

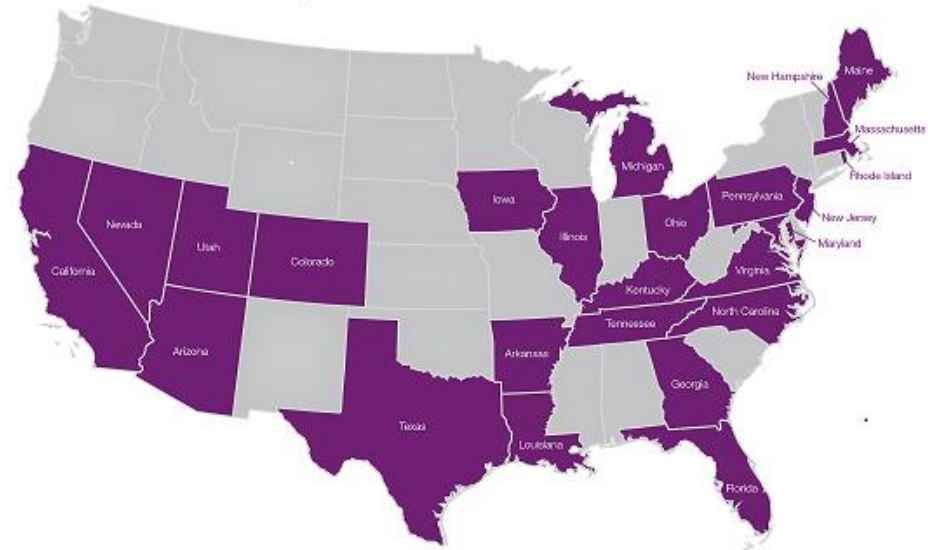


Case Managing Patients with Traumatic Brain Injury

NeuroRestorative Roots



- NeuroRestorative’s roots date back to 1977, the year the renowned Center for Comprehensive Services was founded as the **first after-hospital rehabilitation program in the United States** for individuals with acquired brain injury. Now offering services in **25 states** throughout the United States, NeuroRestorative is the **largest and most experienced provider of subacute and post-acute rehabilitation services for people of all ages with brain, spinal cord and medically complex injuries, and other challenges.** We offer a range of locations and settings to meet the needs of participants at every level of rehabilitation.



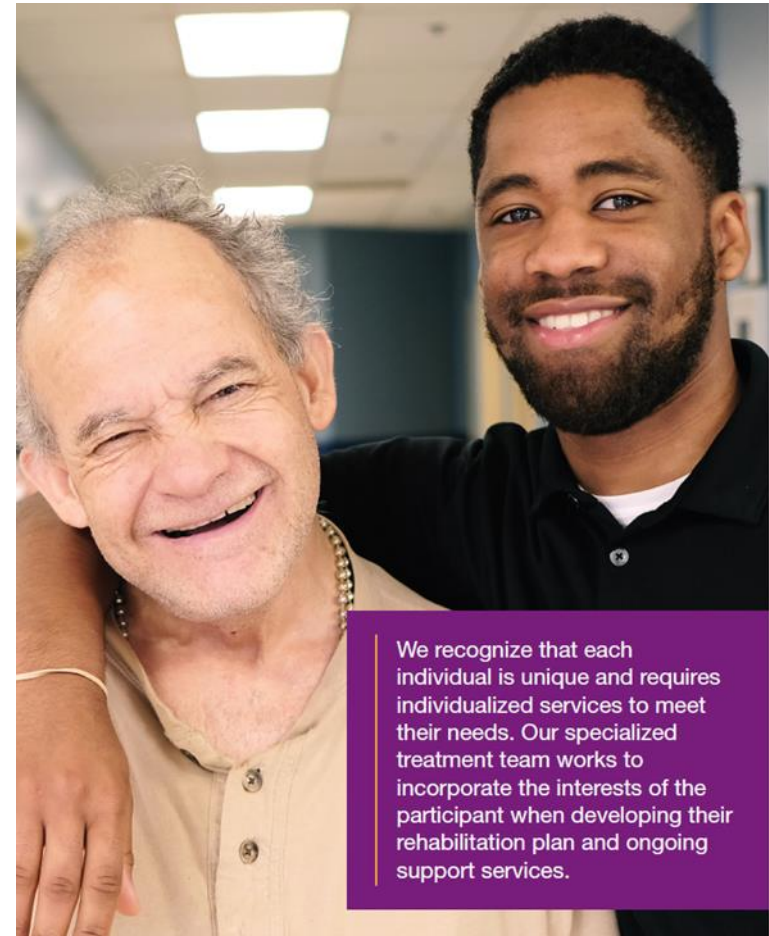
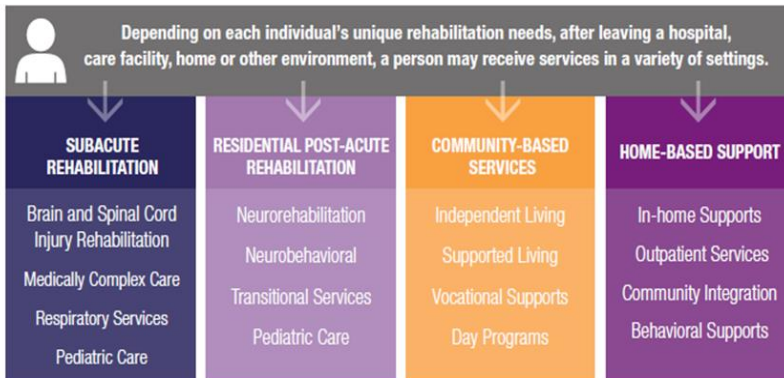
NeuroRestorative Services

