

Trauma Rehabilitation Clinical Guideline

Brain Injury

The Rehabilitation Technical Advisory Committee (TAC) is an open forum for designated trauma rehabilitation services in Washington state that shares ideas and concerns about providing rehabilitation care for trauma patients. The TAC meets regularly to encourage communication among services, and to share best practices and information to improve quality of care. On occasion, at the request of the Trauma Care Steering Committee, the group discusses the value of specific clinical management guidelines for trauma rehabilitation care.

The Washington State Department of Health distributes this guideline on behalf of the Emergency Medical Services and Trauma Care Steering Committee and Rehabilitation TAC to assist rehabilitation services with developing patient care guidelines. The workgroup has categorized the type of guideline, the sponsoring organization, how it was developed, and whether it has been tested or validated. This information will assist rehabilitation services in evaluating the content of this guideline, and its potential benefits for their practice and patients.

The Department of Health does not mandate the use of this guideline. The department recognizes the varying resources of different services, and that approaches that work for one rehabilitation service may not be suitable for others. The decision to use this guideline in any particular situation always depends on the independent medical judgment of the physician providers and clinical staff. We recommend that rehabilitation services and physicians who choose to use this guideline consult with the department regularly for any updates to its content. The department appreciates receiving any information regarding practitioners' experiences with this guideline. Please direct comments to 360-236-2874.

The workgroup has reviewed the guideline, sought input from rehabilitation clinical providers and staff throughout Washington state, and used that input in developing this guideline. The guideline was endorsed by both the Emergency Medical Services and Trauma Care Steering Committee and the Department of Health Office of EMS/Trauma Section. This guideline has not been tested or validated.

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Brain Injury

Introduction

Brain injury (BI) is a frequent event. It occurs in more than 1.7 million people annually, resulting in more than 1 million emergency room visits. These types of injuries have significant public health and socioeconomic effects, resulting in more than 50,000 deaths per year and billions of dollars in healthcare costs. In children, BI is the leading cause of death in patients less than 18 years of age and results in more than 60,000 admissions. The majority of these injuries occurring from trauma result from blunt forces sustained in falls, motor vehicle crashes (MVC), sports and recreational injuries.

Many BI patients will receive rehabilitative care with goals directed at improving independence in regard to activities of daily living, improving social function, and quality of life. Therapies are based on cognitive and physical ability, with treatment regimens focused on improving motor and cognitive function, self-care skills, and community participation.

The purpose of this guideline is to provide evidence-based practice recommendations for brain injury patients at inpatient rehabilitation facilities. The recommendations are directed at limiting the effects of impairments and secondary complications, reducing activity limitations, maximizing wellness and quality of life, decreasing environmental barriers, and promoting self-advocacy.

Comprehensive Brain Injury Care

The overall assessment of BI patients should focus on the effect of the injury on medical, physical, psychological, social, and vocational functioning.

The best model to providing care in the inpatient rehabilitation setting to BI patients is based on an interdisciplinary treatment team. The team is an alliance of professionals from different medical or therapeutic disciplines that establish treatment priorities and goals in a coordinated manner. Individuals with BI are encouraged to participate in team planning, along with their family members and other support systems.

The patient care plan should be developed by this interdisciplinary team which should include psychiatry, therapists (physical, occupational, recreational, and speech), and nursing. The plan should focus on both cognitive and physical rehabilitation.

Cognitive rehabilitation has been found to be effective for mild to severe BI in the post-acute period and up to one year or more from the injury date. Evidence demonstrates there is clear indication that cognitive rehabilitation is the best form of treatment for patients suffering from neurocognitive impairment and functional limitations after BI or stroke. Consider the following practice recommendations:

- Attention training
- Metacognitive training

- Self-directed strategy training
- Promotion of self-monitoring and self-regulation
- Promotion of social communication skills
- Comprehensive-holistic neuropsychological rehabilitation

Physical rehabilitation is essential. Physical components of rehabilitation should focus on maximizing movement patterns and minimizing tone to promote optimal function. Managing tone, promoting active patterns of movement, addressing balance, gait and functional transfers throughout all activities of daily living are essential components of rehabilitation of BI patients. Modalities and equipment aids, such as: body weight-supported treadmill training, gait support devices, orthotics, adaptive ADL equipment, and the use of assistive technology to address both ADL's and leisure activities are essential. An additional focus should include regularly scheduled passive range of motion exercises and body repositioning. Equipment aids are necessary. They may include standing frames, tilt tables, body weight gait support devices, and orthotics. Some studies support the use of modern technology in devices for gaming and virtual reality-based treatments.

