

Reducing Brain Injury Complications



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Practicing good hand hygiene is one simple and effective method to prevent the spread of infections that complicate a patient's condition. Here are other important steps that can reduce the incidence of complications from brain injury.

Common Medical Complications – Notify M.D. Promptly



Monitor for signs and symptoms of:

- **Hydrocephalus:** impaired consciousness, behavioral changes, ataxia, incontinence.
- **Increased intracranial pressure (ICP):** vomiting, slowed, irregular respirations, bradycardia, systolic hypertension, decorticate/decerebrate posturing.
- **Cerebral spinal fluid (CSF) leaks** are common for patients with skull fractures. Look for clear drainage from nose, eyes and/or ears as it puts patients at increased risk for meningitis.
- **Sunken flap syndrome (Syndrome of the Trephined)** in patients after decompressive cranioplasty, especially after shunt placement for hydrocephalus. Complications can occur with a midline shift. Consider early cranioplasty if shunt adjustment, flattening the head of the bed and hydration are unable to resolve sunken flap.
- **Seizures**, which may present atypically. Follow hospital guidelines for seizure response.
- **Endocrine disorders:** strict I/O, weight changes, fluid/electrolyte imbalance, urine and serum sodium, and osmolality.

Monitor Paroxysmal Sympathetic Hyperactivity (PSH) —



commonly referred to as **dysautonomia** or “**neurostorming**.”

- Assess symptoms and patterns to determine cause of PSH. Is there an infection, undiagnosed injuries or other medical issues? Are there triggers, such as poor positioning or the need for endotracheal suctioning?
- Treat sympathetic overactivity (fevers, sweating, tachycardia and hypertension) with fever reducers, beta blockers and alpha-2 agonists, as necessary.
- Treat pain aggressively to decrease effect of PSH: Consider Tylenol (IV or enteral), anticonvulsants, narcotic medications (long-acting and short-acting).
- Treat spastic dystonia with oral medications and botulinum toxin as able and consider intrathecal baclofen in severe cases.
- Medicate pre-emptively to prevent or lessen neurostorming during interventions or treatment.
- Provide additional padding and frequent position changes.
- Change wet linens due to diaphoresis and use fans or cooling blankets to reduce body temperature.
- Monitor for risk of skin breakdown at bony prominences due to motor restlessness.
- Increase hydration, caloric and nutritional intake if neurostorming.
- Reduce stimulation: sounds, light, room temperature, extra physical handling.

While PSH generally indicates a more severe injury, in the majority of cases, it decreases over time, and interventions should be able to be tapered off.

Neuropharmacology



- Solid evidence-based studies are lacking in the acute period, but studies suggest the use of amantadine in individuals with a **disorder of consciousness (DoC)** and the use of propranolol for severe injuries with autonomic overactivity and/or agitation.
- Eliminate drugs that are sedating.
- Regulate the sleep/wake cycle to improve alertness and agitation.
- Use meds with the least detrimental effect on sleep and seizure threshold.
- Weigh the benefits and risks of medications. The side effect(s) may contribute to other complications (e.g., seizure).
- Treat spasticity systemically with oral medications before other interventions are considered.

Environment of Care



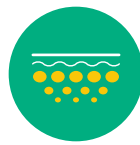
- Assess room temperature, sounds, lighting and extra people in the room.
- Provide routine schedule, do not rush care, use a calm voice, redirect and be aware of your own body language.
- Look for patterns that impact overall status and vital signs (e.g., Does overstimulation occur after a certain visitor or medical intervention?).
- Provide a clear explanation of any interaction before starting.
- Remove objects in the environment that could cause harm to the patient or others.
- Encourage a low-stimulation environment and rest breaks.

Behavior Management



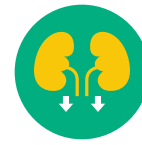
- Manage agitation. Use sedatives, benzodiazepine and antipsychotics judiciously. Consider drug interactions and half-lives of medications.
- Monitor behavior in conjunction with med changes. Observe agitation, participation, wakefulness.
- Address pain and other personal care needs that may lead to increased agitation.
- Consider added safety measures: use of **constant visual observation (CVO)**; use of telemonitoring, if available; implementation of a behavior management plan; and/or use of physical restraints.
- Remove objects in the environment that could cause harm to the patient or others.

Maintain Skin Health



- Keep skin clean and dry. Control moisture. Take careful consideration of skin folds and the perineal area.
- Implement a Q2-hour padding and positioning program, unless medically contraindicated.
- Promote early out-of-bed schedules and routine weight shifts while up.
- Reduce friction and possible abrasions. Use draw sheets and lifts to reposition.
- Check bony prominences after every turn. Examine the entire body for signs of bruising, redness or abrasions.
- Provide foot care and pay attention to thick callouses on feet. Check for pressure ulcers under callouses.
- Routinely check pressure relieving and positioning equipment are working and utilized properly.

Bowel and Bladder



- Consider the effects of cognition, communication and mobility on continence.
- Introduce fiber, hydration and out-of-bed routines.
- Discontinue medications that cause constipation and evaluate for signs of impaction.
- Remove indwelling catheters as soon as possible to lower the risk of infection. Use intermittent catheterization when appropriate and initiate medical interventions if urinary retention persists.
- Introduce bowel and bladder elimination programs as early as possible.