Comprehensive Services & Supports

We provide comprehensive services based on the needs of each individual participant, including:

- Specialized Nursing & Medical Care
- Physical Therapy
- Speech-Language Pathology
- Occupational Therapy
- Behavior Analysis & Therapy
- Neuropsychology
- Case Management
- Medical Care Coordination
- Physician Oversight
- Medication Management
- Family Education & Training
- Specialized Schools & Educational Services
- Counseling
- Life Skills Training
- Non-transitional Therapeutic Opportunities

Our Continuum of Care



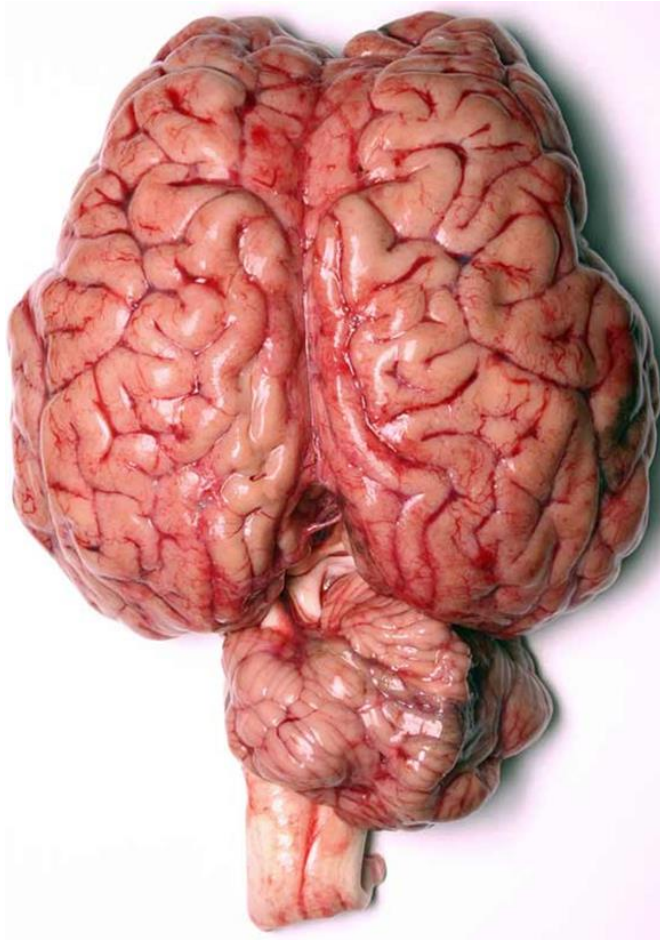
We recognize that each individual is unique and requires individualized services to meet their needs. Our specialized treatment team works to incorporate the interests of the participant when developing their rehabilitation plan and ongoing support services.

NeuroRestorative Accreditation



TBI Case Management

- 💡 The Complex Brain
- 💡 The Disease Process
- 💡 The Systems of Care
- 💡 The Evidence
- 💡 The Steps



The Complex Brain

Traumatic Brain Injury Definition: “The Silent Epidemic”



- An insult to the brain caused by an external physical force
- Not of a degenerative or congenital nature
- May produce diminished or altered state of consciousness which results in impairment of cognitive abilities or physical functioning
- May result in disturbance of behavioral or emotional functioning
- Impairments can be temporary or permanent
- Can cause partial or total functional disability or psychosocial maladjustment

Types of Traumatic Brain Injury

- **Concussion**: mild blow that can cause shearing of brain cells
- **Contusion**: bruising of the brain due to trauma or blood leaking from blood vessels
- **Hematoma**: leaking blood collecting in a confined area of the brain or skull (subdural, epidural or intracerebral)
- **Coup-Contrecoup**: at least 2 injury sites from one blow
- **Penetrating Brain Injury**: skull fracture or gunshot wound; blood vessels rupture, bacteria may enter
- **Diffuse Axonal Injury**: shearing of cell connections due to acceleration/deceleration, global damage