As part of the physical rehabilitation program, an attempt should be made to create a setting similar to the patient's environment, including daily activities. Creating this setting will promote adequate reintegration back to the patient's daily routine prior to injury, and will aid the provider in prescribing any activity or work limitations. Creating this environment will also help prepare the patient for discharge home and reintegration back into the community.

Common Complications of Brain Injury and Intervention Strategies

Depending on which area of the brain is injured, behavioral changes and complications can be common. In the following tables, BI behaviors and complications are listed with recommended intervention strategies to either prevent or treat the occurrence.

Table 1. Behavior and Intervention Strategies

Behavior	Intervention Strategies
Disorientation / Confusion	<ul style="list-style-type: none"> • Provide frequent, unobtrusive reorientation (e.g. provide your name and role whenever in contact during interactions) • Provide simple explanations • Reference the wall calendars or room white board when possible • Maintain a consistent daily schedule with nursing care and therapy visits • Speak in simple sentences, one person at a time • Encourage regular visits and calls from family members; post pictures and notes from family and friends
Agitation	<ul style="list-style-type: none"> • Provide a quiet, private room (consider TBI room) • Reduce auditory and visual stimulation (e.g. no television/radio, dim lights, and close door to room) • Initially treat patient in hospital room and then gradually begin treatment out of room in a quiet place • Limit visitors (one or two at a time) and length of visitations • Provide rest from interaction

	<ul style="list-style-type: none"> • Speak in simple sentences, one person at a time • Maintain consistency in schedule and staffing • If patient is restless, permit him or her to ambulate in the room or around the unit as long as safety is maintained; if in wheelchair, stroll in wheelchair in a quiet place
Depression	<ul style="list-style-type: none"> • Plan for follow-up care to include long term needs, monitoring, and treatment • Create environments with positive interactions • Schedule activities and promote productivity • Support and teach problem solving techniques • Assist and encourage goal setting • Consider the need for psychiatric and psychological consults • Communicate with patient and family members regarding the availability of regional and national support groups and transitional services • Consider the need for pharmacological treatment such as SSRIs
Fatigue	<ul style="list-style-type: none"> • Schedule naps and rest breaks • Shorten sessions and use co-treatment as needed • Assess sleep environment and routine, and modify as needed • Consider sleep medications
Pain	<ul style="list-style-type: none"> • Assess reasons for pain • Pre-medicate before procedures and therapies • Consult pain service as needed
Language	<ul style="list-style-type: none"> • Speak in simple sentences, one person at a time • Avoid having background conversations • Keep instructions simple (one-step) and concrete • Use gestures and visual cues
Frustration	<ul style="list-style-type: none"> • Decrease task demands • Increase reinforcement • Provide breaks within and between sessions
Aggression	<ul style="list-style-type: none"> • Use a quiet and calm voice • Remove materials that can be thrown or damaged • Offer reassurance • Decrease task demands • Give patient choices and control over the situation • Assess for triggers • Consider psychotropic medication • Use TBI room, if available
Impulsivity / Decreased Safety Awareness	<ul style="list-style-type: none"> • Use TBI room, if available • Use bed rails, lock belts, bed alarm, and Posey beds as needed • Pad bed rails as needed • Provide frequent reminders for safety (verbal and visual) • Consider use of one-to-one staffing (e.g. nurse, sitter) or family member to stay with patient • Security training

Verbal Disinhibition and Social Inappropriateness	<ul style="list-style-type: none"> • Interpret the behavior as communication and redirect the patient to a more appropriate means of communicating • Model appropriate behavior and communication strategies
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Table 2. Complications and Intervention Strategies

