. The Model Systems data proves that this lifelong disability requires continued surveillance and the ability to intervene to avoid crisis.

Today, approximately 200 individuals with acquired brain injury are receiving RF at any one time. However, it is quite noteworthy that there have been an **estimated 700 or more additional referrals** from the central Indiana community for RF, the vast majority of whom do not qualify for Indiana Vocational Rehabilitation services. Expanding access to RF, and particularly access to veterans who are impacted by TBI at much

higher rates, is critical to promote optimal health outcomes and decrease disability associated with TBI. RF is not currently eligible treatment under Medicaid, though there is a significant body of evidence proving its effectiveness.

The Indiana State Department of Health, in collaboration with RHI, is already leading the way in developing RF and sharing resources and best practices with other states through a grant from the Administration for Community Living (ACL) at the U.S. Department of Health and Human Services. Further, Indiana is now developing through this grant the first model for proactive condition management of TBI starting at the trauma center using TBI-specific stratification including a cloud-based tool for surveillance and re-assessment. Through this grant, people with TBI will be recruited into a new randomized controlled trial of RF, which will include use of this new telemedicine tool, to examine the extent to which RF will improve health-related quality of life and reduce disability. Secondary aims of this study will also examine the extent to which RF can reduce opioid misuse and prevent incarceration and institutionalization. Application of these methods could have a significant impact on the estimated 112,000 Hoosiers who currently have chronic disability associated with TBI, and the effects could be even more pronounced among veterans, who are impacted by TBI at a much higher rate than the general population.

Conclusion

While Indiana has made tremendous progress in offering better, more effective treatment to those impacted by TBI over the past decade, to sustain the research to practice innovation cycle as well as promote access to evidence-based intervention, it is important that the state recognize that TBI can be a chronic condition that needs to be proactively managed to minimize disability and optimize sustainable recovery. The RHI research has demonstrated these are not unrealistic outcomes, even for survivors ten years post-injury. However, promoting early access could enable earlier recovery and prevent significant health care expense.

Secondly, Indiana could develop a TBI task force, comprised of the many state agencies that all provide resources to those with a TBI and their caregivers to coordinate efforts for 1) screening for the identification of lifetime exposure to TBI, 2) utilization of methods for to accommodate for the effects of TBI, especially for children as an attempt to mitigate their risk for engagement with the criminal justice and mental health systems, and 3) promote access to coordinated systems of supports and services to manage TBI as a chronic condition. The State Department of Health could chair this task force, which could include the Family and Social Services Administration, Veterans Affairs, the Department of Corrections, Department of Education, Vocational Rehabilitation and the Department of Workforce Development, the state law enforcement agencies, and the state's Drug Treatment, Prevention, and Enforcement Commission.

By formally recognizing TBI as a chronic condition, and endorsing the need to find methods to support access to proactive care management, Indiana could accelerate its leadership in TBI, significantly improve outcomes, as well as avoid institutionalization and reduce cost.

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ENDNOTES

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- ^v National Center for Veterans Analysis and Statistics State Veteran Population by Period Served. https://www.va.gov/vetdata/veteran_population.asp
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