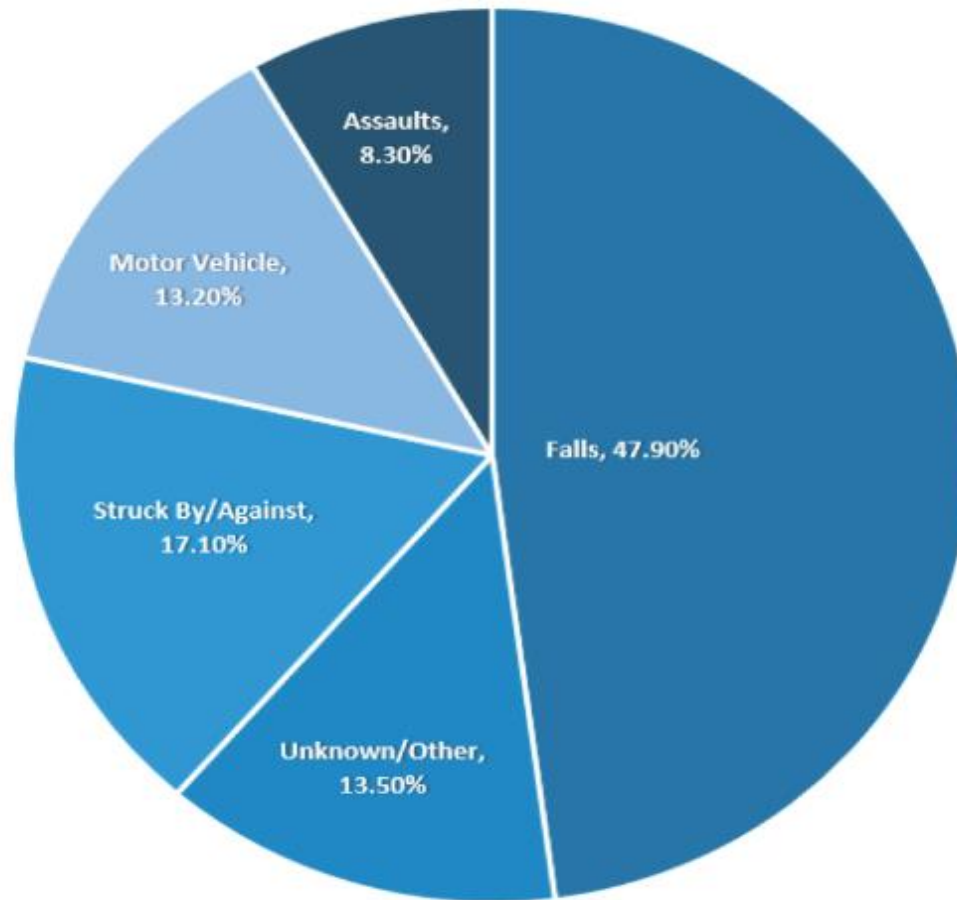
Acquired Brain Injury (ABI)

- **Stroke or Cerebral Vascular Accident (CVA):** a disruption of blood flow (thrombi emboli) in the brain; aneurysms; arteriovenous malformations; and intracerebral hemorrhage.
- **Anoxic Injury:** damage to the brain due to lack of oxygen or reduced flow of oxygen.
- **Other Encephalopathies:** damage to the brain caused by infections (e.g., meningitis, encephalitis), tumors, and metabolic disorders.

Brain Injury Incidence and statistics

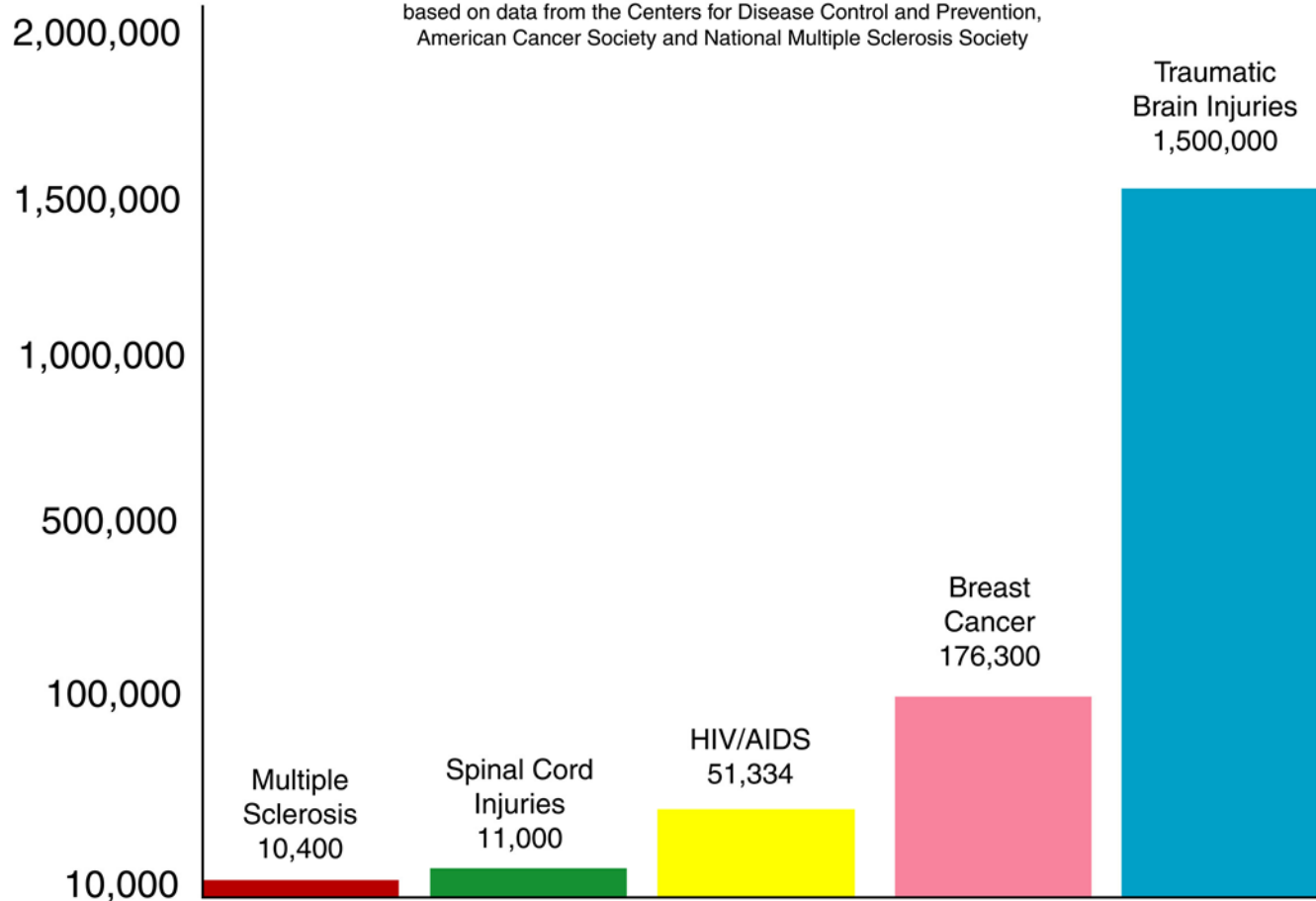
- Every 9 seconds, one person in the US sustains a TBI
- More than 3.5 million children and adults sustain an ABI each year
- At least 2.8 million people in the US sustain a TBI each year
 - 2.2 million are treated for TBI in emergency departments and trauma centers
 - 280,000 are hospitalized
 - 50,000 die
- Every day, 137 people die in the US because of a TBI-related injury
- An estimated 5.3 million Americans—a little more than 2% of the US population—currently live with disabilities resulting from TBI. Approximately 1 of every 60 people in the US.
- Males aged 15-24 and persons older than 75 years of age have the highest incidence of TBI