Intervene with Early Therapy



- Provide **early range-of-motion (ROM)** activities and splinting to prevent contracture, maintain skin integrity and decrease negative effects of **heterotrophic ossification (HO)**.
- Promote out-of-bed schedules. Early mobility with therapy reduces the risk for complications such as **venous thromboembolism (VTE)**, respiratory infection and bowel impaction.
- Preserve abilities through therapeutic activity, which promotes and improves arousal, communication, strength and endurance.
- Consult with a **speech-language pathologist (SLP)** regarding swallowing and communication strategies.
- There is a high incidence rate of misdiagnosis of the level of consciousness in individuals after severe brain injury. Thus, you should assess all patients with a disorder of consciousness using a standardized measure such as the **Coma Recovery Scale – Revised**.

Preventative Measures to Consider

- **Provide aggressive pulmonary care** for patients who are at risk of pulmonary complications as result of direct injury to the brain, reduced consciousness or the inability to protect airways.
- **Prevent aspiration** with oral intake and parenteral nutrition by following NPO status and/or SLP recommendations. Elevate the head of the bed for all tube feedings and monitor residual levels. Consider GJ tube placement for feeding in cases of gastroparesis to decrease the risk of aspiration pneumonia.
- **Prevent Venous Thromboembolism (VTE):** Pay close attention to discrepancies in appearance, size, color and temperature of all extremities. Intervene with anticoagulation, pressure-graded/sequential stockings or other prophylaxis.
- **Consider supplemental nutritional needs** for patients with skin compromise.
- **Assess and treat acute pain to prevent chronic pain.** Pain affects cognitive and emotional functioning. Be aware that excessive complaints of pain could be confabulation or real pain.

Refer to the **DoC Practice Guidelines and Recommendations** for an evidence-based approach to care in severe brain injury. Please reference <https://n.neurology.org/content/91/10/450>.



A GUIDE FOR

REDUCING SPINAL CORD INJURY COMPLICATIONS

Practicing good hand hygiene is one simple and effective method to prevent the spread of infections that complicate a patient's condition. Here are other important steps that can reduce the incidence of complications from spinal cord injury.



PROVIDE AGGRESSIVE PULMONARY CARE

- Control secretions with suctioning, an in-exsufflator cough-assist device and higher-tidal volumes on ventilation.
- Provide good oral care, including swabbing with a hydrogen peroxide solution or oral chlorhexidine.
- Elevate the head of the patient's bed.
- Evaluate the patient for extubation.
- Pay close attention to trach care.
- Perform early intubation to reduce sputum retention.
- Allow patients to have "sedation vacations" to minimize sedation time.



PREVENT VENOUS THROMBOEMBOLISM (VTE)

- Administer low-molecular-weight heparin when the patient is stable and risk of bleeding is low.
- Consider a vena cava filter, especially for patients who are not candidates for anticoagulation or haven't responded to prophylaxis.
- Use appropriate pressure-grade/sequential stockings.
- Pay attention to discrepancies in leg appearance, size, color and temperature.



MAINTAIN SKIN HEALTH

- Use gel-padded backboards, operating tables and stretchers.
- Examine skin twice a day for signs of bruising, redness or abrasion.
- Keep skin clean, especially where it has contact with bowel movements.
- Turn patients frequently, using draw sheets and lifts to lift and reposition rather than dragging the patient.
- Monitor weight shifts.
- Reduce friction/abrasion.
- Always check bony prominence areas after a position change.
- Check to see if equipment, seat cushions and mattresses are working properly.
- Control moisture, especially in gluteal folds, folds under breasts and fatty folds. Sprinkle an anti-fungal powder to reduce friction and bacteria. Antiperspirant deodorant is a good strategy for troublesome areas.
- Provide good foot care; trim nails.
- Pay attention to thick callouses on feet. (There may be a pressure ulcer underneath.)



BOWEL MANAGEMENT

- Start a bowel program immediately.
- Introduce fiber, hydrate and get patient out of bed as soon as possible.
- Use a chemical or mechanical stimulant to start peristalsis.
- Diarrhea doesn't mean the patient's bowels are moving; it could indicate an impaction.
- Listen for changes in bowel sounds.
- Discontinue medications that can cause constipation, if possible.



PAIN MANAGEMENT

- Treat acute pain to prevent chronic pain.
- Work with therapy team to coordinate therapy interventions, such as ice, heat, positioning, splinting and transcutaneous electrical nerve stimulation (TENS).
- Consider a pain consultation for trigger-point injections and alternative measures.



INTERVENE EARLY WITH THERAPY

- Therapy maintains range of motion (ROM).
- It reduces the risk for complications such as joint contractures, VTEs, respiratory infection and bowel impaction.
- Therapy can preserve and improve functional abilities.
- Therapeutic activity increases strength and endurance.
- Consult with speech therapy regarding swallowing and voicing.



TAKE OTHER INFECTION-CONTROL PRECAUTIONS

- When patients present with fever, focus on one of the three W's: wind, wound, water. The source of infection for people with SCI is usually found in one of these areas.
- Minimize the use of antibiotics and use targeted (not broad-spectrum) antibiotics whenever possible.
- Use maximal barriers (gown, mask, sterile gloves, cap) when inserting a central line.
- Clean the skin with chlorhexidine before inserting a central line.
- Monitor changes in the bladder program, look for blood in the urine and check patient temperatures to detect possible urinary tract infections.
- Only treat clinical urinary tract infections to prevent antibiotic resistance.
- Provide adequate nutrition, including a positive nitrogen balance.
- Monitor duration of intravenous catheters to reduce bloodstream infections.
- Remove the indwelling catheter as soon as possible.