Complications	Intervention Strategies
Bladder/Bowel Incontinence	<ul style="list-style-type: none"> • Foley catheter may be needed in some cases • Bladder training • Fluid schedule • Limit evening fluids • Scheduled bathroom attempts • High fiber diet • Adequate fluids for hydration • Monitor skin for breakdown
Deep Vein Thrombosis (DVT)	<ul style="list-style-type: none"> • Assess risk of developing a DVT • Apply mechanical thromboprophylaxis with intermittent pneumatic compression device (PCD) • Compression stockings may be used with PCD • Promote physical activity • Maintain hydration • Promote healthy nutritious meals • Minimize or eliminate cigarette smoking • Ensure clothing is loose fitting • Blood thinning medications may be needed in some cases • Provide patient education regarding risk factors and prevention
Dysphagia	<ul style="list-style-type: none"> • Conduct a comprehensive assessment • Safely support adequate nutrition and hydration • Minimize risk of pulmonary complications • Develop treatment plans to improve safety and efficiency of swallowing • Determine optimum feeding methods • Dietary consult • Modification of diet consistency, texture, and food types • Swallowing exercises • Consider specific equipment or utensils to limit portion size and to facilitate swallowing
Hyponatremia	<ul style="list-style-type: none"> • Treatment will depend on underlying disease process • Endocrinology consultation • Regularly monitor electrolyte levels including sodium • Fluid restriction • Close monitoring • Strict monitoring of intake and output • Daily weight measurement • Intravenous sodium replacement • Consider loop diuretics
Skin Breakdown	<ul style="list-style-type: none"> • Perform a thorough daily skin assessment • Identify patients at risk for skin breakdown

	<ul style="list-style-type: none"> • Focus on prevention • Eliminate the causes of skin breakdown (pressure, friction, shear) • Repositioning every two hours while in bed • Wheelchair-bound patients require frequent hourly position changes • Reassess skin after repositioning for pinked, redden or discolored skin • Use alternating pressure or air mattresses as needed • Pad bony areas in contact with a surface • Keep heels off of direct contact with bed • Use pillows to pad bony skin surfaces while in lateral positions • Lift, do not drag, pull, or push the patient while changing positions • Do not use donut devices • Do not massage pressure points or affected areas
Spasticity/ Contractures	<ul style="list-style-type: none"> • Early recognition and treatment are crucial to minimizing spasticity • A thorough interdisciplinary team assessment should be performed to properly evaluate and gauge the degree of spasticity • Rehab care regarding spasticity should focus on preventing contractures, improving movement, improving activities of daily living, improving quality of life, and incorporating the patient and family to help guide therapeutic interventions • Support daily passive range of motion exercises • Encourage active range of motion • Consider using a scale or tool to measure range of motion • Orthotic devices may be helpful in some cases • Prevent bladder infections, skin breakdown, or injuries to the legs and feet • Follow-up appointments will be necessary to determine appropriateness of the treatment plan • Consider early intervention with oral antispastic medications • In some cases intramuscular injections of botulinum toxin may be helpful

Special Populations

Pediatrics

The effect of BI in pediatric patients can differ from adults. The effects of BI in children may not be fully realized initially and may develop into adulthood. Symptoms may not be immediately apparent because the brain is still developing. BI in children can be chronic and last over the entire life of the child, resulting in long-term challenges.

Return to School

Treatment of children with BI should address the ability to function in everyday activities, including school. Most children with a brain injury will be school age, so entry or reintegration into school is a key component to rehabilitation. Speech and language interventions directed at cognitive communication, behavior, and social interaction will play a key role in successfully school integration.

Treatment must continue after reintegration. The care plan must include therapy partners within the school system in addition to teachers, medical providers outside the school system as well as the parents. School therapists must be knowledgeable of the child's medical history, residual effects of the BI, and any learning disabilities. The care plan must be updated to include treatment options within the school and any needed school-based services or specialized equipment. Consulting with the school's speech-language pathologist will be key to a successful reintegration.

Child Life Specialist

Child life programs are an important component of pediatric hospital and rehabilitation-based care. These programs address the psychosocial concerns that accompany hospitalization and other health care experiences.

Child life specialists (CLS) facilitate the development and well-being of infants, children, adolescents, and young adults, while promoting coping skills and minimizing the effect of hospitalization and other potentially stressful experiences. CLS can work toward meeting the following goals:

- promote optimal development
- educate children and families about health conditions
- prepare children and families for medical events or procedures
- plan and rehearse useful coping and pain management strategies
- help children work through feelings about past or impending experiences
- establish therapeutic relationships with patients, siblings, and parents to support family involvement in each child's care.