What are the Leading Causes of TBI?

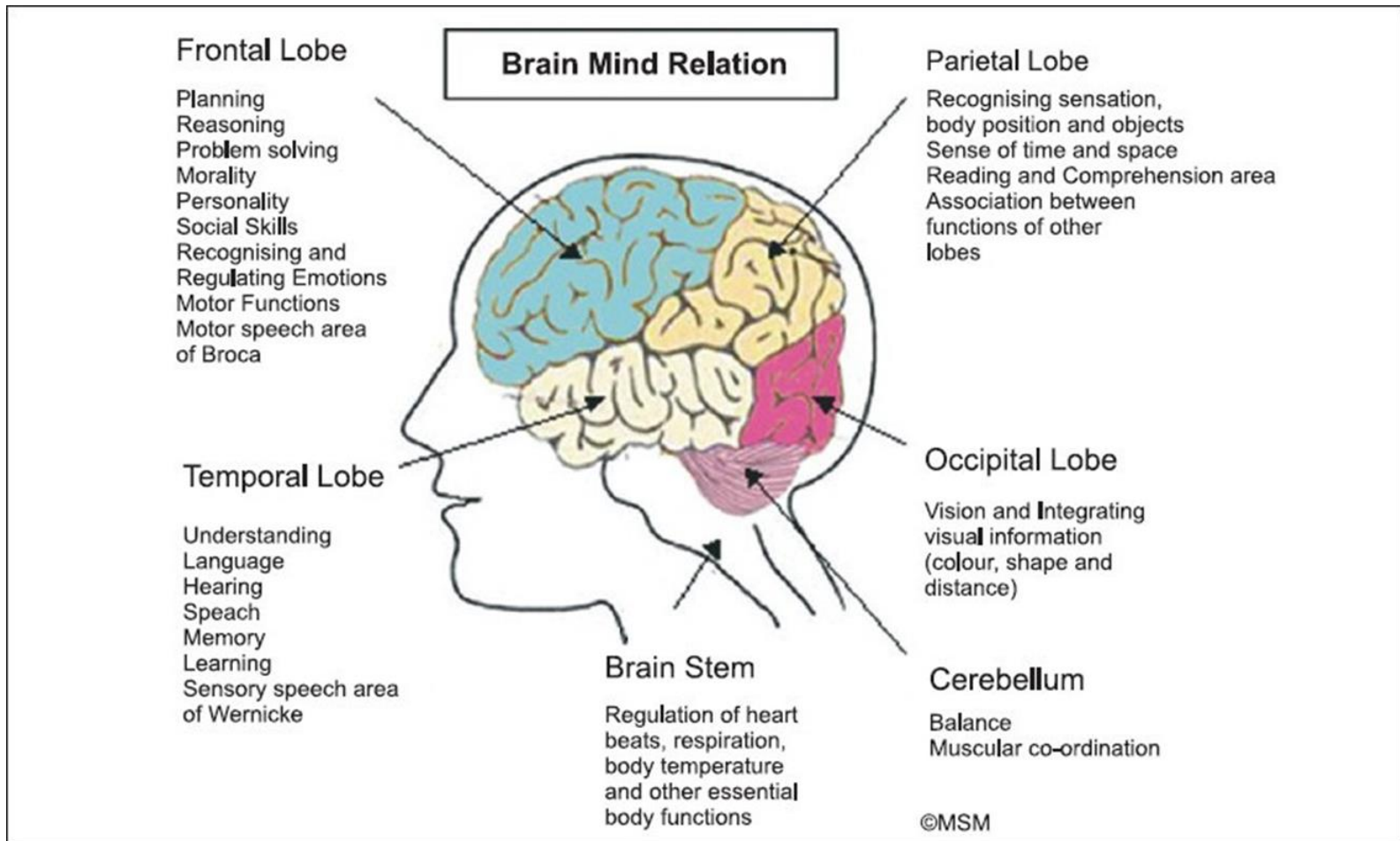


Comparison of Annual Incidence

Data compiled and arranged by the Brain Injury Association of America based on data from the Centers for Disease Control and Prevention, American Cancer Society and National Multiple Sclerosis Society



Brain Anatomy and Function





The Disease Process

Is Brain Injury a Disease?

Defining a Disease

- A disordered or incorrectly functioning organ, part, structure, or system of the body resulting from the effect of genetic or developmental errors, infection, poisons, nutritional deficiency or imbalance, toxicity, or unfavorable environmental factors; illness; sickness; ailment (*dictionary.com*)
- A condition of the living animal or plant body or of one of its parts that impairs normal functioning and is typically manifested by distinguishing signs and symptoms (*merriam-webster.com*)

Defining a Disease

- A disorder of structure or function in a human, animal, or plant, especially one that produces specific symptoms or that affects a specific location and is not simply a direct result of physical injury (***oxforddictionary.com***)
- An abnormal condition of a part, organ, or system of an organism resulting from various causes, such as infection, inflammation, environmental factors, or genetic defect, and characterized by an identifiable group of signs, symptoms, or both (***thefreedictionary.com***)

Disease Management

- Brain ‘injury’ is known to initiate and/or accelerate a number of disease processes
- Brain injury impacts multiple organ systems, is disease causative and disease accelerative:

Epilepsy – 35-50% <15 years	Neuroendocrine – 40%
Cardiopulmonary – 30%	Incontinence – 14% >year fecal and 18% 6 months incontinent
Sleep – 50% <	Psychiatric Disease
Alzheimer's Disease - 2.3-4.5 times greater	Sexual Dysfunction – 40-60%

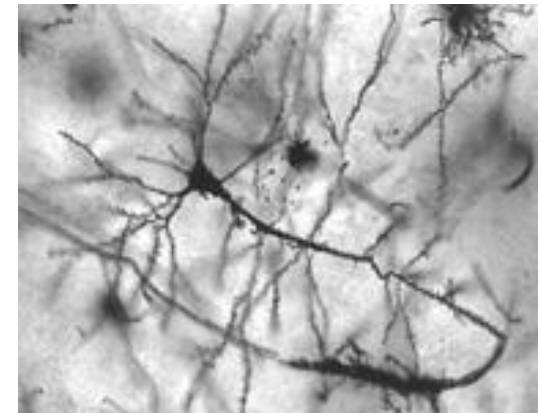
Disease Process

- Individuals surviving more than one year post TBI are:
 - 37x more likely to die from seizures
 - 12x more likely to die from septicemia
 - 4x more likely to die from pneumonia
 - 3x more likely to die from respiratory conditions



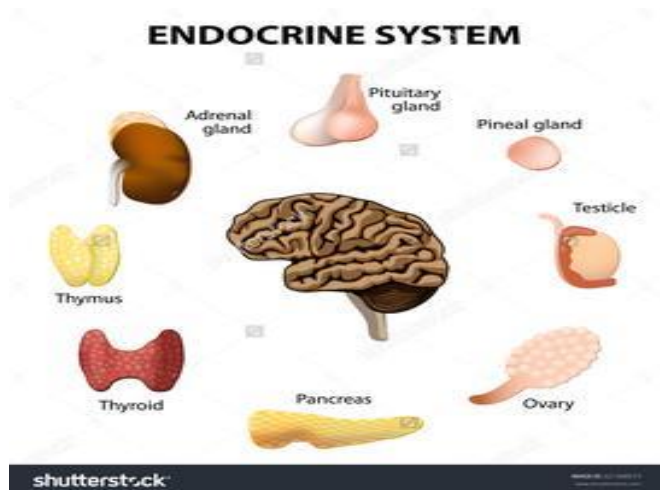
Neurological Disorder

- Anosmia
- Ageusia
- Central auditory processing disorders
- Cerebral salt wasting
- Hydrocephalus
- Encephalomalacia
- Dysphagia
- Motor speech disorders
- Dyslexia
- Bladder dysfunction
- Movement disorders
- Migraine
- Chronic daily headache
- Hippocampal atrophy
- Neurodegenerative disease acceleration
- Oculomotor disorders
- Vestibular disorders
- Attentional disorders
- Epilepsy
- Spacity
- Pain



Neuroendocrine Disorders

- Panhypopituitarism
- Hypoadrenalism
- Hypothyroidism
- Hypogonadism
- Diabetes insipidus
- Infertility
- Impotence
- Decreased libido
- Obesity
- Kidney stones
- Osteoporosis
- SIADH
- Hyperlipidemia
- Hypertension
- Delayed gastric emptying
- GERD
- Constipation
- Cognitive dysfunction
- Immunological suppression