If available, the CLS should be consulted and included in the care team for all pediatric patients.

Returning to Sports

Many mild brain injuries in pediatric patients occur during play, including sports competitions. A common term used to identify these injuries is concussion. Research has found that repeated concussions can result in a more severe injury. In addition, receiving repeated concussions in close succession without healing can be detrimental, resulting in long-lasting injury. To help prevent repeated concussions in school sports, the Washington State Legislature passed the Zackery Lystedt Law. The [Lystedt Law](#) requires school districts to comply with developing guidelines to educate coaches, youth athletes, and their parents regarding the risk concussion. In addition, it also establishes the practice of removing student athletes from play if a concussion is suspected and not returning them to play until after an evaluation is completed by a licensed health care provider. Rehabilitation providers caring for youth athletes with sports-related concussions should be aware of this law and its requirements.

Geriatrics

Sundowning

The term sundowning or sundown syndrome is a common clinical phenomenon in geriatric patients resulting in neuropsychiatric symptoms that occur in the late afternoon and evening. The symptoms can include confusion, disorientation, anxiety, agitation, aggression, pacing,

wandering, resistance to redirection, screaming, and yelling. Many of the symptoms may be related to medical conditions associated with dementia. The symptoms can be very challenging for caregivers.

Before considering a specific treatment, a thorough history and physical examination with laboratory diagnostics should be performed. Treatment for sundowning is generally considered either non-pharmacological or pharmacological. Some common treatments that have been found to be successful in treating sundowning include:

- Bright light therapy
- Melatonin
- Acetylcholinesterase inhibitors
- Antipsychotic medications
- Environmental interventions
- Behavioral modifications

Delirium

Delirium is a cognitive disorder often seen in geriatric patients. Delirium can occur during hospital admissions especially if the patient has dementia, has undergone surgery, or was admitted to the intensive care unit. Delirium is normally a transient state and the prognosis is good for recovery; however, patients with delirium are at risk for reduced function and increased mortality.

All rehabilitation professionals have a role in preventing delirium. Reducing or eliminating risk factors in conjunction with early identification and treatment can help reduce the number of older adults developing delirium. Team members should consider the National Institute of Health and Care Excellence (NICE) recommendations, and be trained in recognition and treatment of delirium.

Patients at risk of developing delirium (prediction rules):

- Age \geq 65
- History of cognitive impairment (past or present) and/or dementia
- Current hip fracture
- Severe illness (a clinical condition that is deteriorating or is at risk of deterioration)

Indications of delirium:

- Recent changes or fluctuations in behavior
- Worsening concentration
- Slow responses
- Confusion
- Reduced mobility and movement
- Restlessness and agitation
- Decreased appetite
- Sleep disturbances
- Withdrawn and poor communication

- Lack of cooperation
- Mood changes

Patients at risk or experiencing any indications should receive a more thorough exam.

General treatment considerations:

- Provide consistent staff to care for the patient
- Provide a care delivery model using a multidisciplinary approach with therapist staff trained in delirium management
- Use the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) criteria to aid and confirm diagnosis

Consider the following nonpharmacological recommendations for delirium:

- Identify any underlying conditions that may be contributing factors
- Assess comorbidities that if uncontrolled can result in delirium
- Routinely orient the patient to time, place, therapist names, and the plan of care
- Involve family members when possible; adjust visitation as needed
- Encourage mobility
- Prevent and treat dehydration
- Prevent and treat hypoxia
- Ensure adequate pain management
- Prevent and treat infection
- Avoid unnecessary catheterizations
- Support nutritional needs; dietary consult as needed
- Reduce routine variability and schedule changes
- Promote normal sleep patterns
- Reduce light and noise at night

Pharmacological recommendations for delirium include:

- Perform a medication review to manage polypharmacy and identify risk medications
- Evaluate the need for medications that may have sedation side effects, which may place the patient at risk and perpetuate delirium
- Consider the use of antibiotics to treat infections
- If pain is not controlled with nonpharmacological management, consider medications such as anti-inflammatories or opioids to control pain
- Antipsychotic and atypical antipsychotics medications may be necessary in some situations to manage symptoms
- Patients prescribed antipsychotic medications are at risk for developing prolonged QT interval, which can result in a heart dysrhythmia
- Patients prescribed haloperidol should receive periodic drug therapeutic level testing