Psychiatric Disorders

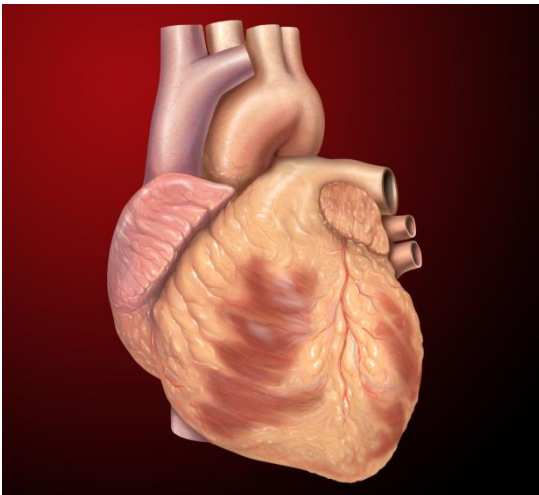
- Suicide
- Suicidal ideation
- Mania
- Hallucinations
- Agoraphobia
- Delirium
- Personality change
- Psychosis
- Depression
- Anxiety
- Accelerative Episodic Dyscontrol
- Substance abuse
- Abulia



Other Disorders

Sexual Dysfunction

- Erectile dysfunction
- Hypersexuality
- Transvestism
- Altered sexual preference
- Fetishism
- Hyposexualism
- Precocious puberty
- Dysmenorrhea



Sleep Disorders

- Sleep apnea/Hypopnea
- Periodic limb movement disorders
- Hypersomnolence
- Insomnia

Coronary Disease

- Coagulopathies
- Hypertension
- Hyperlipidemia



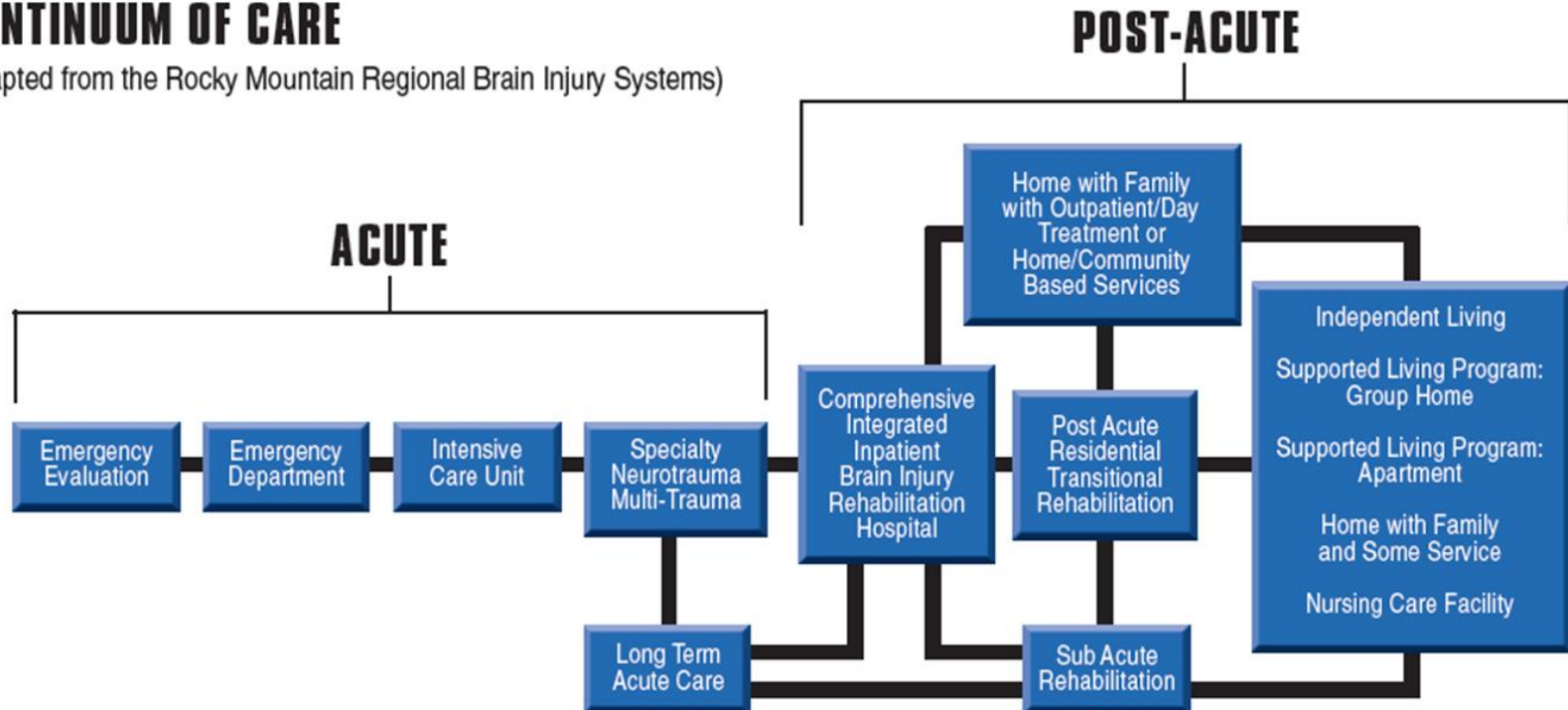
The Systems of Care

Brain Injury Systems of Care

- Traumatic Brain Injury results in dramatic changes in all levels of functioning
- Historically limited potential for recovery
 - Acute care followed by acute rehab, then home or skilled nursing facility
- Traumatic Brain Injury today
 - Encompasses numerous levels and services from onset throughout the lifetime

CONTINUUM OF CARE

(adapted from the Rocky Mountain Regional Brain Injury Systems)



Why So Many Services?

- Not just a medical event
- Not a final outcome
- Rather, the beginning of a disease process



Re-hospitalization Rates Following Brain Injury



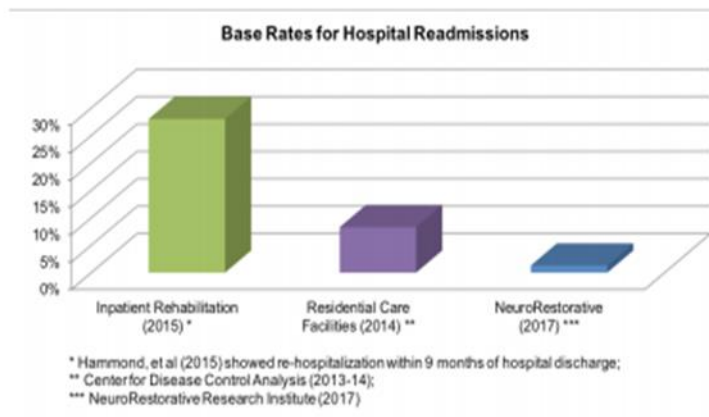
Reason	1 year	3 year	5 year
Rehab	3.8	0	1.3
Seizures	10.1	15	18.7
Psych	6.3	15	16
Ortho	44.3	25	13.3
General Health	13.9	22.5	36

- 70% of all overall costs are consumed by general health, seizures and psych
- Not documented are costs for patients being admitted from acute rehab to emergency department and/or psychiatric facilities

NeuroRestorative Re-hospitalization Rates

Low Return-to-Hospital Rates.

A NeuroRestorative report*, “Hospital Readmission Rates” examined the number of participants readmitted to hospitals or acute rehabilitation facilities due to medical or other complications during post-acute rehabilitation. The report revealed that NeuroRestorative has maintained a low return-to-hospital rate since fiscal year 2013, approximately 1.3%.



Why is the Rate Low?

Comprehensive medical, rehabilitative, and neurobehavioral management.

Complications Associated with Absent or Inappropriate Treatment

- Ongoing disability associated with Physical, Cognitive, Psychosocial Function impacting return to home, school, or work
 - Physical Deficits: Balance, Hearing, Vision, Speech, Ambulation, Motor Control
 - Cognitive Deficits: Memory Loss, Concentration Difficulty, Organizational Problems
 - Psychosocial Deficits: Behavioral Impairment, Decreased Initiation, Impulsivity, Sexual Dysfunction, Depression

Costs of Traumatic Brain Injury

- \$76.5 Billion annually in the United States (2010)
- \$31.7 Billion in hospitalization cost
- \$16.6 Billion in cost associated with fatalities
- \$33 Billion indirect costs (lost wages, lost time at work, social service costs)
- 60% unemployment 2 years post
- 53% homeless
- \$600,000 to \$1.877 Million Lifetime cost per incident
- \$4 Million for severe TBI, est.

Need for Service

40% of those hospitalized with TBI had at least one unmet need for service one year after their injury.

Most Frequently Reported:

- Memory and problem solving
- Controlling ones temper
- Managing stress and emotional upsets
- Job skills





The Evidence

Requires Experts



Core Team

- Patient
- Rehabilitation Doctor
- Case Manager
- Occupational Therapist
- Behavioral Psychologist
- Counselor
- Rehab Nurse
- Physical Therapist
- Speech Pathologist
- Therapeutic Recreationalist
- Neuropsychologist
- Social Worker

Available for Consult

- Endocrinologist
- Neurologist
- Neuro-Ophthalmologist
- Orthopedist
- Psychiatrist
- Special Educator
- Neurosurgeon

Other Key Players

- Parents, spouse, significant others
- Siblings
- Employer, business partner
- Friends extended family
- Insurance case manager
- Claims Adjustors- reinsurers
- Health Insurance Medical Director
- Workers Comp Case Manager
- Attorneys
- Immigration Officials

- If we do all this, does it really make a difference?