Discharge Planning

Community Integration

During rehabilitation, community integration should be a priority in the plan of care that begins during the inpatient stay and carries over to discharge planning. Recent studies have noted the geriatric population is at risk for delays or failure in community integration due to physical, cognitive and psychological factors. Failure to regain functional independence and reintegrate into the community can affect wellbeing and quality of life. A multidisciplinary approach should be made to prepare and support the patient to reintegrate back into the community. This approach should begin with a thorough assessment of the challenges and barriers to integration, followed with a focused comprehensive plan. Subjective tools such as quality-of-life measures or community integration measures should be used when determining level of integration ability.

Return to Work

When considering return to work possibilities following BI, providers must carefully consider the patient's abilities in the following areas: physical, cognitive, communicative, psychological, and behavioral. Referrals to vocational rehabilitation specialists may be necessary for moderate and severe injuries.

The provider must write detailed restrictions when returning a patient with BI to limited duty, and should refrain from using language such as "sedentary or light duty" without defining the specific physical, psychological, and cognitive limitations. The provider must understand the patient's job functions and job requirements to include the physical, visual, cognitive, psychological, and behavioral demands of the job position. The prescribed limitations must be clearly explained to the patient, family members, and employers. Adaptive equipment, assistive devices, breaks, and other accommodations may be necessary to maintain employment.

In addition to the recommendations above, providers should be familiar with state and federal statutes and regulations pertaining to return-to-work planning. These include: Americans with Disabilities Act, Department of Transportation, Family and Medical Leave Act, Federal Motor Carrier Safety Administration, and the Occupational Safety and Health Administration.

Equipment

Individual equipment assessments should be conducted by appropriate rehabilitation team members (e.g. speech language professionals for augmented communication devices). Patients discharged from inpatient rehabilitation with assistive devices and other equipment must be fully trained in their proper use. Consideration should be given to also including family members in the training.

Follow-up and Long-Term Planning

Following BI, recovery is greatest in the first year but may occur over several years after the initial injury. The dynamic nature of BI may result in improvement or deterioration over time. In most cases, some degree of impairment will be present, which will require continuous care plan maintenance and services.

Evidence suggests that BI is associated with an increased risk of mortality in the first years following injury. The risks include death from suicide, assault, and unintentional injuries. The increase in risk is nearly threefold. It is independent of sociodemographic factors such as income

and marital status. For this reason, it is important that patients with BI have follow-up for long-term concerns such as psychiatric comorbidities and substance abuse.

Patient and Family Education

Preparing the home

Patients and family members will be excited about the aspects of returning home after their rehabilitation stay. Returning home can be an emotional and overwhelming time for the patient and the family members. The Brain Injury Association of American provides some excellent guidance and tools for the patient and family members returning home [here](#).

Fall prevention should be a top priority when preparing the patient for discharge home. Materials and information should be provided to family members before discharge to prepare the home for the patient's arrival. This will include methods to assess the home to remove fall hazards, and to prepare assistive devices to facilitate daily activities. All areas of the home should be assessed to ensure they accommodate the patient's daily activities and promote independence without placing the patient at risk for injury. All clutter should be removed. Dimly lit rooms should be lighted in a way that patients can properly see and maneuver safely. Areas such as bathrooms and showers may need to have grab bars and non-slip mats. Emergency contact information such as phone numbers for family members and physicians should be readily available.

Resources

[ASHA](#)

[BrainLine](#)

[Brain Injury Association of America](#)

[Brain Injury Alliance of Washington](#)

[Brain Injury Alliance of Washington \(Pediatrics Services\)](#)

[Centers for Disease Control and Prevention](#)

[Defense and Veteran Brain Injury Center](#)

[LEARNet](#)

[The Sarah Jane Brain Project](#)

[Academy of Neurologic Communication Disorders and Sciences: Evidence-Based TBI Practice Guidelines](#)

[National Institute of Health and Care Excellence Delirium Guideline \(NICE\)](#)

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