Recent Neuroscience says: YES



- **Neuroplasticity:** The ability of the brain to change in response to experience. Experience leads to changes in the brain, which, in turn, facilitate new learning, which leads to further neural change.
- **Neurogenesis:** Growth of new neurons.
- **Neuroplasticity After TBI**
 - After brain injury (lesions, shearing) neurons spontaneously rewire
 - Poor result for functional recovery without environmental stimulation of those pathways

Evidenced Based Rehabilitation

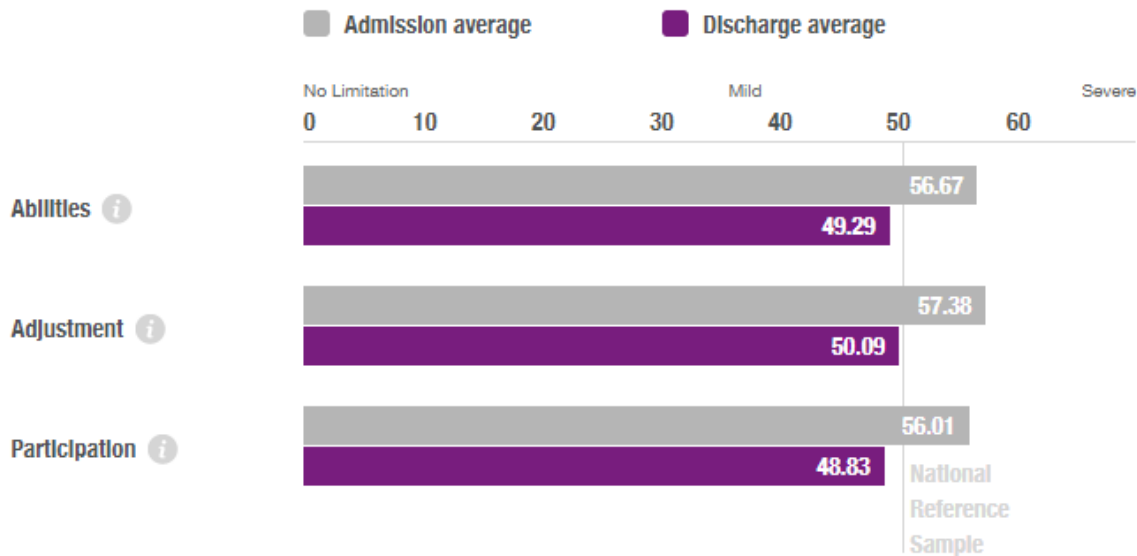


- Formal TBI Rehabilitation results in an increase rate of return to the community, decreased utilization of medical services, and decreased disability. (Cope: Brain Injury 1995 and Bell: Arch Phys Med Rehabil 1998)
- Acute rehabilitation utilizing a dedicated TBI program resulted in, improved cognitive skills, and improved return to home rates. (Mackay: Arch Phys Med Rehab 1992)
- TBI patients > 3 months post-injury demonstrated improvement in behavior, physical ability, functional skills, and independent living. Maintaining improvements 18 months post – completion. (Malec: Brain Injury 1993; Mills: Brain Injury, 1992; Ashley & Cervelli , 2009)

NeuroRestorative Outcomes



Improvement in MPAI-4 Participation, Adjustment and Abilities T-scores



Average Age = 47.7, Average Length of Stay = 5.6 months. Outcomes for all persons treated in active rehabilitation. The mean reduction in disability was 8.68 points, a clinically and statistically significant improvement ($p < .001$).

On average, our participants demonstrated an increase in functional independence across all 29 items of the MPAI-4.

Comprehensive Rehabilitation



- Discoveries lead to conclusion: short and long term benefits of comprehensive brain injury rehabilitation
- Care delivery today based on research that an injured brain has a meaningful capacity to recover
- Programming designed to ensure maximum participation in social roles, education, and work



The Steps

Step 1: Begin with the End

- Assess the patient's Rehab potential
 - History: social and medical
 - Physician interview
 - Therapist input (TBI experience)
- Understand treatment options: Acute rehab, outpatient, residential, home services

Step 2: Know the Funder

- Casualty carriers i.e. workers comp: often obligated to provide medical care and treatment necessary to restore individual as much as possible to previous level (may involve lifetime care)
- HMOs: contractual limitations for rehabilitation services (e.g. 30 to 90 days for inpatient rehabilitation)
- Accident & Health insurance carriers: operate as PPO
 - May substitute benefits (SNF benefits traded for post-acute rehab, superior outcomes)
 - Some carriers rewriting to preclude substitutions
- Public Payer
 - Medicare
 - Medicaid (variable from state to state)
 - Medicaid waiver programs (community coverage)

Step 3: Know the Provider

- CARF Accredited in TBI?
- Organized TBI team of professionals
- Access to special services
- Follow-up services
- Acute Rehabilitation (TBI Team)
- Post-acute rehabilitation (community re-entry programs)
- Outpatient services (speech, neuropsych, physician follow-up)
- Day services (full day of services or recreational activities)
- Supported Living
- Home and Community-Based Services
 - Case management
 - Homemaker services
 - Home health aide services
 - Personal care

Step 4: Know the Family

- Understand the stress
 - Too complex to absorb in a single educational session
 - Provide multiple sessions across time (the miracles: survived, movement, recognition, talking, walking) no family can be completely prepared for the long term
 - Mourning
- Provide resources
- Involve in decision making
- Experts may need to persuade (return to work or school too early almost certain failure)

Case Management Goals

- Proper utilization of resources to:
 - Reduce dependency
 - Maximize health outcomes
 - Maximize productive activity
 - Maintain life satisfaction
- Considerations
 - Consequences of the injury
 - Broad array of practitioners
 - Family concerns
 - Payer concerns
 - Ethical dilemmas associated with costs



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To make a referral, please call us at 800-743-6802, fax our secure line at 781-394-8190, or fill out the form at <https://www.neurorestorative.com/referrals-funding-2/make-a-referral/>